CALIFORNIA DESIGN WEST ARCHITECTS INC.

2100 19TH STREET
SACRAMENTO CA 95818
916.446.2466

TECHNICAL SPECS

SEQUOIA ELEMENTARY SCHOOL
TOILET BUILDING AND SITE SECURITY FENCING

3333 ROSEMONT DRIVE
SACRAMENTO, CA 95826

DSA APP # 02-120800
DSA FILE # 34-53

SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

TOILET BUILDING AND SITE SECURITY FENCING

APRIL 2023

PAGE INTENTIONALLY LEFT BLANK.

LIST OF CONSULTANTS

ARCHITECT

CALIFORNIA DESIGN WEST ARCHITECTS
2100 19th Street
Sacramento, CA 95818
(916) 446-2466

LICENSED ARCHITECT
MITCHELL A. McALLISTER
REN. 02-28-25
STATE OF CALIFORNIA

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-120800 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 04/12/2023

STRUCTURAL ENGINEER

POINT 2 STRUCTURAL ENGINEERS, INC.
3701 Business Drive, Suite 100
Sacramento, CA 95820
(916) 452-8200

REGISTERED PROFESSIONAL ENGINEER
WILLIAM P. LARSON
3148
STRUCTURAL
STATE OF CALIFORNIA

MECHANICAL ENGINEER

WESTON & ASSOCIATES MECHANICAL ENGINEERS
601 University Avenue, Suite 260
Sacramento, CA 95825
(916) 482-0820

REGISTERED PROFESSIONAL ENGINEER
ADAM C. DAVIS
M 34869
EXPIRES 06/30/24
MECHANICAL
STATE OF CALIFORNIA

ELECTRICAL ENGINEER

M. NEILS ENGINEERING, INC.
100 Howe Avenue, Suite 235N
Sacramento, CA 95825
(916) 923-4400

REGISTERED PROFESSIONAL ENGINEER
JESSE U. BASTIAN
No. E20229
Exp. 03-31-25
ELECTRICAL
STATE OF CALIFORNIA

03/21/2023

CIVIL ENGINEER

WARREN CONSULTING ENGINEERS, INC.
1117 Windfield Way, Suite 110
El Dorado Hills, CA 95762
(916) 985-1877

LANDSCAPE ARCHITECT

MTW GROUP
2707 K Street, Suite 201
Sacramento, CA 95816
(916) 369-3990

END OF LIST OF CONSULTANTS.

DIVISION 2 – EXISTING CONDITIONS

DIVISION 3 – CONCRETE

DIVISION 5 – METALS

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

DIVISION 8 – DOORS AND WINDOWS

DIVISION 9 – FINISHES

DIVISION 10 – SPECIALTIES

DIVISION 22 – PLUMBING

DIVISION 23 – HVAC

DIVISION 26 – ELECTRICAL

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

DIVISION 31 – EARTHWORK

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILITIES

END OF TABLE OF CONTENTS.

DIVISION 2 – EXISTING CONDITIONS

02 41 19 – Selective Demolition

PAGE INTENTIONALLY LEFT BLANK.

SECTION 02 41 19 – SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions and other Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Definition: "Demolition" includes cutting into or removing existing construction and conditions to provide for the installation of other work.

B. Section includes Selective Demolition as follows:

1. Removal of above-grade improvements

2. Removal of below-grade improvements

3. Removal of existing building components, including architectural, structural, plumbing, fire protection, mechanical and electrical materials and equipment, as indicated on drawings and as required to accommodate new construction.

4. Sawcut and remove concrete where necessary to prepare for subsequent work as indicated on the Drawings.

5. Disconnect, remove, cap and identify utilities for later reconnection.

6. Removal of materials from site and dispose of legally.

7. Temporary partitions to allow adjacent building occupancy.

8. Salvage of designated elements for repair/reinstallation as indicated on Drawings.

9. Protection of existing trees and adjacent buildings / improvements indicated to remain.

10. Recycling of building components.

1.3 RELATED SECTIONS

A. Section 01 50 00 – Temporary Facilities and Controls (such as fencing, barricades, warning lights, and other temporary safety measures).

B. Coordinate with Sections of Division 26 for electrical items to be demolished.

1.4 EXISTING CONDITIONS

A. Bidders are required to examine the site and examining existing building drawings before providing a Bid (see Instructions to Bidders). Owner makes no representations of conditions other than can be reasonably inferred from examination

of the above, and assumes no responsibility for actual conditions of items or structures to be demolished.

B. If unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit a report to the Owner's representative. Pending receipt of directive from Owner's representative, rearrange demolition schedule as necessary to continue overall job progress without undue delay.

C. Protect trees indicated to remain and provide maintenance (including watering) to ensure their survival. Cut roots only as necessary, and as acceptable to Arborist employed by the Contractor.

D. Protect adjacent buildings and improvements from damage. If contractor damages adjacent work, it shall be his responsibility to completely restore that work to its previous condition, as acceptable to the Architect, at no additional cost to the Owner.

E. Pre-Demolition Meetings: Schedule a conference to be held on-site not less than 14 days before demolition work begins to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Provide not less than one-week advance notification to attendees, Owner, and Architect.

1. Topics to be discussed at meeting shall include:

a. Review and finalize of schedule, methods, and procedures related to selective demolition

b. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations

c. Inspect and discuss condition of construction to be demolished. Discuss items to be salvaged, and location for storage of salvaged items.

d. Review structural load limitations of existing structure.

e. Verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

f. Review areas where existing construction is to remain and needs to be protected

g. Review and finalize protection requirements.

1.5 REFERENCES

A. American National Standards Institute (ANSI): ANSI A10.6 Safety Requirements for Demolition.

B. California Occupational Safety & Health Administration (Cal/OSHA): OSHA Technical Manual (OTM), Section V: Chapter 1.

C. 2022 California Building Code (CBC) with Amendments.

1.6 SUBMITTALS

A. General: Refer to Section 01 33 00 – Submittals.

D. Methodology:

1. Submit overall demolition and removal procedures and schedule, including but limited to:

a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

b. Indication of how long utility services will be interrupted.

c. Coordination for shutoff, capping, and continuation of utility services, and accurately record locations of capped utilities.

d. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

2. Submit a detailed written program for each aspect of selective removal process, including a description of methods and materials used for protection of adjacent areas scheduled to remain.

3. Submit procedures and/or drawing that indicate measures proposed for environmental protection, dust control, and noise control measures, proposed locations, and proposed time frame for measures.

E. Shoring and Bracing Submittals: Prepare and submit shoring and bracing drawings with calculations showing analysis of work to be performed. Drawings and calculations shall be prepared by and bear seal of a registered professional engineer, licensed to practice in California, if required.

F. Pre-demolition Photographs: Before commencing demolition, file with Architect photographs documenting existing conditions that later could be mistaken for damage caused by demolition operations.

G. Shop Drawings: Indicate areas for demolition, removal procedures and removal sequence, and location of salvageable items; location and construction of temporary Work.

H. Project Record Documents: Accurately record locations of capped utilities, subsurface obstructions, and any other requirements provided by Project Manager.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Perform selective demolition in compliance with applicable rules, regulations, codes, and ordinances of authorities having jurisdiction, including Environmental Protection Agency (EPA).

2. Comply with requirements of public utility corporations having jurisdiction over this Project. Obtain and pay for permits, licenses, and certificates needed during performance of selective demolition.

3. Comply with Cal/OSHA demolition requirements.

4. Comply with ANSI A10.6 except as otherwise modified herein.

5. Do not close or obstruct roadways or sidewalks without permits.

6. Minimize interference with corridors, exits, sidewalks, roadways and public thoroughfares.

7. Comply with hauling and disposal regulations of authorities having jurisdiction.

8. Comply with applicable procedures if hazardous or contaminated materials are discovered or suspected.

B. Requirements for Structural Work: Do not cut or remove structural work of building components to remain in a manner that would result in a reduction of load-carrying capacity.

C. Environmental Protection: Provide dust and noise control measures, including but not necessarily limited to dust barriers, sound barriers, ventilation, and watering, to prevent dust and debris from demolition activities from doing damage to existing building conditions.

D. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition work similar to that indicated for this Project.

1.8 MATERIALS OWNERSHIP

A. Unless otherwise indicated, materials and debris resulting from cutting, moving, or removal becomes property of Contractor.

1. On-site storage or sale of Contractor's materials and debris shall not be allowed.

2. All copper feeders removed will go back to SCUSD.

1.9 PROJECT CONDITIONS

A. Protect adjacent work to remain, and items to be salvaged, from damage.

B. Existing Conditions:

1. Do not interfere with use of adjacent buildings. Maintain free and safe passage to and from.

2. Do not close or obstruct walkways or driveways except as otherwise indicated without authorization of authority having jurisdiction. Do not store or place materials in walkways, driveways, or other means of egress.

3. Conduct selective demolition operations with not less than interference to adjacent building areas, public or private roadways, and walkways.

4. Maintain a protected egress and access at all times.

5. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

6. Do not store debris or other materials in building to remain that would overload floor structure.

C. Unforeseen Conditions:

1. It is not expected that hazardous materials will be encountered in Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Do not recommence work in the area until advised by the Architect or Owner that the area has been cleared for work.

3. Should unforeseen conditions be encountered that affect design or function of Project, investigate fully and submit an accurate, detailed, written report to Owner and Architect for consideration.

4. While awaiting Architect and/or Owner's response, reschedule operations if needed to avoid delay of overall Project.

D. Work under this Section shall not affect the operation of adjacent areas.

1.10 SEQUENCING

A. Submit schedule indicating proposed sequence of operations for selective demolition work to Architect, DSA Inspector, Owner, and Project Manager for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services, and details for dust and noise control.

1. Specific attention is called to the requirements to coordinate demolition work with ongoing activities in the building so as to minimize impacts on those activities.

B. Prior to beginning of any work, obtain approval from the Owner and Architect.

C. Coordinate the scheduling of work of Section with the work of other sections.

PART 2 – PRODUCTS

2.1 MATERIALS, EQUIPMENT AND FACILITIES

A. The Contractor shall furnish all materials, tools, equipment, devices, appurtenances, facilities and services as required for performing the selective demolition and removal work.

B. Use repair materials identical to existing materials. Determine type and quality by inspection and testing of existing products where necessary, referring to existing work as a standard.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

2. Use materials whose installed performance equals or surpasses that of existing materials.

C. Materials forming portions of the structure indicated to be removed shall become the Contractor's property and the Contractor shall be responsible for their removal from the site.

2.2 PROTECTION MATERIALS

A. Cushioning Materials:

1. Description: Non-staining, flexible, resilient boards, blocks or sheets of expanded polystyrene closed cell foam.

2. Thickness: As needed to provide adequate protection for on-site conditions.

B. Board (Panel) Materials:

1. Description: Rigid panel products, including but not limited to, tempered hardboard, or plywood.

2. Thickness: Not less than 3/8".

C. Sheet Materials:

1. Description: Non-staining polyethylene sheet and/or nylon reinforced sheets as needed to resist rips and tears due to work being performed and weather or wind.

2. Thickness: Not less than 15 mils.

D. Accessories: Provide tape suitable for joining cushioning, board, gasket, padding materials, and sheet materials together at seams.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Inspect and verify the existing conditions and become familiar with the extent of the Work. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

1. Insofar as practicable, arrange operations to reveal unknown or concealed structural conditions for examination and verification before removal or demolition. Perform engineering surveys as needed to determine both condition of framing, floors, and walls, and possibility of unplanned collapse of any portion of structure and adjacent structures where appropriate.

B. Examine the site to determine proper access within the limitations of the Contract.

1. Verify actual conditions to determine in advance whether removal or demolition of elements will result in structural deficiency, overloading, failure, or unplanned collapse.

2. Perform continuing surveys as work progresses to detect hazards from demolition or construction activities.

C. Conduct operations so as not to interfere with adjacent roads, driveways, walks, buildings, corridors, means of access and egress, work areas, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

E. Verify that utilities have been disconnected and capped.

3.2 PREPARATION

A. Interfaces with Other Work: Coordinate extent of selective demolition work with limits of new work and existing work to remain, and with demolition and modification requirements shown on the Drawings.

B. Protection: Protect existing materials, appurtenances and equipment which are not to be demolished. Existing materials, appurtenances and equipment, building exterior and interior, and landscaping altered or damaged during demolition work shall be repaired or replaced by the to match existing undisturbed conditions at no additional cost.

C. Prevent movement of structure to remain; provide bracing and shoring as required.

D. Provide proper and permanent support to adjacent structure for all piping, conduits and cables to remain.

E. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

F. Provide and maintain temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage, or wind damage occurs to structure or interior areas of existing building.

G. Provide and maintain temporary barriers and security devices at locations indicated. Barriers shall be one-hour fire-rated at exit corridors.

H. Temporary Fire Protection: Provide protection as needed by and in compliance with, local requirements. Consult local fire authority regarding on-site fire protection during selective demolition.

I. Place roof-walk boards over roof areas to protect roofing membrane. Fasten or attach roof protection boards to keep them from being blown off roof; do not harm integrity of roof. Protection shall be provided in such a manner as to completely protect areas subject to damage.

J. Use periodic light water mist, temporary enclosures, and other suitable methods to limit dust and dirt. Comply with applicable environmental protection regulations. Use water only if approved by Architect or Owner.

K. Provide and maintain temporary partitions to prevent spread of dust, odors and noise to permit continued building occupancy.

L. Maintain path of travel for debris removal dust free and clean at all times.

M. Maintain ventilation system dust free at all times.

N. Cover and protect windows and walls that are adjacent to areas to be demolished.

O. Protect smoke alarms and fire sprinklers from dust intrusion.

P. Use covered debris bins and/or debris chute to remove and materials indicated. Location of debris chute and bins shall be approved by Project Manager.

Q. Noise Abatement: Comply with noise abatement ordinances.

R. Maintain parking areas, driveways, exterior walkways, exit paths, and landscaping in a clean, undisturbed condition. Any debris caused by selective demolition work shall be removed each day.

3.3 UTILITY SERVICES

A. Utility Requirements: Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

B. Field verify the exact location of existing concealed utilities. Use caution if working in or about concealed or exposed utilities.

C. Disconnect, remove, and cap designated utility lines within demolition areas. Accurately mark locations of disconnected utilities. Identify utilities and indicate capping locations on Project Record Documents.

F. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

G. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

1. **Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover**.

H. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Prior to interruption of utility services, notify affected public utility companies and obtain instruction for carrying out disconnection. Take precautionary measures deemed necessary by public utility companies.

I. Where utility services are required to be removed, relocated or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.

J. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

K. Utility Requirements: Refer to Mechanical, Plumbing, Fire Protection, and Electrical Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 EXECUTION

A. General:

1. Minimize interference with adjacent and occupied building areas, materials and equipment, and as required to allow the school’s continued use of the facilities.

2. Investigate and measure the nature and extent of unanticipated items that conflict with intended function or design. Submit written report with accurate detailed information to Project Manager. While awaiting instructions from Project Manager, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3. Remove items in an orderly and careful manner.

4. Remove only as much material as is required for new construction work to be conveniently performed. Protect supporting structural members and foundation.

5. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on next lower level.

6. Cut surfaces so as to minimize the amount of new surfaces required to match existing, by using hand or small power tools designed for sawing or grinding, not hammering or chopping. Make cuts plumb, true, level and straight, or as otherwise required to provide proper surfaces to receive new work and repairs. Perform cutting and removal operations so as not to cut or remove more than is necessary and not to damage adjacent work.

7. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

8. Do not use cutting torches until work area is cleared 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 adequate ventilation when using cutting torches.

9. Remove miscellaneous abandoned appurtenances that will be exposed to view, unless indicated otherwise.

10. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

11. Remove and promptly dispose of vermin infested materials.

12. Stop work and notify Project Manager immediately if structure or other items to remain appear to be endangered. Do not resume work until directed by Project Manager.

B. Concrete / Masonry Cutting and Removal:

1. Demolish freestanding columns and free standing walls to level of slab or foundation on which they rest. Carefully examine freestanding columns and walls and do not demolish if their demolition will result in an unstable or unsafe condition.

2. Cut asphalt, concrete, and masonry in small sections by power saw in neat, sharp straight lines; do not use power-driven impact tools. Repair broken edges as directed by Project Manager.

3. Provide saw cut perimeters to horizontal and vertical openings.

4. Apply one coat of epoxy paint to exposed ends of concrete reinforcement at openings made in concrete floors and walls.

5. Contractor to recycle concrete debris to the extent possible.

C. Steel Cutting and Removal:

1. Remove steel framing members individually. Do not heat, cut, or otherwise disturb remaining structural members, including purlins, tie rods, rivets, and bolts.

2. Do not cut structural columns, beams, girders, or trusses to remain.

3. Contractor to clean, sort, and recycle metal components (within reasonable effort).

D. Salvage:

1. Salvage items indicated for reuse, and/or items identified for retention by Owner.

2. Remove materials to be reinstalled or retained and store in a manner to prevent damage. Where items are indicated to be removed and reinstalled, install materials and equipment in locations indicate. Comply with requirements for new materials and equipment.

3. Materials and equipment for reinstallation and/or retention by Owner shall be as indicated on Drawings.

E. Dust Control: Eliminate dust, allowing none into the existing facilities and adjacent facilities. Install dust barriers at doors of spaces where demolition work is being done and as required to keep dust out of corridors and adjacent areas. Use walkoff mats designed to remove dust at the corridor side of doors to rooms where demolition work is being done.

1. Activities which generate silica dust, such as concrete saw cutting, jackhammering, chipping, or abrasive blasting, shall incorporate engineering controls to eliminate visible emissions.

2. Do not use silica sand or other substances containing more than 1 per cent crystalline silica as abrasive blasting material

3. Use concrete and masonry saws that provide water to the blade.

4. Prevent human exposure to dust using methods such as removing dust with water, high efficiency particulate air (HEPA) filters, and wet sweeping. Do not use compressed air or dry sweeping.

F. Do not disrupt service to existing fire sprinkler lines. If disruption becomes necessary, coordinate with Project Manager.

3.5 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

B. Patching is specified in Section 01 73 29 – Cutting and Patching.

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminated evidence of patching and refinishing.

3.6 DISPOSAL

A. Material removed under this Subcontract which is not to be salvaged or reused in the Project shall become the property of the Contractor and shall be promptly removed from the site. Do not store or permit debris to accumulate at the site.

B. Unless indicated otherwise, immediately remove demolished material from site. Dispose of materials legally off site. Do not burn or bury materials on site.

C. Items listed below have unique or regulated disposal requirements and are to be removed and disposed of in manner dictated by law or in most environmentally responsible manner. Typical concerns are listed in parentheses:

1. Fluorescent light ballast manufactured prior to 1978 (PCB)
2. Fluorescent lamps (Mercury)
3. Refrigeration, air-conditioning, and other equipment containing refrigerants (CFC recovery)
4. Batteries (Lead, acid, mercury)
5. Paints, solvents, and other hazardous fluids
6. Asbestos based materials
7. Materials with lead based finishes

3.7 CLEANING

A. Upon completion of selective demolition, tools, materials, apparatus, and rubbish shall be removed. Site shall be left clean. Remove temporary work.

END OF SECTION.

DIVISION 3 – CONCRETE

03 11 00 – Concrete Formwork
03 20 00 – Concrete Reinforcing
03 30 00 – Cast-in-Place Concrete

PAGE INTENTIONALLY LEFT BLANK.

SECTION 03 11 00 – CONCRETE FORMWORK

PART 1 – GENERAL

1.1 PRINCIPLE WORK IN THIS SECTION

A. The requirements of the District's General Conditions, Supplementary Conditions, and Division 1 - General requirements apply to the work of this Section.

B. Coordinate the work of this Section with related trades.

C. Verify applicable extents of work and dimensions at the jobsite

D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:.

1. Forms for concrete, including but not limited to:

   a. Flatwork

   b. Curbs

   c. Ramps

   d. Vehicular paving

   e. Site drainage components

   f. Mechanical and electrical items, such as clean-outs, valve access boxes, and pads.

2. Installation of bolts, anchors, sleeves, slots and inserts furnished under other Sections, except that embedded items for mechanical or electrical work are to be installed by trade involved.

3. Construct smooth face forms for Seat Walls.

1.2 RELATED WORK / SECTIONS

A. Related work includes, but is not limited to the following:

1. Rough Grading

2. Pad construction

3. Finish Paving

4. Soil Treatment

5. Reinforcing

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

1. Section 03 20 00 – Concrete Reinforcement

2. Section 03 30 00 – Cast in Place Concrete

1.3 REFERENCE STANDARDS

A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.

B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code

1. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.

C. Refer to specifications, including, but not limited to Division 1 – References and Definitions.

D. American Concrete Institute (ACI):

1. ACI 303R Guide to Cast-In-Place Architectural Concrete Practice"

2. ACI 318 Building Code Requirements For Structural Steel, Concrete and Commentary

3. ACI 347 Recommended Practice for Concrete Formwork

4. CBC Sections;

a. DSA: 1906A.1 and 1906A.

E. Standard Grading and Dressing Rules #17, West Coast Lumber Inspection Bureau (For Douglas Fir Form Lumber).

F. U.S. Product Standard PS 1-83 (For Plywood Form Lumber).

G. West Coast Lumber Inspection Bureau (WCLIB)

1.4 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.

2. Comply with Building Code.

3. Job site inspections shall be done as herein specified and as listed in drawings.

4. Testing shall be done as herein specified and as listed in drawings.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Material	Exposed concrete application	Smooth face / masonite material	N/A
Refer to drawings and as herein specified			

C. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
Formwork Tolerances	As herein specified	Comply	Refer to as herein specified "WORKMANSHIP and TOLERANCES heading

D. Construction Testing / Inspection by others:

Item	Name of Test	Performance Results	By Whom
Formwork	Design Compliance	Accommodate slopes, heights, slopes and extents	Special Inspector General Contractor

1.5 SUBMITTALS

A. Refer to Division 1 – Submittals.

B. Submit shop drawings showing the locations of all proposed construction joints, control joints and sequence of all concrete pours (for concrete walls, columns, elevated slabs, and slab on grade, etc.)

1.6 QUALITY ASSURANCE

A. Refer to Division 1 Sections.

B. Contractor /Installer shall have been in business for Five (5) years providing/installing similar size projects and complexity.

C. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical and lateral loads that might be applied until such loads can be carried by concrete.

D. General Contractor is responsible for adequacy of all work. Specifications are only minimum standards. Adequate and safe support bracing, shoring, and stabilizing of all concrete forms is sole responsibility of General Contractor, who shall adhere to all requirements of Division of Industrial Safety, State of California.

E. Concrete formwork shall be designated and constructed to safely support fluid concrete and superimposed construction loads without excessive deflection or concrete leakage.

1. Provide bracing to maintain accurate alignment and to resist all anticipated lateral loads. Forms shall conform with drawings and to shape, line, and dimension.

2. Design, engineering and construction of forms shall be General Contractor's responsibility.

3. Formwork for exposed concrete shall be constructed to tolerances indicated in ACI guidelines.

F. Cooperate and coordinate with other trades who furnish and/or install piping, conduit, reglets, anchors, inserts, sleeves, hangers, etc., as their work requires; including provisions for recesses and chases.

G. Conform to Standard Grading and Dressing Rules #17, West Coast Lumber Inspection Bureau (WCLIB) for Douglas Fir Form Lumber.

H. Conform to U.S. Product Standard PS 1-09 (For Plywood Form Lumber).

I. Forms shall be set and field reviewed with General Contractor prior to concrete pours to verify compliance with building code and ADA accessibility requirements.

J. Forms shall not be removed until concrete has reached a minimum of 80% design strength, unless approved otherwise by structural engineer.

1.7 PRODUCT STORAGE AND HANDLING

A. Comply with Division 1 specifications – Product Storage and Handling.

1.8 JOB CONDITIONS

A. Field-verify that all components, backing, subgrade, etc. by others are installed correctly to proceed with installation of products as herein specified, and indicated in drawings.

1.9 PROTECTION

A. Protect finish surfaces, piping, conduit, etc, at all times from work specified herein and in drawings.

B. Finish work defaced with other materials on surface shall be replaced.

C. Protect work under this section from damage by other trades.

1.10 GUARANTEE / WARRANTY

A. Refer to Section 01 78 36 – Warranties and Bonds and Section 01 78 38 Guarantee

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Single source responsibility, specified items shall be from one manufacturer for each product type.

1. Acceptable manufacturers/installer/fabricator shall be one of the following and as herein listed and in Drawings:

a. Refer to documents and as herein specified

b. Reviewed Equivalent by Architect.

i. Substitutions and deviations shall require Architect's approval and shall be given in letterform.

ii. Refer to Division 1– Submittal Procedures.

iii. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.

2. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.

3. Refer to drawings, details, and other related specification section whether listed or not.

4. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. Form material

1. Concrete exposed to view options:

a. Acceptable form material:

i. 5/8" minimum APA Plyform

ii. Steel

iii. MDO (medium density overplay plywood)

iv. Plywood

b. Seat Walls: Line 5/8" plywood with smooth masonite board veneer with seams aligning with reveals at seat walls.

2. Concrete concealed from view materials:

a. 5/8" minimum APA Plywood

b. MDO (medium density overplay plywood)

c. Steel

d. Clean and sound 1 x 8 Standard Grade Douglas Fir

B. Fiber Forms: Tubular column forms spirally constructed of laminated plies of fiber. Plies shall be laminated using a non-water sensitive adhesive and surface wax impregnated for moisture protection. Forms shall give a smooth and seamless appearance to the cast concrete. Provide reveals, as shown on the drawings, as supplied by the form manufacturer.

1. Manufactured by;

a. Sonoco Products (www.sonoco.com), plastic lined

b. Burke Smoothtube by Burke Co.

c. Approved equal

C. Form Clamps: Assembly to have cone washers, (1 inch break back) 3/8" center rod.

D. Form Ties:

1. Concrete exposed to view: Snap ties allowing full 1 inch break back.

a. Seat walls

b. Concrete retaining walls

2. Concrete concealed from view: Snap ties or wire.

3. Verify special spacing requirements with architectural drawings at exposed concrete.

E. Spreaders: Metal (no wood permitted).

F. Form Coating: Non-grain and non-staining types of form coating that will not leave a residual matter on the face of the concrete or adversely affect proper bonding of any subsequent paint or other surface applications.

1. Form coating containing mineral oils or other non-drying materials will not be permitted for any concrete work.

2. Refer to section 03 30 00 – Cast In Place Concrete.

G. Joint Tape: No. 471 plastic film tape 3 inches wide, as manufactured by the Industrial Tape Division of 3M Company.

H. Expansion Joint Filler (Preformed):

1. ½ inch thick; Flexcell by Celotex Corporation.

2. Elastic Fiber Expansion Joint by Phillip Carey Mfg. Co.

3. Sealtight Fiber Expansion Joint by W.R. Meadows, Inc. (www.wrmeadows.com)

I. Extruded Polystyrene Foam: ASTM C578 type IV.

1. Dow Chemical Corp. (www.dow.com) "Styrofoam".

2. US Industries "Foamular", or approved equal.

J. Form support bars:

1. Condition where bars penetrate thru vapor barrier and cannot be patched when removed; install rigid plastic bars which are sealed with vapor barrier manufacturer's mastic when installed.

a. Cutoff bar close to vapor barrier prior to or during concrete placement and maintain minimum 2.5" of concrete cover.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the General Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.

2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

3.2 COORDINATION

A. Refer to Division 1 – Project Coordination.

B. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

A. Perform work in accordance with drawings, and as herein specified.

3.5 FIELD QUALITY CONTROL

A. Monitor work to insure installation and assembly are in accordance with applicable standards, drawings and specifications.

3.6 WORKMANSHIP and TOLERENCES

A. Form to produce concrete straight, plumb and true to plan.

1. Concrete out of line, level or plumb will be rejected.

B. Coordinate with all trades to insure proper placement of all items in forms and to provide proper blockouts wherever required.

C. Earth Forms: Side forms for footings may be of earth provided soil will stand without caving, sides of bank are made with neat cut, and footing width is increased 2 inches, and protected from sluffing-off.

1. Comply with OSHA Standards.

2. Comply with agencies having jurisdiction.

D. Tolerance per ACI 347 (variance shall not be collective).

1. Variation from plumb

   a. In the lines and surfaces of columns, piers, walls, and in risers; 1/4 per 10 ft., but not more than 1/2".

   b. Exposed corner columns, control joint grooves, and other conspicuous lines.

      i. In any bay or 20' max. ------ 1/4"

      ii. In 40' or more max. -------- 1/2"

2. Variation of linear building lines from established position in plan and related position of columns, walls, and partitions.

   a. In any bay or 20' max. ---------- 1/4"

   b. In 40' or more ---------- 1/2"

3. Variation of sizes and locations of sleeves, floor openings, and wall openings---------- 1/4"

4. Variation in cross-sectional dimensions of columns and beams and in thickness of slabs and walls.

   a. Minus ---------- 1/4"

   b. Plus ---------- 1/2"

5. Footings

   a. Variation in dimensions in plan

      i. Minus ---------- 1/2"

      ii. Plus ----------1/2"

   b. Misplacement or eccentricity

      i. 2% of the footing width in the direction of misplacement but not more than -------- 2"*

      ii. *(Applies to concrete only; not to reinforcing bars or dowels.)

   c. Reduction in thickness

      i. Minus ---------- 5%

E. Tolerances indicated shall not be exceeded and shall not cause work to exceed accessibility requirements or limits.

3.7 CONSTRUCTION

A. Form material: Straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Do not reuse material which is warped or delaminated, and/or requires more than minor patching of contact surfaces.

B. Build substantial forms and shores to shapes, lines, grades, elevations and dimensions indicated. Forms and shores shall be substantial, tight to prevent leakage of mortar, concrete and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves, offsets, and recesses too neat, straight lines. Construct forms and shores for easy removal without hammering, wedging or prying against concrete. Tape plywood form joints for exposed concrete surfaces.

1. No forms, shores, wooden stakes or braces shall be left in any concrete pour for either foundations or slabs beyond the point where the concrete has taken its initial set.

    a. Steel stakes shall not be left in floor slab concrete and holes through vapor barrier shall be repaired prior to concrete placement over vapor barrier.

    b. Steel stakes which do not puncture vapor barrier may be left in foundation pours beyond the initial set if they are placed in a pvc or similar sheath so that later removal of the stake will not cause damage to the green concrete. Sheathed stakes shall be placed no closer than 2" from any required reinforcing. Sheath shall be abandoned in place and remaining hole shall be filled with flowable grout.

2. All interpretations and decisions shall be made by the District's Inspector of Record and shall be in accordance with design unless approved otherwise by Structural Engineer.

3. All forms shall extend 10" minimum below finish floor slab elevation and 10" minimum below foundation wall at exterior building sides typical.

4. All foundation trenching sides and edges shall be formed as indicated in Structural Drawings.

5. Apply form coating to forms before reinforcing steel is in place.

C. Sleeves, anchors and bolts, including those for angle frames, supports, ties and other materials in connection with concrete construction, shall be secured in position before the concrete is placed.

D. Proper provisions shall be made for openings, blockouts, sleeves, offsets, sinkages, recesses and depressions required by other trades and suppliers prior to placing concrete.

1. The General Contractor shall also see that sleeves have been installed and other provisions have been made for the installation of mechanical, electrical and other equipment.

2. Coordinate with all trades to insure proper placement of all items in forms and to provide proper blockouts wherever required.

E. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced, as directed by Architect, with no additional cost to the District.

F. Form Not Required: Concrete footings may be poured directly against cut earth where feasible and when the Structural Engineers approval has been obtained.

1. See structural drawings for requirements for placing concrete footings directly against earth without forms.

G. Use ¾ inch minimum wood chamfer strips typical at all exposed corners unless noted otherwise on drawings.

H. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.

1. Exposed conditions; the dimples left in concrete shall be true and align in vertical and horizontal directions.

a. Patch in accordance with Section 03 30 00 – Cast in Place Concrete.

I. Brace, anchor and support all `cast-in items' to prevent displacement or distortion.

J. Notify District's Inspector of Record and Structural Engineer 48 hours prior to concrete placement, for purpose of checking reinforcing steel placement, general form compliance, and form dimensions.

1. This review shall in no way relieve Contractor of his responsibility for safety of forms and shoring, or for proper dimensions.

2. All inspections shall be made by the District's Inspector of Record and shall be in accordance with design unless approved otherwise.

K. During and immediately after concrete placing, tightens forms, posts and shores. Readjust to maintain grades, levels and cambers.

L. Slabs, walks, and curbs:

1. Expansion joints: Install at locations indicated with backer rod and sealant.

2. Contraction joints: Install specified keyed-type joint material where indicated on Drawings, and so that maximum distance between joints is 10' - 0" for exterior concrete, unless otherwise noted on Drawings.

3. Isolation joints: Install premolded isolation joint material with backer rod and sealant cover between walls and slabs so that areas are isolated from all vertical features.

3.8 CLEANING OF FORMS

A. All dirt, chips, sawdust, rubbish, water, etc. shall be completely removed from form by water hosing and air pressure before any concrete is deposited therein. No wooden ties or blocking shall be left in concrete except where indicated for attachment of other work.

B. Thoroughly clean and patch all holes in formwork and re-coat as required before reusing. Forms not suited to obtain concrete surfaces and tolerances in conformity with Contract requirements will be rejected by District.

1. Reuse of forming materials shall be limited only as required to produce the finishes as specified, free from blemishes and other defects unless covered by other building materials in which case blemish free concrete is not required.

3.9 INSPECTION OF FORMS AND VAPOR BARRIER

A. Notify the District's Inspector of Record and Structural Engineer at least 48 hours in advance of the beginning of pouring operations and at the completion of formwork and location of all construction joints.

1. An inspection of forms and joints will be made for approval of finished work and general layout only.

2. The foregoing inspection shall in no way relieve the General Contractor of responsibility of design and safety or formwork, bulkheads and shoring.

B. Vapor barrier shall be inspected in accordance with Section 03 30 00 – Cast in Place Concrete.

1. All penetrations left in place shall be sealed

2. All holes shall be patched

3.10 FORM COATING

A. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.

3.11 REMOVAL OF FORMS, SHORES, WOOD AND/OR METAL SUPPORT STAKES AND BRACES

A. Do not remove forms until concrete has attained sufficient strength to support its weight and any construction loading. Concrete must be allowed to cure long enough to avoid damage during form removal. General Contractor or his representative in charge of concrete construction shall be present during removal of forms and shores, and shall be personally responsible for safety of this operation at all times and under all conditions.

1. Stakes which have penetrated thru the vapor barrier when removed shall require the vapor barrier be patched at each condition, refer to Section 03 30 00 – Cast in Place Concrete

B. Remove without damage to concrete surfaces and vapor barrier.

C. Sequence and timing of form removal shall insure complete safety of concrete structure.

D. Forms, shores, stakes and braces, wood and/or metal shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60ºF or above. For each day the temperature falls below 60ºF, add additional day to periods listed that forms are to remain in place, unless otherwise directed in writing by the District and Structural Engineer.

1. Concrete on grade: 24 hours

2. Walls and Columns: 3 days

3.12 PROTECTION AND CLEAN UP

A. Refer to Division 1 Sections.

B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.

C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

1. Remove water from all excavations.

E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the District.

F. After completion of work in this section, remove all erection equipment and implements of service, and debris.

1. Leave entire area in a neat, clean, acceptable condition.

G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in division – Project Closeout.

H. Provide record drawings in accordance with division 1 – Project Closeout.

I. Close out, on-site inspection will be at the discretion of the Architect after he receives the General Contractor's NOTICE of "Certificate of Substantial Completion".

END OF SECTION 03 11 00

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide reinforcing for cast-in-place concrete work.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete

1.3 REFERENCES

A. The following references, codes and standards are hereby made a part of this Section and all reinforcement shall conform to the applicable requirements therein except as otherwise specified herein or shown on the drawings. Nothing contained herein shall be construed as Permitting work that is contrary to code requirements.

B. American Concrete Institute, ACI:

1. ACI 301 – Specifications for Structural Concrete for Buildings.

2. ACI 315 – Details and Detailing of Concrete Reinforcement.

C. ANSI/AWS D1.4 – Structural Welding Code, Reinforcing Steel.

D. Concrete Reinforcing Steel Institute, CRSI:

1. CRSI – Manual of Standard Practice, 29th Edition.

2. CRSI –Placing Reinforcing Bars, 10th Edition.

E. ASTM International (ASTM):

1. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

2. ASTM A706 – Standard Specification for Low-alloy Steel Deformed Bars for Concrete Reinforcement.

F. California Building code, (CBC) 2022 edition.

1.4 SUBMITTALS

A. Shop Drawings:

1. Fully detailed shop drawings, including bending schedules and bending diagrams, shall be submitted to the Engineer for review. Shop drawings shall show placing details and size and location of all reinforcing steel.

2. Shop drawing shall be of such detail and completeness that all fabrication and placement at the site can be accomplished without the use of project or contract drawings for reference.

3. Contractor shall check civil, landscape, architectural, structural, mechanical, plumbing, electrical and fire protection project or contract drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and any

other items which are required to be cast in concrete and shall make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

4. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Architect and returned to the Contractor. Review of shop drawings by the Architect will not relieve the Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.

B. Mill Test Reports: Certified mill test reports (tensile and bending) for each heat or melt of steel shall be submitted to the Architect before delivery of any material to the site. (See requirements above under "Source Quality Control".) Where reinforcing is required to be welded, mill test reports shall verify the weldability of the steel.

1.5 QUALITY ASSURANCE

A. Where certified mill test reports (required hereinafter under "Submittals") are not furnished, conform to the following:

1. Reinforcing bars shall be tested in tension and bending as per ASTM A615. Testing shall be done by the Contractor's independent testing agency. Furnish one copy of test reports to Architect, Structural Engineer, Owner and Contractor.

2. Samples will be taken from bundles as delivered from the mill by the testing agency. Where bundles are identified by a heat number and a mill analysis accompanies to report, one tensile and one bending test specimen will be taken from each 10 tons or fraction thereof, of each size and kind of bar. Where positive identification of heat numbers cannot be made or where random samples are taken, one series of tests shall be made from each 2-1/2 tons or fraction thereof, of each size and kind of bar.

3. The cost of tests, sampling and handling of reinforcing steel shall be paid by the Contractor.

4. Include all material required to provide samples for testing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcing to site properly bundled and tagged, and stored so as to prevent excessive rusting or fouling with grease or any coating that will interfere with bond. Segregate so as to maintain identification after bundles are broken. Do not use damaged, reworked, or deteriorated material.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars:

1. New, free of loose rust.

2. Billet Steel Bars: ASTM A 615, including supplementary requirements S1. Grade 60 for all bars. Weldable (ASTM A706) where indicated or required.

B. Welded Wire Fabric: As indicated on drawings.

C. Tie Wire: #16 minimum, black and annealed.

D. Reinforcement Splice Couplers: For use only where specified on the drawings. Submit other locations proposed for use to the Engineer for review. "L-series Bar Lock" Coupler Systems for Splicing Reinforcement Bars, ESR-2495, by Dayton-Superior Corporation.

E. Accessories: Metal or plastic spacers, supports, ties, etc., as required for spacing, assembling, and supporting reinforcing in place. Legs of accessories to be of type that will rest on forms without embedding into forms. Galvanize metal items where exposed to moisture, or use approved other non-corrodible, non-staining supports.

2.2 FABRICATION

A. Comply with details on Drawings.

B. Where specific details are not shown or noted, do all detailing and fabrication in conformance with, or superior to, requirements contained in the References, Codes and Standards Article and ACI 315.

C. Clean bars of loose rust, loose mill scale and any substance which may decrease bond. Bend bars cold and accurately to details on reviewed shop drawings.

D. Shop fabricate reinforcement.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Reinforcing steel shall be placed in accord with the Drawings and viewed shop drawings and the applicable requirements of the References, Codes and Standards Article. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

B. Reinforcement Supports:

1. Reinforcement shall be accurately located in the forms and held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. Supports and their placement shall comply with CRSI "Placing Reinforcing Bars". The use of wood supports and spacers inside the forms is not permitted except as noted in Concrete Forms Section.

2. Support reinforcement for on-grade slabs by wiring to precast concrete blocks spaced 3'-0" o.c. (maximum) both ways, staggered. Size blocks so that reinforcing is maintained at the elevation shown in design drawings.

C. Obstructions: Wherever conduit, piping, inserts, sleeves, etc., interfere with placing of reinforcing steel, obtain approval of method of procedure before any concrete is placed. Bending of bars around openings or sleeves is not permitted.

D. Tying: Tie reinforcing rigidly and securely with steel tie wire at splices and at crossing points and intersections in the position shown. Bend tie wires, after cutting, in such a manner that concrete placement will not force the wire ends to surface of exposed concrete.

E. Dowels: Dowels shall be tied securely in place before concrete is deposited. In the

event there are no bars in position to which dowels may be tied, No. 3 bars (minimum) shall be added to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted.

F. A minimum class B lap splice as defined by ACI 318 is required for all cases not otherwise shown on Drawings. Stagger splices wherever possible.

G. Reinforcement Couplers: Install at all locations indicated and may be used as an alternate to lap splices in general. Install couplers in accordance with manufacturer's recommendations.

H. Welding: Do welding by Cadweld T series for bars #10 and larger or as noted on Drawings. No welding of reinforcing steel or of attachments to reinforcing steel will be permitted unless the chemistry of the steel conforms to AWS D1.4 and is so established by the mill certificates. If welding is to be done, all welds shall be approved by the Structural Engineer and all welding shall comply with requirements and procedures established by AWS D1.4. All welding material, wire cuttings, and tramp metal shall be thoroughly cleaned from forms for exposed concrete before any concrete is placed.

I. Minimum covers for reinforcement:

1. As shown on drawings.

J. Lap or spliced bars shall be a minimum of 48 bar diameters in concrete, but never less than 24" or as noted on design drawings.

3.2 CLEANING

A. Reinforcement, at time of placing concrete, shall be free of coatings that would impair bond.

END OF SECTION

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General 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 and foundation walls.

2. Interior slabs-on-grade.

3. Exterior slabs-on-grade.

B. Special Coordination Requirements: Coordinate with the work of the following Sections to identify the finish flooring manufacturer's concrete slab requirements. Such requirements may be over and above the requirements of the Contract Documents and may require additional materials, means, or methods, which shall be included as part of the Work.

C. Related Sections:

1. Section 03 11 00: Concrete Formwork

2. Section 03 20 00: Concrete Reinforcing.

3. Division 22: Plumbing.

4. Division 23: Mechanical.

5. Division 26: Electrical.

1.3 DEFINITIONS

A. Cementitious Materials:

1. Portland cement alone or in combination with one or more of the following, subject to compliance with requirements:

a. Blended hydraulic cement.

b. Fly ash and other pozzolans.

c. Ground granulated blast-furnace slag.

d. Silica fume.

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: See section 03 20 00

D. Certificates: Weighmaster's certificates.

E. Material Certificates:

1. For each of the following, signed by manufacturers:

a. Cementitious materials.

b. Admixtures.

c. Waterstops.

d. Curing materials.

e. Floor and slab treatments.

f. Bonding agents.

g. Adhesives.

h. Vapor retarders.

i. Semi-rigid joint filler.

j. Joint-filler strips.

k. Repair materials.

F. Material Test Reports:

1. For the following, from a qualified testing agency, indicating compliance with requirements:

G. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

H. Vapor retarder: Provide third part documentation that all testing was performed on a single production roll and a summary of test results per ASTM E1745.

1.5 QUALITY ASSURANCE

1. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or

specified:

a. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).

b. American Concrete Institute (ACI) Publications: Comply with the following unless modified by requirements in the Contract Documents:

i. ACI 301, "Specifications for Structural Concrete."

ii. ACI 117, "Specification for Tolerances for Concrete Construction and Materials and Commentary."

iii. ACI 302.1R, “Guide to Concrete Floor and Slab Construction.”

iv. ACI 302.2R, “Guide for Concrete Slabs that receive Moisture-Sensitive Flooring Materials.”

v. ACI 305R, “Guide to Hot Weather Concreting.”

vi. ACI 306R, “Guide to Cold Weather Concreting.”

vii. ACI 318, “Building Code Requirements for Structural Concrete and Commentary.”

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment:

C. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

D. Source Quality Control: Furnish Weighmaster’s certificates for all concrete.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

F. Concrete Testing Service: Engage a qualified independent testing agency approved by DSA to perform material evaluation tests and to design concrete mixtures.

G. Pre-Installation Meeting: Conduct meeting onsite. Include product and material manufacturers. Include all subcontractors. Include under slab vapor barrier supplier to ensure proper installation of material.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 – PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in large sizes to minimize number of joints:

1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.

b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

c. Structural 1, B-B or better; mill oiled and edge sealed.

d. B-B (concrete form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two (2) edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4-inch by 3/4-inch minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Waterstops: Six inch dumbbell shaped, PVC, rated for use.

1. Theut Products, Inc. (Bases of Design)

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.

G. 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 ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. See section 03 20 00

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

1. Portland Cement – ASTM C150, Type II/V. Supplement with the following:

a. Fly Ash: ASTM C618, Class F.

B. Normal-Weight Aggregates: ASTM C33:

1. Maximum coarse-aggregate size: Per plan.

2. Fine aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C94 and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260.

B. 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. Do not use calcium chloride or admixtures containing calcium chloride:

1. Water-reducing admixture: ASTM C494/C494M, Type A.

2. Retarding admixture: ASTM C494/C494M, Type B.

3. Water-reducing and retarding admixture: ASTM C494/C494M, Type D.

4. High-range, water-reducing admixture: ASTM C494/C494M, Type F.

5. High-range, water-reducing and retarding admixture: ASTM C494/C494M, Type G.

6. Plasticizing and retarding admixture: ASTM C1017/C1017M, Type II.

C. Integral Waterproofing Admixtures:

1. ASTM C494, Type S, complex catalyzed hydrous silicate, water and vapor proofing liquid admixture:

a. Product: Subject to compliance with requirements, provide Moxie International Inc.; Moxie Shield 1800 Concrete Admixture, P.O. Box 838 Loomis, CA 95650; Contact Manufacturer's representative: P:916-251-0825, F: 877-330-1930 Email: info@moxieshield.com.

b. Properties:

i. Water/cement ratio: Maximum 0.52.

ii. Water vapor transmission: Less than 0.1 perms (5.7g/Pa-s-m2).

iii. Water seepage or permeability: Not to exceed 7.00 x 10-9 cm/s @ 50psi (2.3x10-10ft/s).

2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E1745, Class A, 15 mils minimum, with a maximum permeance of less than 0.01 perms (grains/[ft^2-hr-inHg]), as tested in accordance with mandatory conditioning tests per ASTM E1745 (all mandatory ASTM testing must be performed on a single production roll). Include manufacturer's recommended adhesive or pressure-sensitive tape:

1. Products are subject to compliance with requirements. Acceptable products:

a. Basis of Design: Stego Industries, LLC Stego Wrap 15 mil Class A.

b. Grace Construction Products: Florprufe 120.

c. W. R. Meadows, Inc.: Perminator 15 mil.

d. Substitutions with Architect’s approval, and pursuant to conditions of Divisions 00 and 01.

B. Vapor Retarder Accessories:

1. Seams: Stego Tape by Stego Industries LLC.

2. Sealing Penetrations of Vapor Barrier:

a. Stego Mastic.

b. Stego Tape.

3. Perimeter/Terminated Edge Seal: Do not use one-sided seaming tape for sealing at the terminated edge:

a. Stego Crete Claw (textured tape).

b. Stego Term Bar.

c. Stego Tack Tape (double-sided sealant tape).

4. Penetration Prevention:

a. Beast Foot by Stego Industries LLC.

b. Beast Form Stake by Stego Industries LLC.

C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch sieve and zero to five percent (0% - 5%) passing a No. 8 sieve.

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately nine-ounces-per-square-yard when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.7 RELATED MATERIALS

A. Non-Shrink Grout:

1. Factory premixed grout: ASTM C1107.

2. Compressive strength: 7,000 psi at 28 days.

B. Exterior Concrete Walks: Provide a capillary break consisting of two inches (2”) of clean dry sand, ASTM C33, evenly spread on top of the compacted subgrade.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301:

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

2. All concrete mix designs shall be prepared and stamped by a California registered civil Engineer.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 15 to 25 percent.

C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls, Concrete Stairs, and Concrete Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum compressive strength: 3,000 psi at 28 days unless otherwise noted.

2. Maximum water-cementitious materials ratio: 0.55.

3. Minimum cementitious materials content: 5.5 sacks of cement per cubic yard.

4. Slump limit: Four inches (4”), plus or minus one inch (1”).

B. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum compressive strength: 4,000 psi at 28 days.

2. Maximum water-cementitious materials ratio: 0.45.

3. Minimum cementitious materials content: Six (6) sacks of cement per cubic yard.

4. Slump limit: Four inches (4”), plus or minus one inch (1”).

C. Exterior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum compressive strength: 3,000 psi at 28 days.

2. Maximum water-cementitious materials ratio: 0.55.

3. Minimum cementitious materials content: 5.5 sacks of cement per cubic yard.

4. Slump limit: Four inches (4”), plus or minus one inch (1”).

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information:

1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is above 90 degrees F reduce mixing and delivery time to 60 minutes.

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.

C. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

F. 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. In no case shall any bolt or anchor be stabbed in place while or after the concrete is poured:

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."

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 degrees F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained:

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.

2. Do not strip vertical concrete in less than seven (7) days.

3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

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 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring:

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions:

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise terminate (a) at a point acceptable to the structural Engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam, or slab itself:

a. Seal vapor barrier to the entire slab perimeter using manufacturer’s textured tape with a surface that creates a mechanical seal to freshly-placed concrete per manufacturer’s instructions.

OR

b. Seal vapor barrier to the entire perimeter wall or footing/grade beam with manufacturer’s double-sided tape, or both termination bar and double-sided tape per manufacturer’s instructions. Ensure the concrete is cleaned and dry prior to adhering tape.

3. Lap all joints six inches (6”) and seal with manufacturer's recommended tape.

4. Apply seam/textured/double-sided tape to a clean and dry vapor barrier.

5. Seal all penetrations (including pipes) per manufacturer’s tape.

6. No penetration of the vapor barrier is allowed except for reinforcing and permanent utilities.

7. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area six inches (6”) and taping all four sides with tape.

8. Do not saturate the sand cushion.

9. If sand is saturated prior to placement of concrete, remove the sand and replace.

10. Protect all installed moisture barrier construction from precipitation and water penetration by covering and providing positive drainage away from the moisture barrier.

11. Cover slab openings and block-outs around columns to prevent water

penetration of moisture barrier.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement:

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

2. Clean reinforcement and remove loose dust and mill scale, earth, oil, and other materials that reduce bond or destroy bond with concrete.

3. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations. Provide metal chairs, dobies, or other aids manufactured for this purpose.

4. Place reinforcement to obtain the required concrete coverages for concrete protection.

B. See also section 03 20 00

3.7 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.

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 inch (1”) 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.

2. Sawed joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide, 1/3-inch depth joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Saw cut slab as soon as surface has hardened to where it can support the equipment and operator, normally within two (2) hours after finishing. Use saw designed for cutting fresh concrete, such as “Soff-Cut” or equal.

D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate 1/2 of dowel length to prevent concrete bonding to one side of joint.

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.

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 (1) 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 six inches (6”) 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 degrees F for three (3) 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 301 and as follows:

1. Maintain concrete temperature below 90 degrees 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 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 exposed to public view, to receive a rubbed finish, 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 (1) 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.

2. Grout-cleaned finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one-part portland cement to 1-1/2-parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-floated finish: Wet concrete surfaces and apply a stiff grout. Mix one-part portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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, restraightening, and finishing operations for concrete surfaces. Except as may be shown otherwise on Drawings, provide the following finishes at the indicated locations.

B. 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:

1. Apply scratch finish to surfaces that are to receive concrete floor toppings or mortar setting beds for bonded cementitious floor finishes.

C. 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 re-straightening until surface is left with a uniform, smooth, granular texture:

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. 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:

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic, or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, ten-foot-long (10') straightedge resting on two (2) high spots and placed anywhere on the surface does not exceed 1/8 inch.

3. Contractor shall anticipate that grinding will be required as a result of curling or other slab defects. Grinding required to bring the slab surface into acceptable tolerances for finished flooring installation shall be included as part of the Work.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom:

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 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.xh 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. 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 (7) days.

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 (7) days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.12 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.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.

3. Headed bolts and studs.

4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.

6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from

beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:

1. Testing frequency: Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding five (5) cubic yards, but less than 25 cubic yards, plus one (1) set for each additional 50 cubic yards or fraction thereof.

2. Testing frequency:

   a. Obtain at least one (1) composite sample for each 50 cubic yards or fraction thereof of each concrete mixture placed each day, but not less than once for each 2,000 square feet of surface area for slabs or walls:

      i. When frequency of testing will provide fewer than five (5) compressive-strength tests for each concrete mixture, testing shall be conducted from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.

3. Slump: ASTM C143/C143M; one (1) test at point of placement for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air content: ASTM C231, pressure method, for normal-weight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.

5. Concrete temperature: ASTM C1064/C1064M; one (1) test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test (1) for each composite sample.

6. Unit weight: ASTM C567, fresh unit weight of structural lightweight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.

7. Compression test specimens: ASTM C31/C31M:

   a. Cast and laboratory cure two (2) sets of two (2) standard cylinder specimens for each composite sample.

   b. Cast and field cure two (2) sets of two (2) standard cylinder specimens for each composite sample.

8. Compressive-strength tests: ASTM C39/C39M; test one (1) set of two (2) laboratory-cured specimens at seven (7) days and one (1) set of two (2) specimens at 28 days:

   a. Test one (1) set of two (2) field-cured specimens at seven (7) days and one (1) set of two (2) specimens at 28 days.

b. A compressive-strength test shall be the average compressive strength from a set of two (2) specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three (3) consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength.

11. 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 seven (7) and 28-day tests.

12. 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.

13. 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 C42/C42M or by other methods as directed by Architect.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

PAGE INTENTIONALLY LEFT BLANK.

DIVISION 5 – METALS

05 50 00 – Metal Fabrications

PAGE INTENTIONALLY LEFT BLANK.

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Items of miscellaneous metal and related accessory items required for the project and which are not specified elsewhere. Such items include, but are not necessarily limited to:

1. Structural Straps/Connectors.

2. Sleeves for miscellaneous metal items.

3. Grouting required for setting miscellaneous metal items.

B. Related Sections:

1. Section 09 91 00, Painting.

2. Division 26 00 00, Electrical.

1.2 SUBMITTALS

A. Shop Drawings: Show dimensions, sizes, thicknesses, gages, finishes, joining, attachments, and relationship of work to adjoining construction. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from Drawings.

1. Where materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work.

2. Where welded connectors and inserts are required to receive work, show exact locations required. Furnish drawings to the trades responsible for installing the connectors or inserts.

3. Catalog work sheets showing illustrated cuts of item to be furnished, scale details and dimensions may be submitted for standard manufactured items.

4. Design shop drawings under direct supervision of professional engineer experienced in design of this work, licensed in the State of California.

1.3 QUALITY ASSURANCE

A. Qualifications: Welding procedures, welders, and tackers for structural metal work shall be qualified in accord with CBC.

B. References and Standards: The following references and standards are hereby made a part of this Section. Miscellaneous and ornamental metal work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements or governing rules and regulations.

1. "Code for Arc and Gas Welding in Building Construction" of the American Welding Society, AWS DI.I, latest edition with current supplements, revisions and addenda. Welded connections; use standard AWS A2.0 welding symbols. Indicate net weld lengths.

2. "Pipe Railing Manual", published by National Assn. of Architectural Metal Manufacturers (NAAMM).

3. "Metal Bar Grating Manual", published by National Assn. of Architectural Metal Manufacturers (NAAMM).

4. Steel Structures Painting Council (SSPC) Surface Preparation Specifications, Vol. 2, Painting Manual.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Standard Structural Steel Shapes, Bars and Plates: ASTM A36, latest edition and ASTM A 283, latest edition.

B. Architectural and Miscellaneous Steel Items: ASTM A 283, latest edition, grade optional.

C. Steel Tubing:

1. Cold Formed: Grade A or B per ASTM A 500 latest edition.

2. Hot Formed: Welded or seamless per ASTM A 501 latest edition.

D. Steel pipe: ASTM A 53, Grade B,

E. Sheet steel: ASTM A 446, grade B, structural quality with galvanized coating.

F. Fastenings - General: Furnish bolts, nuts, screws, clips, washers and other fastenings necessary for proper erection of items specified herein. Use stainless steel or hot dip galvanized on exterior. On interior, match adjacent material. Bolts, ASTM Grade A 307.

G. Welding Electrodes: As permitted by AWS Code DI.I. Where exposed, select filler metal to match base metal. Use E70xx electrodes.

H. Paint Primer: Fed. Spec. TT-P-86, Type II or TT-P-645, zinc chromate.

I. Non-Shrink Grout: Sauereisen No. F-100, Sonneborn-Contech "Fondag", Upco "Upcon", 5-Star, Master Builders "Masterflow 713", or approved equal, non-metallic, non-staining, premixed grout having a min. compressive strength at 28 days as required by Structural Drawings.

2.2 FINISHES

A. Finishes shall be as noted in the following paragraphs, except as otherwise noted on the drawings or specified.

B. Exterior Ferrous Metal and Interior Ferrous Metal Exposed to Continuing Moisture: Welds, burrs, and rough surfaces ground smooth after fabrication and completed assembly hot-dipped galvanized and then given one shop prime coat of paint.

C. Interior Ferrous Metal: Welds, burrs, and rough surfaces ground smooth and completed assembly cleaned, hot phosphate treated, and given one shop prime coat of paint. Hot phosphate treatment not required on items that are not exposed in the finished work or on those items where size prohibits such treatment. Indicate on shop drawings where size prohibits such treatment. Indicate on shop drawings where treatment is proposed to be omitted.

D. Exposed Fastenings: Match color and finish of adjacent material.

2.3 QUALITY

A. Structural steel used for metal fabrications of this section shall conform to ASTM A36, ASTM A500, or ASTMA53.

B. Welds used shall be made with E70XX electrodes.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Inspect surfaces to receive metal work and report defects that would interfere with the installation to the Architect. Starting work implies acceptance of surfaces as satisfactory.

3.2 CONSTRUCTION

A. General Requirements:

1. Verify measurements at project site.

2. Coordinate metal work with adjoining work for details of attachment, fittings, etc. Do cutting, shearing, drilling, punching, threading, tapping, etc., required for metal or for attachment of adjacent work. Drill or punch holes; do not use cutting torch. Shearing and punching shall leave true lines and surfaces.

3. Conceal fastenings where practical. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Form joints exposed to weather to exclude water.

B. Make permanent connections in ferrous metal surfaces using welds where possible; do not use bolts or screws where they can be avoided.

C. Provide lugs, clips, anchors, and miscellaneous fastenings necessary for the complete assembly and installation.

D. Set work plumb, true, rigid, and neatly trimmed out. Miter corners and angles of exposed moldings and frames unless otherwise noted.

E. Do grouting of frames, plates, sills, bolts, and similar items with non-shrink grout.

F. Where items must be incorporated or built into adjacent work, deliver to trade responsible for such work in sufficient time that progress of work is not delayed. Be responsible for proper location of such items.

G. Protect dissimilar metals from galvanic corrosion.

H. Welding:

1. Perform all welding in accord with AWS Code D 1.1.

2. Welds shall be made only by operators experienced in performing the type of work indicated.

3. Welds normally exposed to view in the finished work shall be uniformly made and ground smooth.

4. Where welding is done in proximity to glass or finished surfaces, protect such surfaces from damage due to weld sparks, spatter, or tramp metal.

I. Bolted, Screwed, and Riveted Connections:

1. In general, use bolts for field connections only and then only as detailed. Provide washers under all heads and nuts bearing on wood. Draw all nuts tight and upset threads of permanent connections to prevent loosening. Use beveled washers where bearing is on sloped surfaces.

2. Where screws must be used for permanent connections in ferrous metal, use flat head type, countersunk, with screw slots filled and finished smooth and flush.

3. Where rivets are used, they shall be machine driven tight, heads centered, countersunk, and finished flush and smooth.

J. Surface Treatment and Protective Coatings:

1. Cleaning: Thoroughly clean mill scale, rust, dirt, grease and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting. Conditions that are too severe to be removed by hand cleaning methods shall be cleaned as per SSPC "Surface Preparation Specifications", "Solvent Cleaning, SSPC-SP1-63"; "Power Tool Cleaning, SSPC-SP 3-36"; or "Brush-Off Blast Cleaning, SSPC-SP 7-63", as required.

2. Hot Phosphate Treatment: Conform to SSPC-PT-4.

3. Painting: After material has been properly cleaned and treated, apply shop prime coat of paint to surfaces except those encased in concrete or masonry. Apply paint as per manufacturer's directions. Spot paint abrasions and field connections after assembly. Shop coat must be dry prior to shipment to project site. Unless otherwise specified or directed, do not apply shop prime coats or stenciled or painted identification markings to galvanized surfaces.

4. Galvanizing: Conform to ASTM A 123-78 for rolled, pressed and forged shapes, plates, bar and strip; A 153-78 for hardware items and A 386-78 for

assembled steel products. Conform to ASTM A384 and A385, Recommended Practices, pertaining to galvanized assembled steel products. Unless otherwise permitted, do galvanizing after fabrication, in largest sections practicable. Where galvanizing is removed by welding or other assembly procedure, touch-up abraded areas with molten zinc or zinc-rich paint.

3.3 PROTECTION AND CLEANING

A. Remove soil and foreign matter from finished surfaces and apply such protective measures as may be required to prevent damage or discoloration until acceptance of project. Protection of work and initial cleaning shall be the responsibility of each installer or erector until the installation is completed, whereupon the responsibility for subsequent protection and final cleaning shall pass to the General Contractor for the entire project. Remove protective coverings prior to acceptance of Work.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

PAGE INTENTIONALLY LEFT BLANK.

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

A. Work Included: Rough carpentry, light hardware and miscellaneous items of work not included in another Section. This Section also includes:

1. Structural wood supports, grounds, backing and blocking required for millwork and casework items and which are an integral part of wall, floor and/or ceiling construction.

2. Plywood sheathing and soffits.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 10 00 – Concrete Forms.
B. Section 06 17 00 – Structural Composite Lumber
C. Section 06 46 26 – Pre-Primed Wood Fascia.
D. Section 07 21 00 – Building Insulation.
E. Section 07 92 00 – Joint Sealants.
F. Section 08 71 00 – Door Hardware.
G. Section 09 24 00 – Lath and Plaster
H. Section 09 29 00 – Gypsum Board Assemblies.
I. Section 09 91 00 – Painting.

1.4 REFERENCES, CODES AND STANDARDS

A. The following references, codes and standards are hereby made a part of this Section and carpentry work shall conform to applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained in the Drawings or these Specifications shall be construed as permitting work which is contrary to code requirements.

1. "Standard Grading and Dressing Rule #17, of the West Coast Lumber Inspection Bureau".

2. "Grading Rules for Western Lumber" of the Western Wood Products Assn.

3. "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Service.

4. American Wood Preservers Assn. (AWPA) Standard C1-03, "All timber products- Preservative Treatment by Pressure Processes".

1.5 QUALITY ASSURANCE

A. Lumber and plywood shall be grade or quality marked by WWPA, WCLIB, APA, AWPB or by other grading and inspection agencies acceptable to the Architect. Grade marks shall include the designation "S-DRY"(or "MC-15" as applies) where applicable. Grade and quality marks shall not be apparent on surfaces exposed in the finished work.

1.6 PRODUCT STORAGE

A. Store kiln dried materials in enclosed areas, protected from moisture and separated from contact with concrete or soil.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Temporary Construction: Clean lumber at Contractor's option, rough or smooth, as usage requires.

B. Lumber Not Otherwise Specified or Noted: Douglas fir or larch, graded and grademarked according to Reference Standard 1.4 A.1 or 1.4.A.2, #1 grade.

1. Boards: Construction Grade.

C. Sill Plates (On Concrete): Light Framing, pressure treated as hereinafter specified.

1. As noted on plans

D. Plywood for walls, roofs, and soffits – as noted on plans.

1. Unless glue type is otherwise specified, exterior plywood, interior plywood exposed to continuing moisture and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times.

E. Rough Hardware: Nails, spikes, bolts, screws, tacks and framing connectors of standard manufacture as required. Hot dip galvanize items exposed to moisture or to exterior and those items which are in contact with wood pressure treated with waterborne salts.

1. Bolts and Nuts: ASTM A307, Grade A.

2. Lag Bolts: Fed. Spec. ANSI/ASME B18.2.1. Pre-drill per CBC.

3. Nails: Fed. Spec. ASTM F1667, common unless otherwise noted or specified.

4. Joist Hangers and Framing Connectors: Simpson or approved equal, unless otherwise noted.

5. Power Driven Fasteners: Hilti, Ramset, or approved equal, each use and fastener type subject to prior approval of Architect.

F. Pressure Treatment (Decay and Termite Prevention):

1. Pressure treat for decay and termite prevention, Douglas fir or larch wood materials which are embedded in or set against concrete.

2. Treat in accordance with Reference Standard 1.4.A.4 and quality mark as per Reference Standard 1.4.A.2.

3. Treat with any of the following processes at Contractor option. Creosote type preservatives are not permitted. Products that contain arsenic like CCA treated material are not permitted.

a. Penta in an LPG carrier ("Cellon") or Penta in Hydrocarbon Solvent-Type D (Dow Process)

b. Disodium Octaborate Tetrahydrate (DOT) such as Advance Guard/Hi-bor by Osmose, Inc.

c. Members treated with waterborne salts shall be dried to a moisture content not exceeding 19% after treatment.

4. Where possible, precut material before treatment.

5. Holes and cutoffs and handling and storage shall be in accordance with AWPA M-4.

6. Ensure that ferrous metal fastenings and items in contact with wood treated with waterborne salts are hot dip galvanized (1.25 oz. coating) where required by ICC reports.

G. Building Paper and Felt: Kraft waterproof building paper or 15# unperforated asphalt saturated rag felt per ASTM D226

H. Framing Connectors: Simpson Strong Tie Corp., or equal.

2.2 MOISTURE CONTENT

A. 19% maximum at initial use for 2x thickness and less; 19% maximum at initial use for thickness greater than 2x and less than 4x; and 22% maximum at initial use for thickness greater than 4x.

2.3 SIZES

A. Surfaced to "DRY" sizes. Sizes noted are nominal unless shown as net.

2.4 SURFACING

A. All wood materials exposed in the finished work shall have resawn surfaces of clean natural color unless noted or specified otherwise. Concealed framing lumber shall be S4S.

PART 3 – EXECUTION

3.1 ERECTION AND INSTALLATION: Code references refer to CBC Code.

A. Framing: Conform to CBC where same covers points not indicated on Drawings. Properly lay out framing with pieces closely fitted, accurately plumbed, leveled and aligned and rigidly secured in place.

B. Except as specifically shown on Structural Drawings, cutting of all wood, etc., is limited to those cuts permitted by CBC.

C. Bridging and Blocking: Conform to CBC. Provide 2X blocking at intersections of finished surfaces for adequate bearing and at points where required to support fixtures, cabinets, hardware and other equipment mounted on walls.

D. Plywood (General): Unless more stringent requirements are indicated on the Drawings or required by Code, application of plywood shall be in accordance with recommendations of the American Plywood Association.

E. Connections and Fastenings: Conform to CBC. Unless otherwise specified or shown on the Drawings, conform to minimum nailing requirements of CBC. For bolted connections, provide washers under heads and nuts bearing on wood, and draw nuts tight. Retighten before closing in framing. Exercise care in nailing through exposed sheathing and siding and ensure that fasteners penetrate into framing members.

END OF SECTION.

SECTION 06 17 00 – STRUCTURAL COMPOSITE LUMBER

PART 1 – GENERAL

1.1 SUMMARY

A. The requirements of the General Conditions and Division 1 – General Requirements, apply to the work of this Section.

B. Provide all labor, materials, tools, appliances, facilities and equipment required for the fabrication, delivery and erection of all Structural Composite Lumber (SCL) as shown on the drawing, herein specified and necessary to complete the work.

C. All blocking, bridging, etc., for the installation of members.

D. Clips, angles, straps, hangers, etc., incidental to installation of joists.

E. Nails, bolts, washers and other fasteners used for erecting and securing members.

1.2 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications

B. Section 06 10 00 – Rough Carpentry.

1.3 REFERENCES

A. Comply with applicable provisions of the following standards and references: 2022 California Building Code (CBC), Volumes 1, 2.

1.4 SUBMITTALS

A. Comply with the provisions of Section 01 33 00 – Submittals.

B. Submit shop drawings of materials to be furnished under this section. Shop drawings shall include, but not be limited to;

1. Erection plans, sizes, types, location and specific designation of SCL members.

2. Installation instructions.

3. Details of member connections.

C. Drawings shall also indicate sizes and location of blocking, hangers, etc., with sufficient detailing to ensure correct installation.

1.5 QUALITY ASSURANCE

A. Refer to Division 1 Sections.

B. The fabricator shall have been engaged in the continuous manufacturing of SCL members for a minimum of five years.

C. Manufacturer Requirements:

1. Manufacturing facility shall be approved by an independent ICC approved inspection agency.

2. All members shall bear a stamp indicating the grade, plant number, independent inspection agency, logo and report number.

1.6 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 66 00 – Product Storage and Handling.

B. Deliver members tagged, unload carefully and handle only as recommended by the manufacturer; protect from adverse environmental conditions until members are installed and protected by permanent means.

C. If members must be stored prior to erection, they shall be stored in a vertical position off the ground, covered and protected from light weather.

1.7 WARRANTY

A. Refer to Section 01 77 00 – Project Closeout, Section 01 78 36 – Warranties and Bonds, and Section 01 78 38 – Guarantees.

B. The products delivered will be free from any manufacturing errors or defects in workmanship and material. The design of members shall be adequate to carry the loads specified by the purchaser for the normal and expected life of specified project.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Single source responsibility, specified items shall be from one manufacturer.

B. Manufacturer shall be subject for compliance with all requirements of the documents (both Drawings and Specifications), provide products from one of the following Acceptable manufacturers.

1. WEYERHAUSER, www.iLevel.com P.O. Box 8449, Boise, Idaho 83706, Area Code 208/429-3715.

2. BOISE CASCADE WOOD PRODUCTS, LLC www.bc.com/wood/eqp P.O. Box 2400 White city, Oregon 97503-0400 (541) 826-0200

3. RedBUILT, 200 East Mallard Dr., Boise, Idaho 83706, Tel: 1-866-859-6757.

4. Reviewed Equivalent by Architect.

C. Substitutions and Deviations shall require Engineer's approval and shall be given in letter form.

D. Refer to specifications Section 01 33 00 – Submittals.

E. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.

F. Specified materials indicated are as manufactured by "Weyerhauser" and shall be installed according to current listed specification requirements.

2.2 MATERIALS

A. General: SCL joists and types indicated on Drawings and specified here are as herein listed. Other manufacturers' joists complying with these Specifications and having equivalent properties and dimensions shall be subject to Architect's and Structural Engineer's review upon submission of substantiating data, and may be used only if equivalent, in Architect's and Structural Engineer's opinion, to the SCL joists specified. Structural capacities shall be evaluated by ASTM D2559 and independent structural testing.

B. Lumber:

1. LVL: Versa lam, manufactured in accordance with ICC Report No. ER-1040. Species shall be Douglas Fir, Southern Pine or Western Hemlock. Minimum grade shall be 2.0 E unless noted otherwise on the structural drawings.

2. PSL: Parallam, manufactured in accordance with ICC Report No. ER-1387. Species shall be Douglas Fir, Southern Pine or Western Hemlock. Minimum grade shall be 2.0 E unless noted otherwise on the structural drawings.

3. LSL: Timberstrand, manufactured in accordance with ICC Report No. ER-1387. Multiple species may be used. Minimum grade shall be 1.5 E unless noted otherwise on the structural drawings.

4. Various SCL products shall only be used where specifically indicated on the drawings. No substitutions shall be made without written approval.

C. Adhesive: Exterior type in conformance with ASTM D2559.

D. Types:

1. Sizes, properties and additional information as shown on the drawings.

2. Accessories to be furnished and installed as indicated on the Drawings are as follows:

a. Blocking, diaphragm blocking, miscellaneous blocking required by penetrations.

b. Hangers, brackets, straps, ties, etc., shown on Drawings.

c. Miscellaneous accessories incidental to erection and installation of members.

2.3 FABRICATION

A. Fabrication shall be in compliance with specified standard and industry specifications and requirements of the reports indicated.

B. Fabrication shall be in accordance with best practices with adequate plant and equipment and under supervision of properly qualified personnel.

C. Moisture content of components at time of gluing shall not be less than 7 percent nor more than 16 percent.

PART 3 – EXECUTION

3.1 ERECTION AND HANDLING

A. Structural Composite Lumber (SCL) is to be erected and installed in accordance with plans, manufacturer's drawings and installation suggestions.

B. Temporary construction loads which cause stresses beyond design limits are not permitted.

C. Holes, cuts or notches not previously approved by manufacturer's engineering shall not be permitted.

D. General Contractor is to give notification before enclosing members to provide opportunity for inspection of the installation.

E. Use equipment and methods that avoid damages that may impair strength of SCL members. Sharp instruments and unprotected wire rope, chain slings and the like shall not be permitted.

3.2 INSTALLATION

A. Members are to be erected and installed in accordance with the drawings and manufacturers recommendations. Comply with all manufacturers' recommendations concerning temporary construction loads and erection bracing.

3.3 PROTECTION AND CLEANING

A. Refer to Division 1 Sections.

B. Keep areas of work free from debris as work progresses.

C. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.

D. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.

E. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.

F. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the District.

G. After completion of work remove tools, appliances, surplus materials, waste materials, rubbish, debris and accessory items used in or resulting from said work, and legally dispose of off the site.

H. Provide Guarantee / Warranties and Bonds as required in this specification section and as listed in Section 01 78 36 – Warranties.

I. Provide record drawings in accordance with Section 01 77 00 – Project Closeout.

END OF SECTION 06 17 00.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 06 46 29 – PRE-PRIMED WOOD FASCIA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Pre-primed wood fascia replacement on areas of dry rot, as shown on plans.

1.3 RELATED REQUIREMENTS

A. Section 05 50 00 – Metal Fabrications.

B. Section 06 10 00 – Rough Carpentry.

C. Section 07 62 00 – Flashing and Sheet Metal.

D. Section 09 91 00 – Painting.

1.4 REFERENCES

A. Comply with references to extent specified in this section.

1. Standard Grading and Dressing Rule #17, of the West Coast Lumber Inspection Bureau.

2. Grading Rules for Western Lumber of the Western Wood Products Assn.

3. 2022 California Building Code, with Amendments.

4. ASTM International: ASTM E84 – Surface Burning Characteristics of Building Materials.

1.5 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.

1.6 SUBMITTALS

A. Submittal Procedures: See Section 01 33 00.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.

2. Half full size scale for sections and details 1:50 (1/4 inch) for elevations and plans.

C. Manufacturer's Literature and Data:

1. Description of each product.

2. List of acceptable sealers.

3. Installation instructions.

D. Samples: Small (approx. 6" x 6") sample in grade / finish specified.

E. Certificates: Certify products comply with specifications.

1. Fire retardant treatment of materials.

2. Moisture content of materials.

F. Qualifications: Substantiate qualifications comply with specifications.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Regularly installs specified products.

2. Installed specified products with satisfactory service on five similar installations for minimum five years.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, product, size, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

D. Store products indoors in dry, weathertight, conditioned facility.

E. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21°C (70°F) for minimum 48 hours before installation.

2. Install products when wet construction is completed, dried, and cured.

3. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

B. Field Measurements: Verify field conditions affecting fabrication and installation. Show field measurements on Submittal Drawings.

1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

A. Construction Warranty: See Division 1 for requirements for installation; manufacturer shall provide minimum of 20 year warranty against peeling, flaking, and chalking.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Basis of Design manufacturer and product is UFP-Edge True™, manufactured by UFP-Edge.

B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 25 13 – Project Options and Substitutions.

2.2 PRODUCTS – GENERAL

A. Pre-primed wood fascia is made from all cedar, which naturally resists rot and termites, and shall be knot-free. All six sides shall be pre-primed.

B. Each of these cedar trim boards is finger-jointed and edge-glued with a high-quality exterior adhesive that binds the wood during production.

C. Pre-primed with a first primer coat of an absorbing tannin blocker, with the second coat being fortified using a durable, non-blocking PPG acrylic primer that prepares the surface on all sides for a superior finish.

D. Two-sided board (smooth / resawn) sanded between coats on the smooth side to give you the best surface.

E. Factory-applied coating (Machine-Applied Coatings®) enhanced with a mildewcide to help deter mildew.

F. Coated on all sides for ultimate protection.

G. Provide each product from one manufacturer and from one production run, when possible.

2.3 FABRICATION

A. General:

1. Free from pitch pockets.

2. Standard members of same species, except where special profiles are shown.

3. Edges of members in contact with concrete or masonry having a square corner caulking rebate.

4. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded a shown.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Remove existing wall finish (if applicable) to permit new installation.

D. Clean substrates: Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION

A. Follow manufacturer's instructions for installation.

B. Cutting / Machining:

1. The use of common woodworking tools is recommended. Power saws with a carbide-tipped combination blade work best. Always cut into the finished face for best results.

a. Note that all cuts or machined areas must be primed with a quality primer/paint (see Paint section for further details).

C. Caulk: Caulk is required anytime the product intersects with other materials, such as siding, windows or doors. Always use a high-quality exterior-grade caulk that remains flexible and will move as the wood expands and contracts. Never use hard-setting caulks.

D. Joints: All joints must fall over a structural framing member and be primed and caulked to prevent moisture intrusion. In areas prone to moisture, the use of a water-resistance barrier flashing behind the joint is recommended. For finished appearance, a 22.5-degree angle should be used, double nailing on either side of the joint. Glue joints for the best finished appearance. Do not nail any closer than 1/2" from the end of the material without drilling a pilot hole to prevent splitting.

E. Fastening:

1. 6d or 8d galvanized or other corrosion-resistant fasteners must be used. Ring shank nails are preferred. Fastener length should be long enough to penetrate a minimum of 1-1/2" into structural framing.

2. Product must be fastened to structural framing, sheathing or other materials. It must be double nailed at a maximum of 24" on center or stagger nailed every 12" or less.

3. Nail heads must be driven snug with the surface of the material. Do not overdrive or countersink fasteners. If nails are driven too far and wood fiber is exposed, the area must be caulked or painted to seal the wood.

4. Fasten material from one end to the other. Do not nail from both ends towards the center as this can create undue stress on the wood.

F. Moisture Control:

1. Lumber and finish issues typically result from moisture, which causes the lumber to expand and contract at a greater rate, causing nail pops, splitting, checking and paint degradation. Proper handling and building practices can prevent most performance issues.

2. Products should only be applied to structures that are well ventilated and dry. Never install over wet sheathing.

3. Spacing requirements:

a. 6" above finished grade or landscaping

b. At least 1/2" above brick or concrete and should be properly flashed in all applications to prevent water from traveling behind the trim.

c. In all applications, products should never be placed where they could come into contact with standing water.

d. Trim used in a horizontal application should be flashed.

G. Paint:

1. Refer to Section 09 91 00. Paint color shall be as designated by the Architect or Owner.

2. Any paint or primer used should be a high-quality coating applied to the manufacturer's specifications. Application method and conditions will significantly impact the performance of the coating and thus the substrate.

3. Primer: When primed material is field cut or wood is exposed, it must be primed to prevent the uptake of moisture. All field cuts must be re-primed with one coat of at least 6 wet mills of primer prior to installation to meet warranty requirements. If the primed product is left exposed or unfinished for an extended period of time, all surfaces should be primed again before final coatings.

a. Primers should be a high-quality exterior oil or acrylic latex primer formulated for wood.

4. Surface Preparation: All surfaces must be free from dirt, dust, mildew and other loose or foreign material. Washing the surface with water and a mild detergent may be required to properly prepare the surface. Allow the surface to fully dry before painting.

5. Use satin/semi-gloss or full gloss exterior acrylic latex over a flat finish for better performance.

6. All exposed surfaces must be well coated, paying special attention to the bottom edge on any horizontal applications since this is an especially moisture-prone area.

7. Topcoat must be applied to material that has a moisture content of 15% or less.

8. All exposed surfaces must be top-coated with 2-3 dry mills of high-quality,

3.3 CLEANING

A. Clean exposed surfaces. Remove contaminants and stains.

B. Touch up damaged finishes. Repair painted surfaces with touch up primer.

3.4 PROTECTION

A. Protect from traffic and construction operations.

B. Remove protective materials immediately before acceptance.

C. Repair damage.

END OF SECTION.

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07 21 00 – Thermal Insulation
07 25 00 – Weather Barriers
07 26 00 – Vapor Retarders
07 41 13 – Metal Roof Panels
07 62 00 – Flashing and Sheet Metal
07 71 23 – Gutters and Related Flashing
07 92 00 – Joint Sealants

PAGE INTENTIONALLY LEFT BLANK.

SECTION 07 21 00 – THERMAL INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SUMMARY

A. This Section includes the following:

1. Thermal Insulation

B. All sound walls as identified on the plans, and all otherwise noted walls in the documents, are to receive building insulation to the underside of the structural deck as defined in this section.

1.3 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 07 41 13 – Metal Roof Panels.

C. Section 09 29 00 – Gypsum Board Assemblies.

1.4 DEFINITIONS

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.5 REFERENCES

A. 2022 California Building Code (CBC) with Amendments.

B. ASTM International:

1. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

2. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

3. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

4. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

5. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

6. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

7. ASTM E814 – Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

1.6 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

C. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including R-values, fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.

D. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of plastic foam insulations with building code in effect for Project.

1.7 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: ASTM E84.

2. Noncombustibility: ASTM E136.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage and protection during installation.

B. Protect Insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide only insulating materials that have been certified by the Manufacturer to comply with the California Quality Standards for insulating materials.

2.2 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Fiber Glass Insulation:

a. CertainTeed Corporation.
b. Knauf Insulation.
c. Johns Manville.
d. Owens Corning.

2.3 THERMAL AND ACOUSTICAL BATT INSULATION MATERIALS

A. General: Provide insulating materials which comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

2. Mineral Fiber Type: Fibers manufactured from glass.

3. Flanged Units: Provide blankets/batts fabricated with facing incorporating 4-inch-wide flanges along their edges for attachment to framing members.

4. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization. This is for all concealed and exposed insulating materials.

a. Maximum Flame Spread: Not more than 25.

b. Smoke Developed Index: Not more than 450.

5. Combustibility and Surface Burning Characteristics:

   a. Kraft-Faced Insulation shall comply with the following standards: ASTM C665 Type II, Class C, Category 1.

   b. Foil-Scrim-Kraft Faced Insulation shall comply with the following standards:

      i. ASTM C665 Type III, Class A, Category 1.

      ii. ASTM E84 Max Flame Spread Index 25, Max Smoke Developed 50.

2.4 WALLS, CEILING, ROOF INSULATION SCHEDULE

A. Exterior Wall Thermal Insulation:

1. Thermal Resistance: R-19

2. Thickness: 5-1/2 inch

3. Facing:

   a. Where Covered by Finishes: Kraft-Faced.

   b. Where Exposed: Foil-Scrim-Kraft.

B. Wood Framed Roof and Ceiling Thermal Insulation (at **all** Roofing and/or Ceiling, whether or not it is noted on plans) – see plans for locations of insulation types listed below:

1. Batt Insulation:

   a. Thermal Resistance: R-38.

   b. Thickness: 12 inch.

   c. Facing: Foil-Scrim-Kraft facing.

C. Interior Partition Wall Acoustical Insulation (at **all** Interior Walls, whether or not it is noted on plans):

1. Thermal Resistance: R-19.

2. Thickness: 5-1/2 inch.

3. Facing: Unfaced.

2.5 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding insulation, anchors, or substrates.

B. Adhesively Attached Pin Anchors: Perforated plate, 2 inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:

1. Plate: Zinc-plated steel, 0.106 inch thick.

2. Pin: Copper-coated low carbon steel, fully annealed, 0.106 inches in diameter, length to suit depth of insulation indicated and, with washer in place, to hold insulation tightly to substrate behind insulation.

3. Self-Locking Washer: Mild steel, 0.016 inch thick, size as required to hold insulation securely.

C. Wire Hanger Supports: To secure batt-type insulation in place between joists, with chisel cut ends dig into joists for permanent holding. Overall length is 1/2" less than over center joist spacing, 13 gauge, carbon steel wire, at 24” o.c. within all joist spacing where required.

2.6 PROTECTION BOARD

A. Premolded, semi-rigid asphalt/fiber composition board, 1/2 inch thick, formed under heat and pressure, standard sizes.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic or sealant as recommended by insulation manufacturer.

C. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

D. Set reflective, foil-faced units accurately with not less than 0.75-inch air space in front of foil as indicated.

3.5 PROTECTION

A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuses, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION.

SECTION 07 25 00 – WEATHER BARRIERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Weather Barrier Membrane

B. Seam Tape

C. Flashing

D. Fasteners

1.3 RELATED SECTIONS

A. Section 09 24 00 – Lath and Plaster

B. Section 09 29 00 – Gypsum Board Assemblies

1.4 REFERENCES

A. ASTM International (ASTM):

1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants
2. ASTM C1193 – Standard Guide for Use of Joint Sealants
3. ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting
4. ASTM D1117 – Standard Guide for Evaluating Non-woven Fabrics
5. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials
6. ASTM E96 – Test Method for Water Vapor Transmission of Materials
7. ASTM E1677 – Specification for Air Retarder Material or System for Framed Building Walls
8. ASTM E2178 – Test Method for Air Permeance of Building Materials
9. ASTM E2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

B. AATCC – American Association of Textile Chemists and Colorists: Test Method 127 Water Resistance: Hydrostatic Pressure Test

C. TAPPI:

1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)

2. Test Method T-460; Air Resistance (Gurley Hill Method)

D. 2022 California Building Code (CBC) with Amendments.

1.5 SUBMITTALS

A. Refer to Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer current technical literature for each component.

C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.

D. Quality Assurance Submittals:

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.

2. Manufacturer Instructions: Provide manufacturer's written installation instructions.

3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

E. Closeout Submittals:

1. Refer to Section 01 77 00 – Contract Closeout and Final Cleaning.

2. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installer shall have experience with installation of commercial weather barrier assemblies under similar conditions.

2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.

3. Source Limitations: Provide commercial weather barrier and accessory materials produced by single manufacturer.

B. Mock-Up:

1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed

instructions and recommendations.

a. Mock-up size: 10 feet by 10 feet.

b. Mock-up Substrate: Match wall assembly construction, including window opening.

c. Mock-up may remain as part of the work.

2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

C. Pre-installation Meeting:

1. Refer to Section 01 31 19 – Project Meetings.

2. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.

3. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.7 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 66 00 – Product Storage and Handling.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.8 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

C. The preferred order of installation for Weather Barriers is prior to the installation of windows and doors.

1.9 WARRANTY

A. Refer to Section 01 78 36 – Warranties and Bonds.

B. Special Warranty:

1. Special weather-barrier manufacturer's warranty for weather barrier for a period of ten (10) years from date of purchase.

2. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty are required.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to, the following:

1. To establish a standard of quality, design and performance, DuPont™ Tyvek® CommercialWrap® D, manufactured by DuPont, has been selected as a Basis of Design product. Alternatives will be considered provided they meet or exceed the specification criteria contained herein. The Architect shall be the sole determinant of equivalency.

a. DuPont™ Tyvek® CommercialWrap® D, manufactured by DuPont
1-800-44-TYVEK (8-9835)
http://www.construction.tyvek.com

2.2 MATERIALS

A. Basis of Design: Spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.

B. Performance Characteristics:

1. Air Penetration: 0.001 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. ≤0.04 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2357

2. Water Vapor Transmission: 30 perms, when tested in accordance with ASTM E96, Method B.

3. Water Penetration Resistance: 235 cm when tested in accordance with AATCC Test Method 127.

4. Basis Weight: 2.4 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.

5. Air Resistance: Air infiltration at >750 seconds, when tested in accordance with TAPPI Test Method T-460.

6. Tensile Strength: 33/41 lbs/in., when tested in accordance with ASTM D882, Method A.

7. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.

2.3 ACCESSORIES

A. Seam Tape: 3 inch wide, DuPont™ Tyvek® Tape for commercial applications.

B. Fasteners:

1. Wood Frame Construction: Tyvek® Wrap Caps, as distributed by DuPont: #4 nails with large 1-inch plastic cap fasteners, or 1-inch plastic cap staples with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud.

2. Masonry Construction: Masonry tap-con fasteners with Tyvek® Wrap Caps as distributed by DuPont: 2-inch diameter plastic cap fasteners.

C. Sealants:

1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.

2. Products: Sealants recommended by the weather barrier manufacturer.

D. Adhesives:

1. Provide adhesive recommended by weather barrier manufacturer.

2. Products:

a. SIA 655
b. Or adhesives recommend by the weather barrier manufacturer.

E. Primers:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

2. Products:

a. SIA 655
b. Permagrip 105
c. Or primers recommended by the flashing manufacturer

F. Flashing: Per the manufacturer's direction, use one of the following:

1. DuPont™ FlexWrap™: flexible membrane flashing materials for window openings and penetrations.

2. DuPont™ FlexWrap™: flexible membrane flashing materials for window openings and penetrations.

3. DuPont™ StraightFlash™: Straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.

4. DuPont™ Thru-Wall Surface Adhered Membrane with Integrated Drip Edge: Thru-Wall flashing membrane materials for flashing at changes in direction or elevation (shelf angles, foundations, etc.) and at transitions between different assembly materials.

5. Preformed Inside and Outside Corners and End Dams as distributed by DuPont: Preformed three-dimensional shapes to complete the flashing system used in conjunction with DuPont™ Thru-Wall Flashing.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

A. Install 2 layers of weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install weather barrier prior to installation of windows and doors.

C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Overlap Weather Barrier:

1. Exterior Corners: Minimum 12 inches.

2. Seams: Minimum 6 inches.

H. Weather Barrier Attachment:

1. Wood Frame Construction: Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

2. Masonry Construction: Attach weather barrier to masonry. Secure using weather barrier manufacturer recommended fasteners, spaced 12-18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site.

I. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with non-flanged windows – all cladding types)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLASHING (for use with non-flanged windows – all cladding types)

A. Cut 9-inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.

D. Apply 9-inch wide strips of DuPont™ StraightFlash™ at jambs. Align flashing with interior edge of jamb framing. Start DuPont™ StraightFlash™ at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont™ FlexWrap™ DuPont™ FlexWrap™ NF at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough

framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C 1193.

I. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.\

3.6 OPENING PREPARATION (for use with flanged windows)

A. Cut weather barrier in an "I-cut" pattern. A modified "I-cut" is also acceptable

1. Cut weather barrier horizontally along the bottom and top of window opening.

2. From top center of the window opening, cut weather barrier vertically down to the sill.

3. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING (for use with flanged windows)

A. Cut 7-inch (for 2x4 framing) or 9-inch (for 2x6 framing) wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanically fastening is not require for DuPont™ FlexWrap™ NF.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer's instructions.

F. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

3.8 THRU-WALL FLASHING INSTALLATION

A. Apply primer per manufacturer's written instructions.

B. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.

C. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.

D. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.

E. Roll flashing into place. Ensure continuous and direct contact with substrate.

F. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.

G. Trim exterior edge of membrane 1-inch and secure metal drip edge per manufacturer's written instructions.

H. Terminate membrane on vertical wall.

I. Apply sealant bead at each termination.

3.9 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT BASE OF WALL

A. Overlap thru-wall flashing with weather barrier by 6-inches.

B. Mechanically fasten bottom of weather barrier through top of thru-wall flashing.

C. Seal vertical and horizontal seams with tape or sealing membrane.

3.10 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT SHELF ANGLE

A. Seal weather barrier to bottom of shelf angle with sealing membrane.

B. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.

C. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.

3.11 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT WINDOW HEAD

A. Cut flap in weather barrier at window head.

B. Prime exposed sheathing.

C. Install lintel as required. Verify end dams extend 4" minimum beyond opening.

D. Install end dams bedded in sealant.

E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.

F. Apply sealant along thru-wall flashing edges.

G. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.

H. Tape diagonal cuts of weather barrier.

I. Secure weather barrier flap with fasteners.

3.12 FIELD QUALITY CONTROL

A. Notify manufacturer’s designated representative to obtain periodic observations of weather barrier assembly installation.

3.13 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION.

SECTION 07 26 00 – VAPOR RETARDERS

PART 1 – GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Concrete Vapor Emission Control System for remediation of excessive slab moisture and / or alkyd levels.

2. Repairs and preparation of concrete substrate and to install the concrete vapor emission control system.

3. Subfloor testing after concrete treatment.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 00 72 00 – General Conditions.

C. Section 00 72 00 – Exhibit C: Abatement of Hazardous Materials.

D. Section 03 30 00 – Cast in Place Concrete: Subfloor surface.

E. Section 09 67 23 – Fluid Applied Flooring – Epoxy.

1.3 REFERENCES

A. ASTM C920 – Elastomeric Joint Sealants.

B. ASTM E96 / E96M – Test Method for Water Vapor Transmission of Materials.

C. ASTM F710 – Practice for Prepping Concrete Floors to Receive Resilient Flooring.

D. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

E. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Ten-year experience in producing moisture vapor control emission products.

2. Minimum $5-million product liability insurance policy from an A-rated carrier.

3. A warranty program covering coats associated with repair or replacement of concrete vapor emission control system and finish floor covering or coating, including repair or replacement labor.

B. Installer Qualifications:

1. Installer shall have experience in the installation of floor covering or floor coatings and shall have experience in the installation of concrete vapor emission control systems.

2. Floor covering installer must be factory trained and certified for the installation of the specific products being installed.

3. Installer to provide project inspector proof of certification prior to starting work.

4. Certified installer must be present on job site while work is in progress.

C. Testing Laboratory Qualifications: Certified, bonded, qualified and experienced agency to perform pH and moisture vapor emission tests.

D. Pre-installation Meeting:

1. Contactor to notify Construction Manager with a minimum of 5-days' notice when anticipated to be ready for pre-installation meeting.

2. Contractor, installer and manufacturer representative are required to attend pre-installation meeting. Contractor is responsible for coordinating and scheduling their attendance.

3. Construction Manager will schedule meeting with Contractor team, Project Inspector, and Architect.

4. Purpose of Meeting: To review subfloor condition and test results; determination of appropriate treatment system(s) and location(s); and review installation requirements.

1.5 SUBMITTALS

A. Provide a complete submittal package with all components required within this section. Submit per Section 00 72 00.

1. Product Data: Provide product data describing physical and performance characteristics, material safety data sheets, certificates, warranty information and manufacture's installation instructions for proposed product.

2. Submit product manufacturer's field reports and test reports with warranty certification.

3. Submit anhydrous calcium chloride testing according to ASTM F1869 and RH Probe Tests results according to ASTM F2170. Submit substrate pH readings. Tests shall be performed by the Owner's Inspector and results

provided to the Architect, Owner, General Contractor, flooring installer and Water Vapor Reduction System Manufacturer's Representative.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90°F or below 50°F.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Areas to receive Vapor Emission Control System shall be clean, fully enclosed, weather tight with the permanent HVAC set at a uniform temperature per manufacturer’s recommendation.

B. Maintain ambient temperature required by manufacturer three days prior to, during, and 24 hours after installation of Vapor Emission Control System.

C. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.

D. Do not apply water vapor reduction system when temperature is lower than 50°F or expected to fall below this temperature within 24 hours from time of application.

E. Protection: Protect water vapor reduction system to prevent damage from topical water for a minimum period of 24 hours from time of application.

1.8 WARRANTY

A. Contractor shall file a pre-installation checklist with the manufacturer (as required) and receive written confirmation of the approval to proceed in order to obtain full warranty.

B. Emission control system warranty must be from the manufacturer, in writing, and cover the cost of system materials, cementitious compounds and labor costs of application and preparation. In addition, the warranty must extend to the flooring material, adhesive and installation labor.

C. Warranty period shall be no less than ten years or the life of the flooring covering whichever comes first.

D. Warranty exclusion shall be limited to:

1. Moisture failure due to topical intrusion of plumbing failure or other substances entering from the surfaces.

2. Seismic damage occurring after installation.

3. Replacement of flooring during warranty period as removal of flooring could damage emission control system.

4. Aggregate found to be defective (expansive and reactive aggregate are examples).

E. Warranty shall not exclude cracks visible at time of installation nor “improper installation”.

F. Manufacturer to provide evidence of a product liability insurance policy. Insurer shall have no less than an “A” rating from one of the four major rating services. A certificate of insurance shall be delivered to the Owner and shall name the Owner, Architect and General contractor as co-insured. Liability shall be in the amount of $5 million per occurrence.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor Emission Control System: The appropriate system(s) shall depend on the existing slab moisture and pH levels and the requirements of the specific floor covering product. The determination of which of the following systems would be most appropriate and the extent of treatment area(s) shall be made by the Owner’s representative once the existing slab testing results are known.

1. Koester VAP1 2000 System. 100% solids epoxy.

2. Mapei Planiseal VS System. An alkali-resistant, two-component, 100%-solids epoxy coating that effectively stops moisture-related problems with floor coverings.

3. ARDEX MC™ RAPID.100% solids epoxy system.

2.2 MIX DESIGNS

A. VAP1 2000:

1. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture. Use a low-speed motor less than 400 rpm and a two bladed Jiffy mixing blade only. DO NOT AERATE. Mix ratios are measured by volume.

2. VAP I® 2000 Mix Ratio: Mix Component A and B at a ratio of 2.4:1 by volume.

B. Mapai Planiseal VS:

1. Premix Part A to a homogenous consistency (2 to 3 minutes) using a low-speed mixer (at 300 to 450 rpm) and a “jiffy” (paint mixer) mixing paddle.

2. Pour Part B into Part A container and mix thoroughly to a smooth, homogenous consistency. Do not mix at high speeds, which can trap air within the mixed material.

3. Pour and spread the entire unit of any mixed Planiseal VS onto the substrate within 5 minutes of mixing.

C. ARDEX MC PLUS:

1. Each individual unit of ARDEX MC RAPID™ Red and ARDEX MC RAPID™ Green contains separate, pre-measured quantities of the hardener (Part A) and the resin (Part B). The hardening agent (Part A) is added to the resin (Part B).

2. ARDEX MRP and/or ARDEX K 301 are mixed in 2-bag batches at one time. Mix each bag of powder with the prescribed amount of water using an ARDEX Mixing Paddle and a 1/2" heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written installation instructions for each material.

3. For mix designs related to the use of ARDEX underlayment's and toppings, refer to the standard mixing instructions for installation over concrete as shown in the manufacturer's installation instructions.

4. For instructions on the filling of dormant cracks and joints, follow the written instructions of the selected epoxy manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Calcium Chloride, RH Probe and pH test requirements:

1. Anhydrous calcium chloride testing shall be performed by the Owner's Inspector.

2. Provide anhydrous calcium chloride tests according to ASTM F1869 protocol.

3. Provide RH Probe Tests according to ASTM F2170 protocol.

4. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use. If this is not possible then follow the F1869 method for non-acclimated spaces. Maintain these conditions 48 hours prior to and during tests. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature and humidity are NOT acceptable.

5. Provide substrate surface pH readings.

6. Owner's Inspector shall provide test results with a marked-up floor finish plan showing test result. Inspector shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.

B. Concrete Slab Inspection:

1. Existing concrete slabs: Testing for concrete deficiencies and contaminates such as un-reacted silicates, chlorides, A.S.R. (alkali-silica reaction), oil contamination, etc. is recommended by Koster to avoid bonding issues. These conditions can cause bonding concerns with all epoxy and finished floor coatings, including the Koster VAP 1 2000. This testing is not required by Koster. This testing should be performed by the owner's independent testing agency using utilizing standard coring methods and review of the history of the slab installation if available. Concrete should conform to ACI Committee 201 Report "Guide to Durable Concrete."

2. New concrete slabs: Review Section 03 30 00 curing compounds. Silicate based curing compounds should be avoided.

3.2 PREPARATION

A. Inspect all surfaces with regard to their suitability to receive moisture vapor reduction system with manufacturer's representative.

B. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors to a CPS #3 or #4 and clean surfaces with vacuum and remove all residue off the concrete. Grinding is allowed only in areas not accessible by shot blasting. Do not acid etch. Remove ALL defective materials, and foreign matter such as dust, adhesives, gypsum based patching and leveling compounds, paint, dirt, un-reacted sprayed on silicates, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast bee bees, etc. Repair all cracks, expansion joint, control joints, and open surface honeycombs and fill in accordance with Manufacturers recommendations. Inform vapor reduction system manufacturer if concrete additives like silicates or chlorides or any other soluble compounds that have been used in the concrete mix or topically applied. Reinforcing fibers that are visible after shot blasting must be removed and vacuumed leaving no fibers left on the concrete surfaces. Provide uncontaminated, sound surface.

C. Repair concrete prior to moisture vapor reduction system. Consult with vapor reduction manufacturer to determine suitable products for concrete repair.

D. Shot blast a small test area and review surface profile with the finished flooring applicator. As the moisture vapor reduction system is not a leveling material make sure the flooring installer is aware that a feather finish or leveling material may be utilized to "flatten" the concrete after the application of the moisture vapor reduction system and prior to the flooring installation.

E. Clean substrate surfaces to receive system treatment and treat surface irregularities with a 100% Portland Cement based patching compounded and cementitious fill compatible with prescribed system treatment as recommended by the manufacturer of the moisture control system.

F. At all treated locations under finish goods i.e. carpet, VCT, etc., install self-leveling material to provide a smooth and uninterrupted concrete substrate for proper installation of floor finish.

3.3 JOINT AND CRACK PREPARATION

A. VAP1 2000:

1. Fill cracks, control joints, voids and deteriorated concrete with CTS Cements Rapid Set Cement All, Mortar Mix, Concrete Mix or Skim Coat prior to the VAP I 2000 application. Allow the products to cure according to Rapid Set's requirements before applying the VAP products over the repaired area. Do not use gypsum based cementitious patching, leveling and repair mortars under the VAP I 2000 systems. Cracks should be opened up to at least 1/4" x 1/4" to allow for a proper amount of Rapid Set materials to fill the voids. Any cracks/voids that may be contaminated by known or unknown substances should be routed out to remove any contaminants.

2. Expansion joints should be repaired per the detail on the VAP I 2000 data sheets. A fumed silica epoxy thickening agent (Aerosil or Cabosil) can be added to the VAP I 2000 products and used in place of cementitious materials for control joints and cracks if needed.

3. Consult with Koster America for crack general repair guidelines.

B. Mapai Planiseal VS:

1. Repair cracks before application of the Planiseal VS using an appropriate high-modulus epoxy (Planibond EBA or Planibond CR 50) mixed with sand if required (depending on the size of crack under repair). Cracks narrower than 1/8" (3mm) may typically be filled with Planiseal VS neat. Cracks wider than 1/8" (3mm) are to be repaired with suitable high-modulus epoxy such as Planibond EBA or Planibond CR 50 (consider an epoxy mortar if appropriate) filled to 1/8" to 1/4" (3 to 6mm) shy of the substrate surface (just below flush).

2. Avoid overfilling of cracks with high-modulus epoxies that will lead to epoxy spilling onto substrate. Any epoxy that spills onto the substrate surface must be removed, and any remaining residue must be fully seeded with sand. The subsequent application of the Planiseal VS must take place after all loose sand have been vacuumed up off the floor, and fully encapsulate the epoxy utilized for crack repair.

3. Contraction, control or saw-cut joint treatment: Dormant control joints may typically be filled with Planiseal VS, or with Planibond EBA or Planibond CR 50 (consider an epoxy mortar if appropriate) filled to 1/8" to 1/4" (3 to 6mm) shy of the substrate surface (just below flush).

C. ARDEX MC:

1. Moving Joints: Honor all expansion and isolation joints up through the ARDEX Moisture Control System, and underlayment or topping.

2. Saw cuts, control joints and dormant cracks: To ensure that a continuous barrier to moisture emissions is created over the entire surface, ARDEX recommends the use of a two-part, low viscosity rigid epoxy crack and joint filler to fill small, non-moving cracks and saw-cut joints in existing concrete substrates. Cracks greater than a hairline in width [1/32" (0.79 mm)] and saw-

cuts must be filled in strict accordance with the installation instructions provided by the ARDEX Technical Department. Once the dormant cracks and saw-cuts have been properly filled, allow these areas to cure thoroughly in accordance with the epoxy manufacturer's recommendations prior to proceeding with the ARDEX MC™ RAPID installation.

3. Saw Cuts, Control Joints and Dormant Cracks: Fill all non-moving joints and cracks greater than 1/32" with a rigid, low-viscosity, two-part epoxy joint sealant. Once the cracks and joints have been properly filled, broadcast a sand layer to refusal and allow these areas to cure as recommended by the epoxy manufacturer prior to proceeding with the installation of the ARDEX MC™ RAPID.

3.4 INSTALLATION (per manufacturer's guidelines or as follows)

A. The coverage rates vary by system. Follow manufacturer recommendations for the specific project application.

B. Application of moisture reduction system shall be in strict accordance with manufacturer recommended methods and installation information.

C. Cementitious underlayment with suitable primer is recommended if required by the Owner, floor covering installer, or the floor covering manufacturer to smooth and/or level surfaces after shot blasting and installation of the moisture reduction system. No underlayment or feather finish system is allowed under the moisture reduction system material. When water-based adhesives are utilized in the floor covering installation, use an approved cementitious underlayment system with primer prior to the installation of the flooring system. Contact the adhesive manufacturer for their minimum recommended thickness of cementitious underlayment to absorb excess moisture in the adhesive. Typically, a minimum of 1/8" is required. Note this is only for some water-based adhesives.

3.5 PROTECTION

A. Prohibit any traffic or any activity that generates dust or debris from contaminating the treated slab until finished flooring is installed.

B. Do not install finished flooring until the vapor control system has fully cured in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 07 41 13 – METAL ROOF PANELS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Section Includes: Prefinished, prefabricated structural standing seam roof system with continuous interlocking field formed seams, with related metal trim and accessories.

1.3 RELATED REQUIREMENTS

A. Section 06 10 00 – Rough Carpentry.

B. Section 07 21 00 – Thermal Insulation.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 07 92 00 – Joint Sealants.

1.4 REFERENCES

A. 2022 California Building Code (CBC) with Amendments.

B. American Architectural Manufacturer's Association (AAMA):

1. AAMA 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.

2. AAMA 809.2 – Voluntary Specification Non-Drying Sealants.

C. American Society of Civil Engineers (ASCE): ASCE 7-16: Minimum Design Loads for Buildings and Other Structures.

D. ASTM International (ASTM):

1. ASTM A653 – Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. ASTM A755 – Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

3. ASTM A792/A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

4. ASTM A980 – Standard Specification for Steel, Sheet, Carbon, Ultra High Strength Cold Rolled.

5. ASTM C645 – Specification for Nonstructural Steel Framing Members.

6. ASTM C1371 – Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

7. ASTM C1549 – Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

8. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

9. ASTM D523 – Specular Gloss.

10. ASTM D1003 – Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

11. ASTM D2244 – Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

12. ASTM D4214 – Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.

13. ASTM E1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

14. ASTM E1646 – Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.

15. ASTM E1680 – Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

16. ASTM E1918 – Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field

17. ASTM E1980 – Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

18. ASTM E2140 – Weather Penetration of Metal Roof Panel Systems by Static Water Pressure Head.

E. International Accreditation Service (IAS): IAS AC 472 – Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B.

F. Underwriters Laboratories, Inc. (UL): UL 580 – Tests for Uplift Resistance of Roof Assemblies

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, inspection agency and related trade contractors.

1. Coordinate building framing in relation to metal panel system.

2. Coordinate openings and penetrations of metal panel system.

3. Coordinate work of openings and penetrations, and manufacturer's accessories with installation of metal panels.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications / Source: Provide metal roof panel assembly and accessories from a single manufacturer providing fixed-base roll forming, and providing:

1. Ten years' experience, minimum, in factory fabrication of metal panels.

2. Manufacturer shall carry $2,000,000 liability insurance, minimum, for metal panel system.

B. Installer Qualifications: Experienced Installer with minimum of five years' experience with successfully completed projects of a similar nature and scope.

1. Installer must be approved by manufacturer in writing prior to bid. Approval document must be included with project bid.

2. Installer's Field Supervisor: Experienced mechanic supervising work on site whenever work is underway.

C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.

1.7 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets for specified products.

B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, roof accessories, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.

1. Indicate points of supporting structure that must coordinate with metal panel system installation.

2. Include data indicating compliance with performance requirements.

3. Include structural data indicating compliance with requirements of authorities having jurisdiction.

C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch-long section of each metal panel profile. Provide color chip verifying color selection.

1.8 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, witnessed by a professional engineer.

B. Qualification Information: For Installer firm and Installer's field supervisor.

C. IAS Accreditation Certificate: Indicating that manufacturer is accredited under provisions of IAS AC 472.

D. Manufacturer's Warranty: Sample copy of manufacturer's standard warranty.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Manufacturer's Warranty: Executed copy of manufacturer's standard warranty.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.

1. Deliver, unload, store, and erect metal panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

2. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.

3. Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.

1.11 COORDINATION

A. Coordinate sizes, profiles, and locations of roof curbs and other roof-mounted equipment and roof penetrations, based upon sizes of actual selected equipment.

1.12 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard 25-year performance warranty, stating the following:

1. Architectural fluorocarbon finish:

a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244.

b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214 method D659.

c. Will not peel, crack, chip, or delaminate.

2. Metal substrate will not rupture, fail structurally, or perforate.

3. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within one year from date of Substantial Completion.

B. Special Weathertightness Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail to remain weathertight, including leaks, within 20 years from date of Substantial Completion.

C. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal roof or wall panel systems that may by incorporated in the work include, but are not limited to, the following:

1. AEP Span, a division of ASC Profiles.

2. The Garland Company

3. MBCI, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal roof panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

B. Roof Classification: Class A.

C. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated:

1. Wind Loads: Per CBC 2022, Chapter 16A, determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings and per CBC Chapter listed above.

a. Wind Uplift Testing: Certify capacity of metal panels by actual testing of proposed assembly per ASTM E1592 or UL 580.

2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of the span as required by UL 250 with no evidence of failure.

3. Seismic Performance: Comply with ASCE 7-16, Section 9, "Earthquake Loads."

D. Wind Uplift Resistance: Comply with UL 580 for wind-uplift class.

E. Water Penetration Static Pressure: Testing in accordance with ASTM E1646. No leakage through panel joints at 15 psf.

F. Water Penetration: No leakage through panel sideseams and endlaps after six hours when tested according to ASTM E2140 at a static water pressure head of 6 inches.

G. Air Infiltration: Tested in accordance with ASTM E1680. 0.022 cfm per linear foot of joint at static test pressure differential of 12 psf.

H. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures through 120°F ambient, 180°F material surface. Accommodate thermal movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

2.3 METAL ROOF PANELS

A. Mechanically-seamed, Concealed Fastener, Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with vertical ribs at panel edges, installed by lapping and mechanically interlocking edges of adjacent panels, and attaching panels to supports using concealed clips and fasteners in a weathertight installation.

1. Basis of Design: AEP Span, Span-Lok, ER-309.

a. Other Acceptable Products / Manufacturers:

i. MBCI, BattenLok.

ii. Garland, RMer.

2. Aluminum-Zinc Alloy-Coated Steel Sheet: Yield strength 50,000 psi, with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.

   a. Nominal Coated Thickness: 24 gage.

   b. Panel Surface: Striated with Pencil Ribs.

   c. Exterior Finish: DuraTech® 5000, Polyvinylidine Fluoride, full 70 percent Kynar 500®or Hylar 5000®, consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.

   d. Color: Selected from manufacturer's full line. Intent is to match existing on campus.

3. Panel Width: 16 inches (406 mm).

4. Panel Seam Height: Approx. 2 inches.

5. Joint Type: Mechanically seamed.

2.4 FRAMING AND SUBSTRATES

A. Framing and Sheathing: Refer to Divisions 5 and 6.

B. Roofing Underlayment:

1. Roofing Felt: Laminated polypropylene and polyethylene sheet, tear-resistant, UV resistant, manufactured with textured surface for slip resistance, meeting performance requirements of ASTM D226.

2. Self-Adhering, High-Temperature Underlayment: Cold-applied sheet underlayment minimum 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer for substrate.

3. Slip Sheet: As recommended by manufacturer.

2.5 METAL ROOF PANEL ACCESSORIES

A. General: Provide manufacturer's standard accessories to complete the installation of metal roof panel assembly incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings, in manufacturer's standard profiles. Provide required fasteners, closure strips, thermal spacers, splice plates, support plates, and sealants as indicated in manufacturer's written instructions.

B. Rigid Insulation: In some locations, metal roofing to be installed over rigid insulation. See Section 07 21 00 – Thermal Insulation and plans for details.

C. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.

D. Panel Clips: Provide panel clip of type specified, at spacing indicated on approved shop drawings. Provide clip designed to allow panels to thermally expand and contract. Clip shall incorporate a self-centering feature to allow 1 inch of movement in both directions along panel length. Clip type shall be selected to meet positive and negative pressures as specified.

1. Two-piece Floating: ASTM C645, with ASTM A653/A653M, G90 (Z180) hot-dip galvanized zinc coating, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.

2. Single-Piece Fixed: ASTM A653/A653M, G90 (Z180) hot-dip galvanized zinc coating, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.

3. Sealant: Factory-installed sealant to provide continuity of seal at clip locations.

E. Panel Fasteners: #12 x 1-1/4" Type A, fully threaded for wood applications, self-tapping screws and other acceptable corrosion-resistant fasteners recommended by roof panel manufacturer. Where exposed fasteners cannot be avoided, supply fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.

F. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:

1. Factory-Applied Seam Sealant: Factory apply high-grade butyl mastic sealant within the confines of panel’s female leg, designed to seal against adjacent male panel leg.

2. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.

3. Concealed Joint Sealant: Non-curing butyl, AAMA 809.2.

G. Steel Sheet Miscellaneous Framing Components: ASTM C645, with ASTM A653, G60 (Z180) hot-dip galvanized zinc coating.

2.6 FABRICATION

A. General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.

B. Fabricate metal panel joints configured to accept factory-applied sealant providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.

C. Panels shall be factory correctively-leveled.

D. Form panels in continuous lengths for full length of detailed runs from ridge to eave when possible, except where otherwise indicated on approved shop drawings.

E. Where single length panels are not practical, provide mated swaged panels for positive joint end laps, shingled to accommodate water run-off (fabricated with overlap in direction of water flow).

F. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations which create voids and requiring supplemental closure devices shall not be considered acceptable.

G. Engineer panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.

H. Seams:

1. Panel seams shall interlock entire length of seam.

2. Design standing seam to lock up and resist joint disengagement during design wind uplift conditions as calculated according to local building codes.

3. Provide pre-installed sealant within confines of panel's female leg to aid in resistance of leaks and provide panel-to-panel seal while allowing expansion and contraction movement.

4. Seams shall be continuously locked or crimped together by mechanical means during installation. Seaming tools shall be sourced from manufacturer's recommended vendor.

I. Fabrication Tolerances: Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panels are factory correctively-leveled to minimize the occurrence of "oil canning". As such, "oil canning" will not be accepted as cause for rejection.

J. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish.

2.7 FINISHES

A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

B. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 – 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, to meet normal weathering conditions of a minimum of 20 years. Custom color, to match "Atwater HS Falcon Blue".

C. Interior Finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.

PART 3 – EXECUTION

3.1 EXAMINATION

A. With installer present, examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion. Prior to starting any work, correct defects.

B. Inspect metal panel support substrate to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable supports at recommended spacing to match installation requirements of metal panels.

C. Field Measurements:

1. Coordinate field measurements and fabrication schedule with construction progress.

2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.

3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.

D. Panel Support Tolerances: Confirm that panel supports are within tolerances acceptable to metal panel system manufacturer but not greater than the following:

1. 1/4 inch in 20 foot in any direction.

2. 1/2 inch across building elevation.

3. 1/8 inch in 5 feet.

E. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal roof panel system installation.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, girts, furring, and other miscellaneous panel support members according to ASTM C754 and manufacturer's written instructions.

B. Self-Adhering Sheet Underlayment: Apply in accordance with underlayment manufacturer's written instructions; apply primer if required. Apply at locations indicated below. Roll laps with roller.

1. Apply over the entire roof surface.

C. Felt Underlayment: Apply at locations indicated below, in accordance with underlayment manufacturer's written instructions.

1. Apply on area of roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 6 inches (150 mm).

D. Rigid Insulation: In some areas, metal roofing to be installed over rigid insulation. See Section 07 21 00 – Thermal Insulation and plans for details.

E. Flashings: Provide flashings as required to complete metal roof panel system. Install in accordance with Section 07 62 00 – Sheet Metal Flashing and Trim, and approved shop drawings.

3.3 METAL PANEL INSTALLATION

A. Mechanically-Seamed, Standing Seam Metal Roof Panels: Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal roof panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses, and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.

B. Attach panels to supports using clips, screws, fasteners, and sealants recommended by manufacturer and indicated on DSA Approved Drawings.

1. Fasten metal panels to supports with concealed clips at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.

2. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool clip, metal roof panel, and factory-applied sealant are completely engaged.

3. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.

4. Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.

5. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.

6. Cutting and Fitting:

a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.

b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.

c. Openings less than 6 inches: Field cutting is acceptable.

7. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar metals or treated lumber, treat faces and edges in contact with dissimilar materials as recommended by manufacturer, and

fabricate transition to facilitate drainage and minimize possibility of galvanic action. Galvanic action can cause panels and trim to fail prematurely.

3.4 ACCESSORY INSTALLATION

A. General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.

3. Provide concealed fasteners except where noted on approved shop drawings.

4. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

B. Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions. Provide airtight and waterproof installation. Prepare joints and apply sealants per requirements of Section 07 92 00 – Joint Sealants.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: If required, engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective films immediately in accordance with metal roof panel manufacturer's instructions. Clean finished surfaces as recommended by metal roof panel manufacturer.

B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION.

SECTION 07 46 46 – CEMENTITIOUS SOFFIT PANELS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Fiber cement vented soffit panels, and accessories; James Hardie HZ10 Engineered for Climate Siding and Hardie Architectural Panels.

1.3 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 06 46 29 – Pre-Primed Wood Fascia.

C. Section 07 62 00 – Flashing and Sheet Metal.

D. Section 07 71 23 – Gutters and Related Flashing

E. Section 09 91 00 – Painting.

1.4 REFERENCES

A. 2022 California Building Code (CBC), with Amendments.

B. ASTM D3359 – Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.

C. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00 – Submittals.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.

D. Selection Samples: For each finish product specified, two complete physical sets manufacturer's full range of available patterns.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years' experience with installation of similar products.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Remodel mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. Product Warranty: Limited, non-pro-rated product warranty.

1. HardieSoffit HZ10 panels for 30 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects.

C. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: James Hardie Building Products, Inc., which is located at: 303 E. Wacker Dr.; Chicago, IL 60601; 877-236-7526; https://www.jameshardiepros.com

B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 25 13 – Project Options and Substitutions.

2.2 SOFFIT PANELS

A. Vented Soffit Panels: HardieSoffit HZ10 Vented Panels. as manufactured by James Hardie Building Products, Inc.

1. Net Free Ventilation: 5 sq inches of net free ventilation per linear foot (10583 sq mm per linear meter).

2. Factory sealed on 5 sides.

3. Thickness: 1/4 inch (6 mm).

4. Size:

a. At Multipurpose: 24 inches wide by length as shown on plans.

b. At Relocatables: 24 inches wide by length as shown on plans at back of relocatables. 5'-0" wide soffit at front of relocatables, shall be painted plywood as shown on plans and noted in Section 06 10 00.

5. Texture: Smooth, woodgrain, or textured, to match adjacent existing soffit panels.

2.3 FASTENERS

A. Wood Framing Fasteners: As recommended by manufacturer, from the following:

1. Wood Framing: 4d common corrosion resistant nails.

2. Wood Framing: 6d common corrosion resistant nails.

3. Wood Framing: 8d box ring common corrosion resistant nails.

4. Wood Framing: 0.089 inch (2.2 mm) shank by 0.221 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.

5. Wood Framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.

6. Wood Framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2-1/2 inches (64 mm) corrosion resistant siding nails.

7. Wood Framing: 0.091 inch (2.3 mm) shank by 0.221 inch (5.6 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.

8. Wood Framing: 0.091 inch (2.3 mm) shank by 0.225 inch (5.7 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.

9. Wood Framing: 0.121 inch (3 mm) shank by 0.371 inch (9.4 mm) head by 1-1/4 inches (32 mm) corrosion resistant roofing nails.

10. Wood Framing: No. 11 gauge 1-1/4 inches (32 mm) corrosion resistant roofing nails.

11. Wood Framing: No. 11 gauge 1-1/2 inches (38 mm) corrosion resistant roofing nails.

12. Wood Framing: No. 11 gauge 1-3/4 inches (44 mm) corrosion resistant roofing nails.

13. Wood Framing: 16 gauge 1-1/2 inches (38 mm) stainless finish nails

2.4 FINISHES

A. Factory Primer: Provide factory applied universal primer.

1. Primer: Factory primed by James Hardie.

2. Topcoat: Refer to Section 09 91 00 – Painting.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Nominal 2 inch by 4 inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.

1. Install water-resistive barriers and claddings to dry surfaces.

2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.

3. Protect siding from other trades.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Install a water-resistive barrier is required in accordance with local building code requirements.

D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.

E. Install Engineered for Climate HardieWrap weather barrier in accordance with local building code requirements.

F. Use HardieWrap Seam Tape and joint and laps.

G. Install and HardieWrap flashing, HardieWrap Flex Flashing.

3.3 INSTALLATION – HARDIESOFFIT HZ10 AND VENTED PANELS

A. Install materials in strict accordance with manufacturer's installation instructions.

1. Panels may be installed as soffit or ceiling over wood or steel framing; 20 gauge (33 mils) minimum to 16 gauge (54 mils), complying with local building code. Install soffits to nominal 2 x 4 framing members spaced a maximum of 24 inches (610 mm) on center with the long dimension perpendicular to the rafter or joist framing.

2. Support edges by framing.

3. Install water barriers and air barriers as required by local building codes.

4. Ensure gutters have end caps. Maintain a minimum 1 inch (25 mm) gap between end caps and siding and trim.

5. Install kickout flashing at roof-wall junctions per manufacturer's instructions.

6. Additional framing may be needed to ensure proper fastening.

7. Position vent holes toward outside of eave for optimal airflow.

8. Vents can be installed into non-vented soffit.

9. Insect screen can be installed using construction adhesive.

10. Fastener Positioning: Position fasteners 3/8 inches (9.5 mm) from panel edges and no closer than 2 inches (51 mm) away from corners when using soffit greater than 12 inch (305 mm) wide and no closer than 1 inch (25 mm) away from corners when using soffit that is less than or equal to 12 inch (305 mm) wide.

11. Jointing Methods: Install panels in moderate contact at ends, provide PVC or metal jointers, battens or leave appropriate gap and caulk.

12. Drive fasteners perpendicular to siding and framing.

13. Fastener heads should fit snug against siding; no air space.

3.4 FINISHING

A. Finish factory primed siding with a minimum of three (3) coats of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 62 00 – FLASHING AND SHEET METAL

PART 1 – GENERAL

1.1 SUMMARY

A. All applicable portions of Division 1, including the drawings and general provisions of the contract, the general and supplementary conditions and Division 1 specification sections which apply to work of this section as if printed herein.

B. Section Includes: Flashings, counter flashings, and copings as indicated on the Drawings and specified herein.

C. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Section 05 50 00 – Metal Fabrications.

3. Section 07 41 13 – Metal Roof Panels.

4. Section 07 71 23 – Gutters and Related Flashings.

5. Section 07 92 00 – Joint Sealants.

6. Refer to Division 7, for Roofing Sections, and Prefabricated roof curbs, hatches, roof deck insulation, and Division 8 component daylight systems.

1.2 REFERENCES

A. Fabricate sheet metal items from sheet steel in accordance with ASTM G90.

B. ASTM A924 / A924M-16ae1 – General Requirements for Steel Sheet, Metallic-Coated by the Hot Dip Process.

C. FS TT-C 494B – Federal Specification for Coating Compound, Bituminous, Solvent Type, Acid Resistant.

D. SMACNA – Architectural Sheet Metal Manual, current edition.

E. AWS – American Welding Society.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate locations, configurations, jointing methods, welding methods, fastening methods, expansion joint layouts, downspout layout and installation details.

C. Samples: Submit two samples, 12 inches long illustrating component design, finish, color, and configuration.

1.4 QUALITY ASSURANCE

A. Conform to SMACNA Manual for architectural sheet metal flashing and installation details.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Where general flashing pieces are shown on drawings, provide steel sheet metal of at least 22-gauge steel unless otherwise noted on drawings.

B. Where sheet aluminum is shown on Drawings, provide 0.032-inch thickness (20-gauge) and in accordance with ASTM B209, 6063-T5 in color finish as selected by Architect.

C. Extruded Aluminum: Manufacturer's standard extrusions of sizes and profiles indicated, 60063-T52, AA-C22A41 clear anodized finish; 0.080-inch minimum thickness for primary legs of extrusions.

D. Stainless Steel: AISI Type 302/304, complying with ASTM A167, 2D annealed finish, soft, except where harder temper required for forming or performance; 0.0156-inch thick (28 gauge) except as otherwise indicated.

E. Galvanized Steel: ASTM A924 / A924M-09a, Grade A, G90 zinc coating.

2.2 ACCESSORIES

A. Fasteners and Clips: Provide as required and appropriate for the materials being fastened. Where fasteners or clips may be exposed to outside weather conditions, provide galvanized or stainless-steel type.

1. Provide fasteners such as bolts, screws, and nails hot-dip galvanized as specified in accordance with ASTM A153.

B. Where rivets will be used, provide malleable iron type with rust-inhibitive coating.

C. If drive pins are incorporated into work, provide Omark or other approved, cadmium plated with neoprene facing, at least 1-inch long, with neoprene washers.

D. Solder:

1. For use steel or copper, provide 50 – 50 tin/lead solder (ASTM B32) with rosin flux.

2. For use with stainless steel, provide 60 – 40 tin/lead solder (ASTM B32) with acid-chloride type flux, except use rosin flux over tinned surfaces.

E. Bituminous Coating: SSPC – Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

F. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

G. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 Joint Sealers.

H. Epoxy Seam Sealer: Two-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

I. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

J. Paper Slip Sheet: 5 lbs. rosin-sized building paper.

K. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E154.

L. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncorrosive.

M. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

2.3 FABRICATION

A. General Metal Fabrication:

1. Shop fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate waterproof and weather-resistant performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work.

2. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed seams with epoxy seam sealer; rivet joints for additional strength where required.

B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, in edges to be seamed, form seams and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weather/waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from incompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed for extruded aluminum joint covers. Fabricate mitered and welded corner units.

2.4 PREFABRICATED SHEET METALS

A. Copings: Provide factory prefabricated 22-gauge galvanized steel sheet metal continuous snap on type copings per SMACNA Chapter 3, Figure 3-1 with EIEPGE Styles. Copings shall be maximum 10-foot lengths, secured at one (1) end and free at other end and/or per SMACNA requirements. Cover plate shall extend 6-inch minimum beyond 1/2-inch space between coping lengths. Secure cover plate with screw in neoprene washer per SMACNA Figure 3-1-Detail 1 in oversized holes. Provide copings manufactured by MM Systems Corporation, Construction Specialties, Tremco, KC Metals, Fry Reglet or others, as approved by Architect.

1. Pre-finish coping in Kynar 500 coating of standard color as selected by Architect.

B. All other flashing: Provide minimum 22-gauge galvanized flashing to the sizes and shapes as detailed on the drawings. All exposed flashing shall be primed and painted per the paint specification sections. Provide minimum two (2) coats of paint.

C. Expand-O-Flashing, for Expansion Joints at Roof Expansions and Roof/Wall Expansion Joint Conditions: Provide factory Expand-O-Flash by Johns Manville or equal. Provide 10 foot or maximum lengths possible. Fabricate Expand-O-Flash expansion joint covers as detailed on the drawings. Use Type N-Neoprene Sheet-Black, flange shall be minimum 26 ga. galvanized steel bellows width minimum 4 inches.

D. Expansion and Seismic Covers for Expansion Joints and Seismic Joints for Floors, Ceilings, Walls and Roofs: Provide factory aluminum joint covers by Balco Inc. or equal. Provide maximum lengths possible. Fabricate expansion and seismic joints covers Model No. RDA-4 with aluminum center plate. Provide extruded aluminum sub-channel (6063-T5) standard mill finish. Movement capabilities shall be at 50 percent or as recommended by the manufacturer.

1. At Rated Expansion and Seismic Joint Conditions up to 2 Hour Rated Systems: Use Balco Fire Barrier Systems as tested in accordance with ASTM E1966 and as listed with Omega Point Laboratories Inc.

2. Expansion and Seismic Joint Covers at Interior, Vertical, and Ceiling Surfaces: Use 6000 Series No. 6GOU- Aluminum snap lock cover plate with standard aluminum mill finish.

3. Expansion and Seismic Joint Cover at Exterior Vertical and Ceiling/Soffit Surfaces: Use FCWW aluminum with standard mill finish.

E. All Expansion and Seismic Covers that intersect at Floor to Wall, Wall to Ceiling/Soffit, Roof to Parapet, etc.: Use factory preassembled transition pieces that will meet the manufacturers' minimum requirement for a watertight intersection connection.

F. Balconies Edge Flashing: Use Schluter-Bara-Rak powder-coated aluminum edging profile with drip lip. Extruded aluminum to ASTM B221, 6463-T5 alloy with integral trap E201-DAL-perforated anchoring leg and complete with outside/inside corners and connectors. Length 8 ½ inches long. Color from standard color. Use a thin set mortar over the trapezoid perforated anchoring leg. Apply waterproof membrane per manufacturers' requirements.

PART 3 – EXECUTION

3.1 PREPARATION

A. Inspect substrate conditions prior to installation of sheet metal items. Conditions which could be detrimental to correct and proper installation of sheet metal assemblies are to be called to the attention of the Owner for their disposition prior to sheet metal work being installed.

B. Coordinate fabrication and installation of sheet metal items with work of others such as roofing, curtainwall and windows, sealants, mechanical and electrical.

3.2 INSTALLATION

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal 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 weatherproof.

B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

D. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, finish reglets to trades of masonry work, for installation as work of Division 4 sections.

E. Install counter flashings in reglets, either by snap-in seal arrangement or by welding in-place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated in depending on degree of sealant exposure.

F. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement as joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water

for flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

G. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

H. Conductor Head Guards: Install "bee-hive type" strainer-guard at conductor heads, removable for cleaning downspouts.

I. Flash around exterior openings in the building where other waterproofing methods are insufficient.

J. Joints:

1. Typically, provide flat locked joints with sealant between metal surfaces, unless shown otherwise. Where standing seams are required, provide with folded corners.

2. Provide minimum of 3-inch laps.

3. Where concealed joints are possible, provide flat locked joints with 3-inch reinforcing behind, set-in full bed of sealant.

4. Do not leave sheet metal joint unsealed. See sealant section of these specifications.

3.3 INSPECTION

A. Immediately following installation of sheet metal work, touch-up areas where primer has been removed during installation operations and where soldering has occurred.

B. Where architectural coatings are provided, touch-up marred or abraded finishes with compatible coating which can be expected to provide the same serviceability as factory applied coatings.

3.4 CLEANING

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

3.5 PROTECTION

A. Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION

SECTION 07 71 23 – GUTTERS AND RELATED FLASHINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Galvanized steel gutters.
2. Downspouts.
3. Related flashing.

B. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Section 05 50 00 – Metal Fabrications.

3. Section 06 46 29 – Wood Fascia.

4. Section 07 41 13 – Metal Roof Panels

5. Section 07 62 00 – Sheet Metal Flashing and Trim.

6. Section 07 92 00 – Joint Sealants.

7. Section 09 91 00 – Painting: Field painting of metal surfaces.

8. Refer to Division 7, for Roofing Sections, and Prefabricated roof curbs, hatches, roof deck insulation, and Division 8 component daylight systems.

1.2 REFERENCES

A. ASTM A924 / A924M-16ae1 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

B. FS TT-C-494 – Coating Compound, Bituminous, Solvent Type, Acid Resistant.

C. SMACNA – Architectural Sheet Metal Manual, current edition.

D. AWS – American Welding Society.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate locations, configurations, jointing methods, welding methods, fastening methods, expansion joint layouts, downspout layout and installation details.

C. Samples: Submit two samples, 12 inches long illustrating component design, finish, color, and configuration.

1.4 QUALITY ASSURANCE

A. Conform to SMACNA Manual for architectural sheet metal flashing and installation details.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 66 00.

B. Stack pre-formed material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.6 COORDINATION

A. Coordinate painting portions prior to installation and the work with downspout discharge pipe inlet.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Galvanized Steel: ASTM A924 / A924M-09a, Grade A, G90 zinc coating.

B. Schedule 10 galvanized pipe.

2.2 COMPONENTS

A. Gutters: 18-gauge core steel. Minimum size shall be 6" x 6" or as otherwise shown on drawings.

B. Downspouts: Finished grade to bottom of gutter shall be schedule 10 galvanized pipe, round shape only, 3" minimum diameter or size as shown on drawings.

2.3 ACCESSORIES

A. Anchorage Devices: SMACNA requirements.

B. Gutter Supports: Straps.

C. Fasteners: Galvanized steel or stainless steel and as specified in Section 05 50 00. Finish exposed fasteners same as flashing metal.

D. Clean out Tee: Smith 4510 cleanout tee with countersunk plug and round access cover. 4", 5" or sized as required to coordinate with downspout and underground piping sizes.

E. Touch-up Primer: Cold applied zinc-rich type.

F. Protective Back Coating: FS TT-C-494, bituminous.

G. Sealant: Type as specified under Section 07 92 00.

H. Conductor-Head Guards: 20-gauge bronze or nonmagnetic stainless-steel mesh or fabricated units, with salvaged edges and noncorrosive fasteners. Select materials for compatibility with gutters and downspouts.

I. Overflow Drain: 18 ga. galvanized sheet metal. Approximately 2 inches high by 2 inch diameter.

2.4 FABRICATION

A. Form gutters of profiles and size indicated, to SMACNA requirements.

B. Gutters shall be fascia mounted whenever possible. See drawings for additional mounting information.

C. Fabricate with required connection pieces.

D. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

E. Hem all exposed edges of metal.

F. Welding process shall be Metallic Inert Gas (MIG).

G. Weld all shop formed metal joints. Grind exposed joints flush with adjacent surfaces and apply touch-up primer as specified.

H. Butt weld all field assembled gutter sections. Grind exposed joints flush with adjacent surfaces and apply touch-up primer as specified.

I. Fabricate gutter sections with SMACNA butt type expansion joints at 40 feet maximum with a minimum of one (1) downspout in each 40 foot section. Provide additional downspouts as necessary to accommodate expansion joint locations.

J. All joints shall be watertight per SMACNA standards.

K. All downspouts shall have fully welded joints and be ground smooth. Provide T-shaped bracket welded to back of downspout for bolting to building. See drawings for additional information.

L. All downspouts that spill to grade shall have a 45-degree elbow of same pipe profile fully welded to bottom of downspout.

M. All downspouts connecting to underground storm drainage systems shall be provided with a cleanout tee at grade.

N. At all individual gutter sections, provide an overflow drain at opposite end of gutter from downspout. Overflow drain shall be fully welded to gutter bottom. I.D. shall match the I.D. for the downspout outlet.

2.5 FINISHES

A. Field paint gutters under provisions of Section 09 91 00.

B. Apply bituminous protective backing on surfaces in contact with dissimilar materials.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.2 INSTALLATION

A. Install gutters and downspouts as shown on drawings. Install expansion joints, additional downspouts and accessories as specified.

B. Field assemble (weld) gutter sections at “ground level” wherever possible and lift into place as one unit.

C. All downspout sections shall be fully welded, ground smooth, primed and painted. All downspouts shall be mechanically fastened to building at top, bottom, and maximum 6 feet on center.

D. Install gutters level and straight in line with building. Shim horizontally and vertically as required to level. Installed gutter to have no ponding water more than ¼" deep.

E. Water test all gutters and downspouts for leaks and ponding in presence of IOR.

F. At all welded connections, end caps, overflows, and outlets, provide bituminous coating minimum 1 inch each side of joint.

G. Provide 3-inch closure plate at all gutter expansion joint locations.

END OF SECTION

SECTION 07 92 00 – JOINT SEALANTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing sealant substrate surfaces.

2. Concrete Joint Sealants.

3. Sealant and backing.

4. Fireproof Firestopping and fire-safing materials and accessories.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 00 72 13 – General Conditions.

C. Section 03 30 00 – Cast-In-Place Concrete.

D. Section 07 62 00 – Flashing and Sheet Metal: Sealants used in conjunction with metal flashings.

E. Section 07 71 23 – Gutters and Related Flashings.

F. Section 08 11 13 – Hollow Metal Doors and Frames: Perimeter sealants.

G. Section 09 29 00 – Gypsum Board Assemblies.

H. Division 22: Mechanical.

I. Division 26: Electrical.

J. Section 32 16 00: Site Concrete.

1.3 REFERENCES

A. ASTM C834 – Standard Specification for Latex Sealants.

B. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

C. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

E. ASTM E814 – Standard Test Method for Fire Tests of Penetration Firestop Systems.

F. FM (Factory Mutual) – Fire Hazard Classifications.

G. UL – Fire Hazard Classifications.

H. UL 263 – Standard for Fire Tests of Building Construction and Materials.

I. UL 723 – Test for Surface Burning Characteristics of Building Materials.

J. UL 1479 – Fire Tests of Through-Penetration Firestops.

K. FS TT S 00227 – Sealing Compound: Elastomeric Type, Multi-Component.

L. FS TT S 00230 – Sealing Compound: Elastomeric Type, Single Component.

M. FS TT S 001543 – Sealing Compound, Silicone Rubber Base.

1.4 SUBMITTALS

A. Submit manufacturer's product data under provisions of Section 01 33 00, for each product required.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, and color availability.

C. Submit samples under provisions of Section 01 33 00.

D. Submit standard color ranges of exposed materials for Architect selection.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years' experience.

B. Applicator: Company specializing in applying the work of this section with minimum three years' experience, with projects of a similar size and type.

C. Conform to Sealant Waterproofing and Restoration Institute requirements for materials and installation.

D. Prior to installation of joint sealants, field test adhesion to joint substrates.

1. Install joint sealants in 5-foot joint lengths. Allow to cure before testing. Test adhesion by pulling sealant out of joint.

2. Perform field tests for each type of elastomeric sealant and joint substrate.

3. Arrange for tests to take place with joint sealant manufacturer's technical representative present.

4. Report whether or not sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.

5. Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrate during testing.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

C. Do not install sealants under adverse weather conditions or when temperatures are above or below manufacturer's recommended limitations for installation.

D. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, color, expiration period, curing time and mixing instructions for multi-component materials.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with all Sections referencing this Section.

1.8 WARRANTY

A. Provide two-year warranty for materials and workmanship under provisions of Section 01 33 00.

B. Warranty: Include coverage of installed sealants and accessories which fail to achieve airtight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 – PRODUCTS

2.1 SEALANTS

A. Silicone Sealant: Silicone Sealant (use at concrete, masonry, or glazing applications): FS TT S 01543, Class A, low modulus type; Spectrum I as manufactured by Tremco, Inc.

B. Interior Building Sealant: Acrylic-emulsion; one-part, non-sag, mildew-resistant. Complying with ASTM C834, formulated to be paintable; Pecora Corp. "AC-20", Sonneborn "Sonolac", Tremco Inc. "Tremco Acrylic Latex 834" or approved equal.

C. Sanitary Sealant: One-part mildew-resistant silicone; ASTM C920 Type S; Grade NS Class 25; Uses NT, G, A and O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic file, showers, sinks and plumbing fixtures; Dow Corning Corp. "786 Mildew Resistant", or approved equal.

D. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, non-skinning, non-staining, gun-able, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound; Pecora Corp. “BA-98”, Tremco Inc. “Tremco Acoustical Sealant” or approved equal.

E. Acoustical Sealant for Exposed Joints: Nonoxidizing, skin-able, paintable, gun-able sealant recommended for sealing interior exposed joints to reduce transmission of airborne sound; Pecora Corp. “AC-20”, USG “Sheetrock Acoustical Sealant” or approved equal.

F. Concrete Expansion Joints: Joint sealing material shall be a two-component, self-leveling, polyurethane elastomeric sealant. Product shall be Sikaflex 2cSL as manufactured Sika Corporation, or equal. Color shall be chosen from the full range of manufacturer’s standard colors.

G. Vertical Building Expansion Joints: Joint sealing material shall be a one-component, polyurethane-based non-sag elastomeric sealant. Product shall be Sikaflex Construction Sealant as manufactured Sika Corporation, Pecora Corp. “DynaTrol II” or approved equal. Color shall be chosen from the full range of manufacturer’s standard colors.

H. Sheet Metal Flashings, Trims, Gutters, & Joints: Joint sealing material shall be a two-component, self-leveling, polyurethane elastomeric sealant. Product shall be Sikaflex 2cSL as manufactured Sika Corporation, or equal. Color shall be chosen from the full range of manufacturer’s standard colors. Provide Sikaflex 260 Primer at all stainless steel and/or galvanized substrate location for proper adhesion of Sikaflex 2cSL.

I. Substitutions: Under provisions of Section 01 33 00.

J. Color of sealant shall be as selected by Architect.

2.2 FIRESTOPPING SEALANTS

A. Firestopping Material: One-Piece insert conforming to the following:

1. All fire stopping shall be one part, two stage intumescent sealants and putty.

2. All fire stopping sealants shall be capable of maintain an effective barrier against flame, heat, and smoke in compliance with the requirements of ASTM E814, UL 1479, ASTM E119, UL 723, ASTM E84 and UL 263.

3. Fire stopping materials shall be classified in the Underwriters Laboratories (UL) Fire Resistance Directory or listed in the Warnock Hersey International Directory.

4. Fire stopping materials shall be paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

5. Acceptable Manufacturers: Hilti Firestop Systems, International Protective Coating Corporation “Flamesafe” Systems, 3M Fire Protection Products or approved equal.

6. Substitutions: Under provisions of Section 01 25 13.

2.3 ACCESSORIES

A. Primer: Non staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Noncorrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Non-staining; compatible with sealant and primer; such as round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Sealant shall not adhere to back-up material.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Solvents: cleaning agents or other accessory materials shall be as recommended by the sealant manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing surfaces.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with sealant manufacturer's recommendations.

E. Protect elements surrounding the work of this Section from damage or disfiguration.

F. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or acid washing to produce a clean, sound substrate. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints.

G. Clean metal, glass, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Caulk all exterior joints and openings in the building envelope that are observable sources of air infiltration.

C. Measure joint dimensions and size materials to achieve required width/depth ratios.

D. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width. Roll the material into the joint to avoid lengthwise stretching. Do not twist or braid rod stock.

E. Install bond breaker where joint backing is not used.

F. Prime surfaces to receive joint sealant with primer recommended by sealant manufacturer.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges. Apply masking tape where required to protect adjacent surfaces from sealant application.

H. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

I. Tool joints concave.

J. At all surface-mounted light fixtures mounted on gypsum board ceilings, contractor shall caulk light fixture body to ceiling finish to eliminate gap between metal body and fixture. Coordinate locations with drawings.

K. Firestopping:

1. Apply materials in exact accordance with manufacturer's latest published instructions, requirements, specifications, details and approved submittals.

2. Installation shall be in accordance with the appropriate UL Fire Resistance Directory or Listing with the appropriate Warnock Hersey International Listing.

3. Seal holes or voids made by penetrating items to ensure an effective fire and smoke barrier.

4. Seal intersections and penetrations of floors, ceilings, walls and columns.

5. Seal around cutouts for lights, cabinets, pipes, plumbing, HVAC ducts and electrical boxes, etc.

6. Where floor openings are four inches or more in width and subject to traffic or loading, install cover plate systems capable of supporting same loading as floor.

7. Interface with Other Projects: Coordinate and cooperate with adjacent, contiguous and related materials trades, (such as concrete, drywall, plumbing, conduit, electrical wiring, communication systems) to ensure a proper and timely installation.

8. Seal steel deck flute openings.

3.4 CLEANING AND REPAIRING

A. Clean work under provisions of Section 01 77 00.

B. Clean adjacent soiled surfaces. Use a solvent or cleaning agent as recommended by the sealant manufacturer.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01 66 00.

B. Protect sealants until cured.

C. Do not paint sealants until sealant is fully cured.

D. Do not paint silicone sealant.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

DIVISION 8 – DOORS AND WINDOWS

08 13 13 – Hollow Metal Doors and Frames
08 31 13 – Access Doors and Frames
08 71 00 – Door Hardware

PAGE INTENTIONALLY LEFT BLANK.

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included:

1. Non-rated and fire rated rolled steel doors, panels, and frames.
2. Louvers.

B. Referenced Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Section 08 71 00 – Door Hardware.

1.2 REFERENCES

A. ANSI A250.8 – Recommended Specification for Standard Steel Doors and Frames.

B. ANSI A250.3 – Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.

C. ANSI A250.10 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

D. ASTM A653 – Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot- Dip Process.

E. ASTM A924 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized} by the Hot-Dip Process.

F. CEC – California Energy Commission.

G. NFPA 80 – Fire Doors and Windows.

H. SDI-105 – Recommended Erection Instructions for Steel Frames.

I. DHI – Door and Hardware Institute.

J. CBC – California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 and Part 6.

K. UL 9 – Fire Tests of Window Assemblies.

L. UL 10C – Fire Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

B. Fire rated door, panel and frame construction to conform to UL 9 and UL 1OC.

C. Installed frame and door assembly to conform to NFPA 80 for fire rated class indicated on Drawings.

D. Installed exterior frame and door assembly to be weather tight

E. Manufacturer shall have both fabrication and assembly plant located within the continental United States or Canada. Products that are either fabricated or assembled outside the continental United States or Canada are not acceptable.

1.4 SYSTEM REQUIREMENTS

A. Performance Requirements:

1. Thermal Performance: Glazed exterior borrowed lite, side lite and transom lite frames shall have an overall minimum u-value of 1.19 as rated in accordance with the default table method approved by the California Energy Commission (CEC). Provide Label Certificate FC-1, Figure 3-3, from the Nonresidential Compliance Manual documenting compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 116, Table 116-A.

2. Solar Heat Gain Coefficient: Glazed exterior borrowed lite, side lite and transom lite frames shall have an overall maximum solar heat gain coefficient of 0.68 as rated in accordance with default table method approved by the California Energy Commission (CEC). Provide Label Certificate FC-1, Figure 3-3, from the Nonresidential Compliance Manual documenting compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 116, Table 116-B.

B. Regulatory Requirements:

1. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 for fire rated frames and doors.

2. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, for u- value and solar heat gain coefficient.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.

C. Indicate door elevations, internal reinforcement, closure method, and cut outs for glazing and louvers.

D. Submit two (2) samples of exterior frame profile at mullion intersection.

E. Submit Label Certificate FC-1, Figure 3-3, from the Nonresidential Compliance Manual documenting compliance with the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 6, Section 116, Table 116-A and 116-8.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Section 01 62 00.

B. Store products on site under cover.

C. Place products on at least 4-inch wood sills to prevent rust and damage.

D. Protect doors and frames with resilient packaging.

1.7 SEQUENCING AND SCHEDULING

A. Sequence work under the provisions of Section 01 32 13.

B. Schedule work under the provisions of Section 01 32 13.

C. Schedule delivery of all doors and frames so as not to delay progress of other trades.

1.8 WARRANTY

A. Provide manufacturer's standard warranty.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Amweld Building Products, Inc., www.amweld.com.

B. Curries Mfg. Inc., www.curries.com.

C. Door Components, Inc., www.doorcomponents.com.

D. Fleming, www.flemingdoor.com.

E. Krieger Steel Products Company, www.kriegersteel.com.

F. Republic Builders Products Corporation, www.republicdoor.com.

G. Curries, www.curries.com.

H. Ceco, www.cecodoor.com.

I. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Doors, Panels and Frames:

1. Steel: Commercial quality cold rolled steel conforming to ASTM A653 galvanized to A60 or G60 coating class or Type 8, A40 (ZF120) according to ASTM A924 with minimized spangle, mill phosphatized.

2. Exterior Doors: ANSI A250.8, Level 3, extra heavy-duty, Model 2, continuous welded seam, minimum 0.053-inch-thick faces (16 GA. Minimum).

3. Interior Doors: ANSI A250.8, Level 2 heavy duty, Model 1, minimum 0.042-inch-thick faces (18 GA. Minimum).

4. Exterior Frames: ANSI A250 .8, Level 3, 0.067-inch-thick material (14 GA. Minimum), core thickness.

5. Interior Frames: ANSI A250 .8, Level 2, 0.053-inch-thick material (16 GA. Minimum), core thickness.

6. Panels: Same materials and construct ion as specified for doors.

B. Door Core:

1. Exterior Core: Polystyrene insulation.

2. Interior Door Core: Impregnated cardboard honeycomb.

C. Closer Channels: Close top and bottom edge of exterior door flush with inverted steel channel closure. Weld all joints watertight.

D. Frame Anchors:

1. Masonry Anchors: Adjustable T-strap, 0.053-inch-thick steel, corrugated, 2-inch x 10-inch size. Fire rated frames to have UL listed perforated strap anchor permanently anchored to frame.

2. Metal Stud Anchor: Z type anchor, welded to frame, 0.053-inch-thick steel, UL listed as required for fire rating.

3. Wood Stud Anchor: U shaped anchor, welded to frame, 1 inch wide, 0.053-inch-thick steel, with 2 pre- punched holes in nailing flange. UL listed as required for fire rating.

4. Existing Wall Anchor: 0.053-inch-thick pipe spacer with 2-inch x 0.053-inch-thick steel plate sized to accommodate a 3/8 diameter countersunk flathead expansion anchor. UL listed as required for fire rating.

5. Floor Clip: Angle anchor, full width of frame, 0.067-inch-thick steel.

E. Protective Coatings:

1. Bituminous Coating: Fibered asphalt-based corrosion proofing and sound deadener compound. Equivalent to Transcoat 101-F, www.oilservice.com.

2. Primer: Clean and treat with three stage iron phosphate process. Provide baked-on shop coat of EPA compliant gray synthetic rust - inhibitive enamel primer meeting acceptance criteria of ANSI 250.10.

F. Hardware Reinforcement:

1. Fabricate frames and doors with hardware reinforcement plates welded in place.

2. Hinge reinforcing shall be full width of frame profile.

3. Provide spacers for all thru-bolted hardware.

4. Reinforcement components shall be the following minimum thickness:

a.	Hinge (door and frame)	3/16 inch
b.	Mortise Lock or Deadbolt	0.093 inch
c.	Bored Lock or Deadbolt	0.093 inch
d.	Flush Bolt Front	0.093 inch
e.	Surface Bolt	0.093 inch
f.	Surface Applied Closer	0.093 inch
g.	Hold Open Arm	0.093 inch
h.	Pull Plates and Bars	0.067 inch
i.	Surface Exit Device	0.093 inch
j.	Floor Checking Hinge	0.167 inch
k.	Pivot Hinge	0.167 inch

2.3 ACCESSORIES

A. Door Louvers: 18-gauge, non-vision, inverted split “Y louver with 12-gauge security grille two sides, prime coat finish for field painting. Provide optional galvanized attached mesh insect screen. Size as shown on Drawings.

1. Anemostat security door louvers, model #PLSL.

2. Air Louvers Inc., Model 1500-A.

B. PeepHoles: Schlage 190 Degree Wide Angle Viewer. Satin nickel finish.

C. Rubber Silencers: Resilient rubber as supplied by Section 08 71 00.

D. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamperproof screws at door installations, square butt at light frames.

2.4 FABRICATION

A. When shipping limitations so dictate, frames for large openings shall be fabricated in sections designed for splicing·

B. All spliced joints shall occur on the interior side of exterior frames.

C. Fabricate frames as full profile welded units.

D. All face, rabbet and soffit joints between abutting members shall be continuously welded and finished smooth when exposed to exterior.

E. Corner joints shall have all contact edges closed tight, with faces mitered and continuously welded.

F. Frames with multiple openings shall have mullion members fabricated with no visible seams or joints. All face, rabbet and soffit joints between abutted members shall be continuously welded and finished smooth when exposed to exterior.

G. Provide 3/8-inch back bend return on frames where gypsum board wall material occurs whether on one or both sides.

H. Mullions for Double Doors: Removable type supplied by Section 08 71 00.

I. Dust cover boxes or mortar guards of 0.016-inch-thick steel shall be provided at all hardware mortises on frames.

J. Reinforce frames wider than 48 inches with roll formed, 0.093-inch-thick steel channels fitted tightly and welded into frame head, inverted U-shape profile.

K. Prepare frame for silencers except for frames which receive weatherstripping. Provide three (3) single rubber silencers for single doors on strike side, and two (2) single silencers on frame head at double doors without mullions.

L. Provide steel spreader temporarily attached to feet of both jambs as a brace during shipping and handling. Spreader is not to be used for installation purposes.

M. Attach fire rated label to each frame and door unit.

N. Manufacturing Tolerances: Manufacturing tolerance shall be maintained within the following limits:

1.	Frame width	+1/16 inch -1/32 inch
2.	Frame height	+-3/64 inch
3.	Frame face	+-1/32 inch
4.	Frame stop	+-1/32 inch
5.	Frame rabbet	+-1/64 inch
6.	Frame depth	+-1/32 inch
7.	Frame throat	+-1/16 inch
8.	Door width and height	+-3/64 inch
9.	Door thickness	+-1/16 inch
10.	Hardware location	+-1/32 inch
11.	Door flatness	+-1/16 inch

2.5 FINISHES

A. Primer: Baked on rust-inhibitive enamel.

B. Finish: Site paint under provisions of Section 09 91 00.

C. Coat inside of frame profile for frames installed in masonry construction with bituminous coating to a thickness of 1/16 inch. Coating may be factory or site applied. Do not apply coating to fire rated frames.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install frames in accordance with SDI-105.

B. Install doors in accordance with DHI.

C. Install fire doors and frames in accordance with NFPA 80.

D. Installation of exterior doors and frames to be weathertight and waterproof.

E. Seal penetration of all surface applied screws on exterior face of frames at glass stops and hardware attachments.

F. Coordinate with wall construction and details for anchor placement. Provide anchors as follows:

1. Frames up to 7 feet 6 inches height - 4 anchors each jamb.

2. Frames 7 feet 6 inches to 8 feet 0-inch height - 5 anchors each jamb, plus an additional anchor for each 2 feet or fraction thereof over 8 feet 0 inch.

3. Frames for double doors; minimum of two (2) anchors in head approximately 12 inches from each jamb.

4. Borrowed lite frames; two (2) anchors each jamb plus 1 for each 18 inches or fraction thereof over 3 feet 0 inch. Minimum two (2) anchors in head and sill approximately 12 inches from each jamb plus 1 for each 30 inches of length or fraction thereof.

5. Floor anchors - one (1) anchor each jamb for interior doors. Where wall construction will not allow placement of floor anchor, provide one (1) additional jamb anchor as close to floor as possible.

6. Existing wall anchors shall be welded to provide non-removable condition. Welded bolt head to be ground, dressed and finished smooth.

G. Frames installed in masonry walls to be fully grouted with masonry grout.

H. Exposed field welds to be finished smooth and touched up.

I. Primed or painted surfaces which are scratched or marred shall be touched up.

J. Hardware to be applied in accordance with hardware manufacturer's templates and instructions.

K. Coordinate installation of glass and glazing.

L. Install door louvers.

M. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.2 CONSTRUCTION

A. INSTALLATION TOLERANCES

1. Edge clearance for swinging doors shall not exceed the following:

a. Between door and frame at head and jamb: 1/8 inch.

b. Between edge of pair of doors: 1/8 inch.

c. At door sill with threshold. (From bottom of door to top of threshold): 3/8 inch.

d. At door sill with no threshold: 1/2 inch.

e. At door bottom and rigid floor covering per NFPA 80: 1/2 inch.

f. At door bottom and nominal floor covering per NFPA 80: 5/8 inch.

2. Frame installation tolerance shall not exceed the following:

a.	Squareness	+-1/16 inch.
b.	Alignment	+-1/16 inch.
c.	Plumbness	+-1/16 inch.
d.	Diagonal Distortion	+-1/32 inch.

END OF SECTION

SECTION 08 31 00 – ACCESS DOORS AND PANELS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Steel access panels, except those specified under Divisions 22 – Plumbing, 23 – HVAC, or 26 – Electrical.

B. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Section 06 10 00 – Rough Carpentry.

3. Section 09 24 00 – Lath and Plaster.

4. Section 09 29 00 – Gypsum Board Assemblies.

5. Section 09 91 00 – Painting.

6. Division 22 – Plumbing.

7. Division 23 – HVAC.

8. Division 26 – Electrical.

1.2 SUBMITTALS

A. Shop Drawings:

1. Indicate sizes, materials, thickness, fabrication methods, panel door and frame reinforcement, anchorage, and installation details.

2. Provide layout drawings, indicating dimensioned locations of proposed access panels, size of each panel, and installation details. Determine and indicate required access panels in finished surfaces, whether furnished under this section or as part of Work of Divisions 22 – Plumbing, 23 – HVAC, and 26 – Electrical.

1.3 QUALITY ASSURANCE

A. Panels shall be provided with UL listings and labels.

B. Access panels and frames shall be products of one (1) manufacturer.

C. Coordinate access panels with plumbing, HVAC, and electrical work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Panels and Frames: Provide protection as required by manufacturer to protect panels from damage during storage.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Access Panels:

Non-Rated		Milcor	Karp	Nystrom
1.	Ceramic Tile	MS	DSC214M	NT
2.	Plaster	K	DSC214M	NP
3.	Drywall, Plaster Veneer	DW	DSC214M	NW
Fire Rated		**Milcor**	**Karp**	**Nystrom**
4.	Ceramic Tile	MS	KRP150FR	IT
5.	Plaster	M	KRP150PR	IP
6.	Drywall, Plaster Veneer	M	KRP150FR	IW

Or approved equal.

B. Unless otherwise indicated, provide brushed stainless-steel finish for panels installed in ceramic tile. Provide prime coat finish suitable for field painting for panels installed in other finishes.

C. Access Panels shall be 18 gauge minimum with vandal-proof lock operated by Allen wrench or another special tool. Exposed fastenings shall be secured with vandal-proof screws.

D. Ceiling Access Doors:

1. Provide exterior type single-door by Dur-Red Products, Model TCA, 30 inches by 36 inches in size.

   a. Door Leaf: 1-inch-thick core rigid fiberglass with 20-gauge steel outer shell.

   b. Finish: Primer grey and painted minimum two (2) coats of paint. Color to match adjacent ceiling color finish.

2. Install ceiling access door where access to the enclosed attic spaces is required and/or as shown in the drawings. If not shown in the drawings, provide one ceiling access panel in each enclosed drywall ceiling room. Where ceiling is rated, the ceiling access door shall meet or exceed the rating of the ceiling. All ceiling access doors shall receive keyed locks.

PART 3 – EXECUTION

3.1 GENERAL

A. Provide access panels in finish construction, where indicated on Drawings, wherever required for access to concealed mechanical and electrical equipment, and where required by codes. Panels indicated on architectural Drawings shall be furnished

under this section. Required panels for access to equipment, but not indicated on architectural Drawings, shall be furnished as part of Work requiring access.

3.2 INSTALLATION

A. Install panels accurately in location, perfect alignment, plumb, straight and true. Brace to prevent displacement by adjacent Work.

B. Examine panels after installation for proper opening, closing and clearances. Replace damaged or defective panels.

3.3 CLEANING

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.4 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 08 71 00 – DOOR HARDWARE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:

1. Door Hardware, including electric hardware.

2. Gate Hardware.

3. Thresholds, gasketing and weather-stripping.

4. Door silencers or mutes.

1.3 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 08 11 13 – Hollow Metal Doors and Frames.

C. Section 32 31 13 – Chain Link Fences and Gates

D. Section 32 31 19 – Decorative Metal Fences and Gates.

1.4 REFERENCES

A. 2022 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. NFPA – National Fire Protection Association.

1. NFPA 80 – Standard for Fire Doors and Other Opening Protectives

2. NFPA 105 – Standard for Smoke Door Assemblies and Other Opening Protectives

F. UL – Underwriters Laboratories.

1. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies

2. UL 305 – Standard for Panic Hardware

G. WHI – Warnock Hersey Incorporated

H. SDI – Steel Door Institute

1.5 SUBMITTALS AND SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with;

a. Job Name, location, telephone number.
b. Architects name, location and telephone number.
c. Contractor’s name, location, telephone number and job number.
d. Suppliers name, location, telephone number and job number.
e. Hardware consultant's name, location and telephone number.

2. Job Index information included;

a. Numerical door number index including; door number, hardware heading number and page number.
b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
c. Manufacturers' names and abbreviations for all materials.
d. Explanation of abbreviations, symbols, and codes used in the schedule.
e. Mounting locations for hardware.
f. Clarification statements or questions.
g. Catalog cuts and manufacturer’s technical data and instructions.

3. Vertical schedule format sample:

a. Single or pair with opening number and location.

b. Degree of opening
c. Hand of door(s)
d. Door and frame dimensions and door thickness.
e. Label requirements if any.
f. Door by frame material.
g. (Optional) Hardware item line #.
h. Keyset Symbol.
i. Quantity.
j. Product description.
k. Product Number.
l. Fastenings and other pertinent information.
m. Hardware finish codes per ANSI A156.18.
n. Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

G. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

H. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.6 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

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 similar in quantity, type, and quality to that indicated for this project and that 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.

1. Responsible for detailing, scheduling and ordering of finish hardware.

2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing. To maintain the integrity of patented key systems, provide a letter of authorization from the specified manufacturer indicating that supplier has authorization to purchase the key system directly from the manufacturer.

3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

F. Product packaging to be labelled in compliance with CA Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986.

G. Pre-Installation Conference:

1. Schedule a pre-installation conference at least one week prior to beginning work of this section.

2. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key Owner Personnel, and Project Inspector.

3. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review Owner’s keying standards.

1.7 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) 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, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.8 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: "L" Series (3) years – "ND" Ten (10) years.
2. Closers: Thirty (30) years –1260 twenty (20) years –Concealed High Security fifteen (15) years except electronic closers shall be two (2) years.
3. Exit devices: Three (3) years.
4. All other hardware: Two (2) years.

1.9 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

Item		Manufacturer	Acceptable Substitutes
A.	Hinges	Ives	Hager, Stanley, McKinney
B.	Locks, Latches & Cylinders	Schlage	Or Approved Equal
C.	Exit Devices	Von Duprin	Or Approved Equal
D.	Closers	LCN	Or Approved Equal
E.	Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
F.	Flush Bolts	Ives	Trimco, BBW, DCI
G.	Dust Proof Strikes	Ives	Trimco, BBW, DCI
H.	Coordinators	Ives	Trimco, BBW, DCI
I.	Stops	Ives	Trimco, BBW, DCI
J.	Overhead Stops	Glynn-Johnson	Or Approved Equal
K.	Thresholds	Zero	Pemko, National Guard
L.	Seals & Bottoms	Zero	Pemko, National Guard

2.2 MATERIALS

A. Hinges: Ives as scheduled.

1. Ives 5BB1HW x NRP (Heavy use exterior doors) 630 finish.

2. Ives 5BB1HW (Interior doors) 652 finish.

3. Hinges shall be sized in accordance with the following:

a. Height:

i. Doors up to 42" wide: 4-1/2" inches.

ii. Doors 43" to 48" wide: 5 inches.

b. Width: Sufficient to clear frame and trim when door swings 180 degrees.

c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

4. Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

5. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Continuous Hinges: Ives as scheduled.

1. SL-224HD (Heavy use exterior doors & Remodels) 628 finish.

C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.

1. Bathroom (Student – multi use) ND94

2. Faculty ND94

3. Administration ND91

4. Classroom Safe School Lock ND95

5. Bathroom (Typical) ND94

6. Janitor / Storage room ND96

7. Bathroom (Faculty - single compartment toilet)L9485 x 06A x L283-722

8. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:

a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access

b. Offset lever pull – minimum 1,600-foot pounds without gaining access

c. Vertical lever impact – minimum 100 impacts without gaining access

9. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers

10. Cylinders: Refer to “KEYING” article, herein.

11. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.

12. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.

13. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.

14. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.

15. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

16. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

D. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. P4041XP 689 finish

a. Hold open arms or cush closers are not allowed.

2. Door closer cylinders shall be of high strength cast iron construction with double heat-treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

3. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.

4. All parallel arm closers shall incorporate one-piece solid forged steel arms with bronze bushings. 1-9/16” steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.

5. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.

6. Closers shall be installed to permit doors to swing 180 degrees.

7. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.

8. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed. Door frames shall be reinforced at all mounting locations.

9. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

E. Flush Bolts & Dust Proof Strikes: Ives as scheduled.

1. FB51 (Manual) (metal doors) (Storage & Utility rooms) 626 finish

2. FB61P (Manual) (wood doors) (Storage & Utility rooms) 626 finish

   a. Manual flush bolts only permitted on storage or mechanical openings as scheduled.

   b. Provide dust proof strikes at openings using bottom bolts.

   c. Automatic flush bolts allowed only where required by Fire Code.

F. Door Stops: Ives as scheduled.

1. FS18S (Exterior Floor) 626 finish

2. FS436/438 (Interior Floor) 626 finish

3. WS406CVX (Wall) 626 finish

4. WS406CCV (Inswing push-button locks) 626 finish

   a. Allow for maximum swing of doors

b. Backing required at wall holders

5. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.

6. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).

7. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

G. Door Holders: Ives as scheduled.

1.	WS452-4 Series Automatic Holder (Door)	626 finish
2.	FS40 Series Automatic Holder (Wall)	626 finish

a. Backing required at wall holders

b. Allow for maximum door swing

H. Protection Plates: Ives as scheduled.

1.	Kick Plate: 8400-10” x 2” LDW	630 finish
2.	Mop Plate: 8400-5” x 2” LDW	630 finish
3.	Push / Pull Plate: 8200 x 8302-6x 4x16	630 finish
4.	Lock Protector: LP-13, LP-12	626 finish

5. Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

I. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.

2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.

3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).

4. Thresholds shall comply with CBC Section 11B-404.2.5.

J. Seals and Surface Applied Hardware: Zero as scheduled.

1.	Smoke Seal: 488S-BK	Black

2. Weather Seal: 488S-BK 628 finish
-and-
8780N Factory

3. Door Sweep: 328AA 689 finish

4. 139SS (Wood doors) (Use only where required by fire code) 630

   a. Astragal by door manufacturer at HM door

5. Drip Guard: 17D x 4" PDW (Exterior doors exposed to rain) 628

6. Door Bottom: Use automatic door bottoms only if required by code.

7. Provide silicone gasket at all rated and exterior doors.

8. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.

9. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.

10. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.

K. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

L. Silencers: Ives as scheduled.

1. 654A, 655A, 623A Black

2. Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

M. Keying: Schlage as scheduled.

1. Furnish a Proprietary Schlage master key system as directed by the owner or architect. Key system to be designated and combination-d by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer. This is to be a Schlage Primus keying system. SCUSD to verify all keyways. Provide as follows:

   a. 6 pin x Standard Core plug (D Series) 626 finish

   b. 6 pin x Rim type x IC Core (Exit Device) 626 finish

c. 6 pin x 1-1/4" Mortise x IC Core (KR Mullions and CD) 626 finish

2. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.

3. Establish a new master key system for this project as directed by the keying schedule.

4. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).

5. Furnish PrimusXP "Classic" keyway Patent Protected Schlage cylinders where noted. Furnish all other cylinders in matching conventional "Classic" keyway. Furnish Patent Protected Schlage keys for all cylinders. (e.g., Primus XP Classic Keyway for patent protected / Maximum control) (with mix of conventional "Classic" keyway)

6. Furnish construction keying for doors requiring locking during construction.

   a. For FSIC systems provide 23-030-ICX Full Size Construction Cores

   b. For FSIC systems provide ten 48-101-ICX Construction Keys

   c. For FSIC systems provide two 48-056-ICX Control Keys (const.)

   d. For FSIC systems provide two control keys for installing the permanent cores (49- 056 for "Classic" keyways, 48-052-XP for "Classic Primus") (49-003 for "Everest Conventional", 48-005–XP for "Everest Primus")

-OR-

7. Furnish construction keying for doors requiring locking during construction.

   a. For "Split Key" Construction Cylinders (non-IC cylinders) specify "CK" for each keyed cylinder.

   b. Provide ten Construction Keys (48-104 "Classic", 48-008 "Everest")

   c. Provide two Extractor Tools (35-057)

8. Furnish all keys with visual key control.

   a. Stamp key "Do Not Duplicate".

9. Furnish mechanical keys as follows:

   a. Furnish 2 cut change keys for each different change key code.

   b. Furnish 1 uncut key blank for each change key code.

c. Furnish 6 cut master keys for each different master key set.

d. Furnish 3 uncut key blanks for each master key set.

e. Furnish 2 cut control keys cut to the top master key for permanent I/C cylinders.

f. Furnish 1 cut control key cut to each SKD combination.

g. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47- 413 (conventional) or 47-743-XP (PrimusXP) with above.

h. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.

i. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

10. Furnish Schlage Padlocks and the cylinders to tie them into the master key system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

a. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47- 413 (conventional) or 47-743-XP (PrimusXP) with above.

b. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.

c. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

N. Fasteners:

1. 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.

2. Screws for butt hinges shall be flathead, countersunk, full-thread type.

3. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

4. Provide expansion anchors for attaching hardware items to concrete or masonry.

5. All exposed fasteners shall have a Phillips head.

6. Finish of exposed screws to match surface finish of hardware or other adjacent work.

7. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

2.3 FINISHES

A. Generally, to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives). A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

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. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Locations: Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.3 ADJUSTING AND CLEANING

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. 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. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.5 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

D. Manufacturers Abbreviations (Mfr.)

GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
KNX	=	Knox	Knox Boxes
LCN	=	LCN	Door Closers
LOC	=	LOCINOX	Gate Hinges / Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weatherstripping

E. Hardware Group 6 – Exterior Boy's / Girl's Restroom:

EACH DOOR LEAF TO HAVE:

QTY	DESCRIPTION	MODEL	FINISH	MFR
1 EA	CONTINUOUS HINGE	224XY	628	IVE
1 EA	VANDLGUARD CLASSROOM LOCK	ND94LD RHO	626	SCH
1 EA	PRIMUS K-I-L CYL.	20-765-XP	626	SCH
1 EA	SURFACE CLOSER	P4041XP	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1 EA	WALL STOP	WS406/407CCV	626	IVE
1 EA	GASKETING	488SBK PSA	BLK	ZER
1 EA	DOOR SWEEP	111AA	AA	ZER
1 EA	THRESHOLD	655A	AL	ZER

F. Hardware Group 7 – Exterior Unisex Restroom:

EACH DOOR LEAF TO HAVE:

QTY	DESCRIPTION	MODEL	FINISH	MFR
1 EA	CONTINUOUS HINGE	224XY	628	IVE
1 EA	BATHROOM LOCK – UNISEX SINGLE COMPARTMENT	L9485 x 06A x L283-722	626	SCH
1 EA	PRIMUS K-I-L CYL.	20-765-XP	626	SCH
1 EA	SURFACE CLOSER	P4041XP	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1 EA	WALL STOP	WS406/407CCV	626	IVE
1 EA	GASKETING	488SBK PSA	BLK	ZER
1 EA	DOOR SWEEP	111AA	AA	ZER
1 EA	THRESHOLD	655A	AL	ZER

G. Hardware Group 8 – Exterior Janitor / Electrical:

EACH DOOR LEAF TO HAVE:

QTY	DESCRIPTION	MODEL	FINISH	MFR
1 EA	HEAVY DUTY HINGES	5BB1HW x NRP	630	IVE
1 EA	STORAGE LOCK	ND96LD RHO	626	SCH
1 EA	PRIMUS K-I-L CYL.	20-765-XP	626	SCH
1 EA	SURFACE CLOSER	P4041XP	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1 EA	WALL STOP	WS406/407CCV	626	IVE
1 EA	GASKETING	488SBK PSA	BLK	ZER
1 EA	DOOR SWEEP	111AA	AA	ZER
1 EA	THRESHOLD	655A	AL	ZER

H. Hardware Group 20.2: Ornamental Metal Gates – Pedestrian – Double Leaf – Panic Hardware:
Gate: G004

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
3	EA	Heavy Duty Self Closing Hinges	Mammoth 180	LOC
1	EA	Exit Device	AX-CD99NL	VON
1	EA	Lock Protector / Stop	Fabricated from 10 ga. bent steel	-
1	EA	Rim Cylinder	20-057 26D (Verify Keyway)	SCH
1	EA	Mortise Cylinder	26-091 26D (Verify Keyway)	SCH
1	EA	Kick Plate	8400 (10 ga x 10"H x full width of gate x B-CS); match gate color	IVE
1	EA	Door Stop / Holder	FS43 Series	IVE
1	TOT	Solid Mullion	Provided by gate MFR	-

NOTE: GATE HAS EXPANDED METAL MESH OVER GATE AND ADJACENT FENCING. REFER TO SECTION 32 31 19.

I. Hardware Group 20.3: Ornamental Metal Gates – Pedestrian – Single Leaf – Panic Hardware:
Gates: G005, G006

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
3	EA	Heavy Duty Self Closing Hinges	Mammoth 180	LOC
1	EA	Exit Device	AX-CD99NL	VON
1	EA	Lock Protector / Stop	Fabricated from 10 ga. bent steel	-
1	EA	Rim Cylinder	20-057 26D (Verify Keyway)	SCH
1	EA	Mortise Cylinder	26-091 26D (Verify Keyway)	SCH
1	EA	Kick Plate	8400 (10 ga x 10"H x full width of gate x B-CS); match gate color	IVE
1	EA	Door Stop / Holder	FS43 Series	IVE

NOTE: GATES HAVE EXPANDED METAL MESH OVER GATE AND ADJACENT FENCING. REFER TO SECTION 32 31 19.

J. Hardware Group 20.5: Ornamental Metal Gates – Pedestrian – Single Leaf:
Gates: G001, G002, G008

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
3	EA	Heavy Duty Self Closing Hinges	Mammoth 180	LOC
1	TOTAL	Heavy Duty Drop Fork Gate Latch	As recommended by gate manufacturer	
1	TOTAL	Padlock – Fork Latch	KS43D3200	SCH
1	TOTAL	Cylinder	23-030 (Verify Keyway)	SCH
1	EA	Kickplate	8400 (10 ga x 10"H x full width of gate x B-CS); match gate color	IVE
1	EA	Drop Bolt, with staple at top and bottom for padlock, and sleeve for locking in open position		-

K. Hardware Group 20.6: Ornamental Metal Gates – Vehicular:
Gates: G003, G007

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
3	EA	Heavy Duty Industrial Hinges	As recommended by gate manufacturer. Match gate finish.	
1	TOTAL	Heavy Duty Drop Fork Gate Latch	As recommended by gate manufacturer. Match gate finish	
1	TOTAL	Padlock – Fork Latch	KS43G3200	SCH
1	TOTAL	Padlock – Drop Bolt	KS43G3200	SCH
2	TOTAL	Cylinder	23-030 (Verify Keyway)	SCH
1	EA	Drop Bolt, with staple at top and bottom for padlock, and sleeve for locking in open position		-

L. Hardware Group 20.7: Ornamental Metal Gates – Pedestrian – Double Leaf:
Gates: G009

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
3	EA	Heavy Duty Industrial Hinges	As recommended by gate manufacturer. Match gate finish.	
1	EA	Heavy Duty Drop Fork Gate Latch	As recommended by gate manufacturer. Match gate finish.	
1	TOTAL	Padlock – Fork Latch	KS43G3200	SCH
1	TOTAL	Padlock – Drop Bolt	KS43G3200	SCH
2	TOTAL	Cylinder	23-030 (Verify Keyway)	SCH
1	EA	Kick Plate	8400 (10 ga x 10"H x full width of gate x B-CS); match gate color	IVE
1	EA	Drop Bolt, with staple at top and bottom for padlock, and sleeve for locking in open position		-

M. Hardware Group 20.8: Black Vinyl Coated Chain Link – Pedestrian – Single Leaf:
Gate: G010

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
2	EA	Heavy Duty Self Closing Hinges	Mammoth 180	LOC
1	TOTAL	Heavy Duty Drop Fork Gate Latch	As recommended by gate manufacturer	
1	TOTAL	Padlock – Fork Latch	KS43D3200	SCH
1	TOTAL	Cylinder	23-030 (Verify Keyway)	SCH
1	EA	Kickplate	8400 (10 ga x 10"H x full width of gate x B-CS); match gate color	IVE
1	EA	Drop Bolt, with staple at top and bottom for padlock, and sleeve for locking in open position		-

N. Hardware Group 20.9: Black Vinyl Coated Chain Link – Pedestrian – Single Leaf – with Existing Posts:
Gate: G011

EACH GATE LEAF TO HAVE:

QTY	UNIT	DESCRIPTION	PRODUCT	MFR
2	EA	Heavy Duty Self Closing Hinges	Mammoth 180	LOC
1	TOTAL	Heavy Duty Drop Fork Gate Latch	As recommended by gate manufacturer	
1	TOTAL	Padlock – Fork Latch	KS43D3200	SCH
1	TOTAL	Cylinder	23-030 (Verify Keyway)	SCH
1	EA	Kickplate	8400 (10 ga x 10"H x full width of gate x B-CS); match gate color	IVE
1	EA	Drop Bolt, with staple at top and bottom for padlock, and sleeve for locking in open position		-

END OF SECTION.

DIVISION 9 – FINISHES

09 05 61 – Common Work Results for Flooring Preparation
09 24 00 – Lath and Plaster
09 29 00 – Gypsum Board Assemblies
09 65 13 – Resilient Wall Base and Accessories
09 67 23 – Fluid-Applied Flooring – Epoxy
09 77 20 – Fiberglass Reinforced Plastic (FRP) Wall Panels
09 91 00 – Painting

PAGE INTENTIONALLY LEFT BLANK.

SECTION 09 05 61 – COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:

1. Epoxy Flooring.

B. Preparation of new and existing concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and pH.

D. Preparation of new subfloors for installation of new floor coverings.

E. Floor leveling and repair, as required.

1.3 RELATED REQUIREMENTS

A. Section 03 30 00 – Cast-In-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

B. Section 07 92 00 – Joint Sealers.

C. Section 09 67 23 – Fluid Applied Flooring – Epoxy.

1.4 REFERENCES

A. ASTM C109/C109M – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).

B. ASTM C348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

C. ASTM C472 – Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.

D. ASTM D4259 – Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.

E. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

F. ASTM E96/E96M – Standard Test Methods for Water Vapor Transmission of Materials

G. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

H. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

I. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.6 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and pH limits and test methods.

2. Manufacturer's required bond/compatibility test procedure.

C. Product Data:

1. Moisture remediation system.

2. Underlayment Primer.

3. Cementitious Self-Leveling Underlayment.

4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes).

D. Testing Agency's Report: Include:

1. Description of areas tested; include floor plans and photographs if helpful.

2. Summary of conditions encountered.

3. Moisture and pH test reports.

4. Copies of specified test methods.

5. Recommendations for remediation of unsatisfactory surfaces.

6. Submit report to Architect.

7. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test.

1.7 QUALITY ASSURANCE

A. Moisture and pH testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:

1. Provide access for and cooperate with testing agency.

2. Confirm date of start of testing at least 10 days prior to actual start.

3. Allow at least 4 business days on site for testing agency activities.

4. Achieve and maintain specified ambient conditions.

5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.8 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.9 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65°F or more than 85°F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.

2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.

3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment. This is included for reference and remediation if needed during construction and shall not be included in the Base Bid.

1. Thickness: 1/8 inch (3 mm), maximum.

2. If testing agency recommends any particular products, use one of those.

PART 3 – EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:

1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:

a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.

b. Removal of existing floor covering.

2. Preliminary cleaning.

3. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.

4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.

5. pH tests; in same locations as moisture vapor emission tests, unless otherwise indicated.

6. Specified remediation, if required.

7. Patching, smoothing, and leveling, as required.

8. Other preparation specified.

9. Adhesive bond and compatibility test.

10. Protection.

B. Remediation:

1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.

2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.

3. Excessive pH: If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.3 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation

if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.4 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.5 PH TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Note: This procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range pH paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the pH paper into the water, remove it, and compare immediately to chart to determine pH reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value is over 10.

3.6 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.7 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.8 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.9 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 09 24 00 – LATH AND PLASTER

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes:

1. Stucco System
2. Metal Lath and Furring
3. Water Resistive Barrier
4. Accessories

1.3 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry

B. Section 07 62 00 – Flashing and Sheet Metal

C. Section 07 92 00 – Joint Sealants.

D. Section 09 29 00 – Gypsum Board

E. Section 09 91 00 – Painting

1.4 REFERENCES

A. 2022 California Building Code, with Amendments.

B. American Concrete Institute (ACI): ACI 524R – Guide to Portland Cement Plastering.

C. Portland Cement Association (PCA): Portland Cement Plaster (Stucco) Manual, Current Addition.

D. ASTM International (ASTM):

1. ASTM A489 – Standard Specification for Carbon Steel Eyebolts

2. ASTM A526 – Steel Sheet, Hot-Dip Galvanized, Commercial Quality

3. ASTM A580 – Standard Specification for Stainless Steel Wire

4. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

5. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6. ASTM A1008 – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

7. ASTM B69 – Standard Specification for Rolled Zinc

8. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

9. ASTM C11 – Standard Terminology Relating to Gypsum and Related Building Materials and Systems

10. ASTM C150 – Standard Specification for Portland Cement

11. ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

12. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

13. ASTM C841 – Installation of Interior Lathing and Furring

14. ASTM C847 – Standard Specification for Metal Lath

15. ASTM C897 – Standard Specification for Aggregate for Job Mixed Portland Cement Based Plasters

16. ASTM C920 – Standard Specification for Elastomeric Joint Sealants

17. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster

18. ASTM C933 – Standard Specification for Welded Wire Lath

19. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. in Thickness

20. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

21. ASTM C1007 – Standard Specification for Installation of Load Bearing (Transverse and axial) Steel Studs and Related Accessories.

22. ASTM C1032 – Standard Specification for Woven Wire Plaster Base

23. ASTM C1063 – Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster

24. ASTM C1328 – Standard Specification for Plastic (Stucco) Cement

25. ASTM D226 – Standard Specification for Asphalt Saturated Organic Felt Used in Roofing and Waterproofing

26. ASTM D4258 – Standard Practice for Surface Cleaning Concrete for Coating

27. ASTM D4259 – Standard Practice for Abrading Concrete

28. ASTM D4260 – Standard Practice for Acid Etching Concrete

29. ASTM D4261 – Standard Practice for Surface Cleaning Concrete Masonry Units for Coating

30. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

31. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

E. Federal Specification:

1. UU-B-790a; Moisture Resistant Building Papers; Type 1, Grade 2, Style 2

2. FF-N-105-B; Nails and Wire Staples

3. FS QQ-W-461H; Carbon Steel Wire

F. ICC-ES (International Code Council – Evaluation Service Reports – Acceptance Criteria):

1. AC11 – Cementitious Exterior Wall Coatings

2. AC38 – Water-resistive Barriers

G. Plaster and Drywall Systems Manual, Current Edition.

H. Underwriters Laboratories (UL): UL Fire Resistance Fire Resistance Directory, Current Version.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project Site, a minimum of two (2) weeks prior to start of plaster work.

1.6 PERFORMANCE REQUIREMENTS

A. Design and install framing and lath to limit deflection to the following:

1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs

2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads.

B. Installation shall be completed by a manufacturer's certified and approved installer.

C. Metal lath shall have a minimum zinc coating of G60 in accordance with ASTM A653.

1.7 SUBMITTALS

A. General: Refer to Section 01 33 00 – Submittals.

B. Product Data:

1. All product data sheets, evaluation reports, accessories, material specifications, details, and warranty information that pertain to the project.

2. Include the metal lath's manufacturer's certification that the lath meets or exceeds the specified weight per ASTM C847 for U.S. nominal weights respectively. Provide manufacturer's product literature and ICC-ESR report for metal lath prior to ordering

C. Shop Drawings: Indicate locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

D. Samples: The contractor shall submit to the Owner / Architect:

1. Samples for Initial Selection: For each type of factory-prepared finish coat and for each color, finish, and texture to be used on the project.

2. Samples for Verification: For each type of factory-prepared finish coat and for each color and texture specified, provide two (2) samples of sufficient size (approx. 12"x12"), prepared on rigid backing. The same tools and techniques proposed for the actual installation shall be used to prepare the samples.

3. Retain approved samples at the construction site throughout the application process.

E. Material Certificates: Submit producer's certificate for each kind of plaster aggregate indicated evidencing that materials comply with requirements.

F. Construction and Demolition Waste Management: Refer to Section 01 50 13 – Construction Waste Management and Disposal for information on the required waste management plan.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: System component materials shall be manufactured by a firm engaged in lath and plaster manufacturing and shall be distributed by the same or its authorized dealers.

1. Materials shall be manufactured at a facility covered by a current ISO 9001:2015 and ISO 14001:2015 certification.

B. All lath pallets and individual bundles of lath shall be identified with the weight of the lath, the name of the manufacturer and country of origin and the manufacturers ICC-ERS Number.

C. Installation method and materials shall meet the established guidelines set forth by ASTM and as noted above, as well as any prevailing local codes and accepted practices.

D. Single Source Responsibility: Obtain all required lathing material from a single source, and all plaster material from a single source, for a complete plaster system.

E. Coordination of Work: Coordinate layout and installation of suspension system components for suspended ceilings with other work supported by or penetrating through ceiling.

F. Control Joints: Architect is to review the lath locations for each building prior to scratch coat for approval of control joints. All vertical and soffit joints are to align unless otherwise indicated by the Architect during the field review.

G. The lath and water-resistive barrier installation shall be inspected as required by DSA prior to plaster materials being applied, per CBC 2503.2.

1.9 MOCKUPS

A. If requested by District, provide a mockup to demonstrate the matching aesthetic effects to the adjacent building, and to set quality standards for materials and execution.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver all materials to the construction site in their original, unopened packaging with labels intact.

B. Inspection: Inspect the materials upon delivery to assure that specified products have been received. Report defects or discrepancies to the responsible party according to the construction documents; do not use questionable material for application.

C. Storage: Store materials inside under covering and keep dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes, and per manufacturer's recommendations. Protect metal corners and trim from being bent or damaged.

D. Paper backed metal lath shall be carefully delivered, stored, handled and erected to prevent puncture and or removal of paper.

E. Packaging: All lath pallets and individual bundles of lath shall be identified with the weight of the lath, the name of the manufacturer and country of origin and the manufacturers ICC-ESR Number.

F. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202 – Code of Standard Practice for Cold-Formed Steel Structural Framing.

1.11 PROJECT CONDITIONS

A. Comply with ASTM C926 requirements.

B. Environmental Requirements: Follow product manufacturer's recommendations for environmental conditions and surface preparation.

C. Substrates: Prior to installation, inspect the wall for surface contamination or other defects that may adversely affect the performance of the materials, and shall be free of residual moisture.

D. 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°F (for a minimum period of 24 hours) and rising.

3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

E. Interior Plasterwork: Maintain room temperatures at greater than 40°F for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.

2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

3. Coordinate the installation of the plaster with all other construction trades. To reduce the likelihood of the stucco cracking, it is recommended the building carry a minimum of 90 percent of the dead building load and the interior gypsum be installed prior to installation of the stucco.

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

1.12 SEQUENCING

A. Sequencing: Coordinate the installation of the plaster with all other construction trades. To reduce the likelihood of the stucco cracking, it is recommended the building carry a minimum of 90 percent of the dead building load and the interior gypsum be installed prior to installation of the stucco.

1.13 WARRANTY

A. System Warranty: Submit documentation on manufacturer's standard warranties for the products installed. At completion of work, provide written system warranty documentation.

1.14 MAINTENANCE

A. Maintenance and repair shall follow the procedures noted by the manufacturer.

B. Sealants, flashings and other building envelope components shall be inspected on a regular basis and repairs made as necessary.

1.15 PROJECT CLOSEOUT / EXTRA MATERIALS / ATTIC STOCK

A. The following materials shall be presented to the owner following the application of the work:

1. One container of finish for each color and texture utilized on the project.

2. A maintenance program for finishes as required.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:

1. Metal Lath:

a. AMICO (Alabama Metal Industries Corporation)
b. ClarkDietrich
c. CEMCO (California Expanded Metal Products Co.)

2. Plaster System: Basis of Design is CCP3 (Commercial Cement Plaster 3) system, manufactured by Dryvit.

2.2 METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon steel sheet with ASTM A653, G60 hot-dip galvanized-zinc coating.

1. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd.

2. Woven Wire Lath: Self-furring, minimum 17 gauge, shall be galvanized with openings not exceeding 1-1/2 in x 1-1/2 in meeting ASTM C1032.

B. Water-Resistive Barrier: Where paper-backed diamond mesh lath is shown, provide two (2) layers of asphalt-impregnated paper factory-bonded to back and complying with FS UU-B-790a, for Type I, Grade D (vapor permeable), Style 2.

1. Paper Backing: FS UU-B-790a, Type I, Grade D, Style 2 vapor-permeable paper. Provide paper-backed lath unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper.

D. Rod Hangers: Mild steel, zinc or cadmium coated.

E. Flat Hangers: Mild steel, zinc or cadmium coated or protected with rust-inhibitive paint.

F. Channels: Cold-rolled steel, 0.0598-inch min. thickness of base (uncoated) metal, allowable bending stress of 18,000 psi, protected with rust-inhibitive paint finish or galvanizing, 3/4-inch-deep by 7/16-inch-wide flanges, 300 lbs. per 1000 feet with painted finish, 316 lbs. per 1000 feet with galvanized finish, and as follows:

1. Carrying Channels: 1-1/2-inch-deep by 7/16-inch-wide flanges, 475 lbs. per 1000 feet painted, 508 lbs. per 1000 feet galvanized.

2. Hat-Channels: Hat shaped screwable furring channels, 7/8-inch deep formed from zinc-coated (galvanized) steel sheet minimum 0.0179-inch min. base (uncoated) metal thickness, complying with ASTM A653, Coating Designation G 60, designed for mechanical attachment of insulation boards or blankets to monolithic concrete and masonry walls.

3. Furring Brackets: Serrated arm type, 0.0329-inch min. thickness of base (uncoated) metal, adjustable from 1/4-inch to 2-1/4-inch wall clearance for channel furring.

4. Provide galvanized channels for exterior installations.

G. Hanger Anchorage Devices: Screws, cast-in-place concrete inserts, or other devices appropriate for anchorage to the form of structural framing indicated and whose suitability for use intended has been proven through standard construction practices or certified test data.

1. Size devices to develop full strength of hanger but not less than 3 times calculated hanger loading, except size direct pullout concrete inserts for 5 times calculated hanger loading.

2.3 ACCESSORIES

A. General: Comply with ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories: As required:

1. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A653, G60 zinc coating.

2. External (Outside) Corner Reinforcement: Fabricated from metal lath with ASTM A653, G60 hot-dip galvanized-zinc coating.

3. Metal Corner Reinforcement: Expanded large-mesh diamond mesh lath fabricated from zinc-alloy or welded wire mesh fabricated from 0.0475-inch-diameter zinc-coated (galvanized) wire and specially formed to reinforce external corners of Portland cement plaster on exterior exposures while allowing full plaster encasement.

4. Strip Mesh: Metal Lath, 3.4 lb/yd^2 expanded metal; 6 in. wide x 18 in. long.

5. Corner Aid: Minimum 26-gauge thick; expanded flanges shaped to permit complete embedding in plaster; minimum 2 in. wide; style as noted on plans; use unless otherwise indicated.

6. Vent Screed: Minimum 26-gauge thick; thickness governed by plaster thickness; minimum 4-inch (102 mm) width, double “V” profile, with perforated expanse between “V’s” of longest possible lengths.

7. Drip Screed: Minimum 26-gauge thick, depth governed by plaster thickness, minimum 3-1/2 in. high flange, maximum possible lengths.

8. Control and Expansion Joints: Depth to conform to plaster thickness; use maximum practical lengths.

    a. 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.

    b. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

    c. 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 (6 to 16 mm) wide; with perforated flanges.

9. Column Rings: MM System, style “WCR” with factory punched mounting holes.

10. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.

    a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.

    b. Smallnose cornerbead with perforated flanges; use on curved corners.

    c. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.

    d. Bullnose cornerbead, radius 3/4 inch minimum, with expanded flanges; use at locations indicated on Drawings.

11. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges. Minimum 26-gauge thick; thickness governed by plaster thickness; maximum possible lengths; expanded metal flanges with removable protective tape, with square edges.

2.4 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Bonding Compound: Comply with ASTM C932. Use where plaster is adhered to structurally sound unit masonry or monolithic concrete.

C. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.

D. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.

E. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

2.5 PLASTER MATERIALS / MIXES

A. General: Comply with ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Air/Water-Resistive Barrier Components:

1. Dryvit Backstop NT: A vapor permeable, flexible, polymer-based noncementitious water-resistive and air barrier coating available in Texture, Smooth, and Spray. See DS180 and DS181.

2. Dryvit Backstop NT-VB: A Class 1 vapor retarder, available in trowel and spray versions. When specified, consider having a WVT analysis performed. See DS830 and DS831.

3. Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive available in rolls 4 in (102 mm) wide by 100 yds (91 m) long.

C. Paper Backed Metal Lath:

1. Self-Furring Diamond Mesh Metal Lath: Shall be galvanized, 3.4 lbs/yd^2 (1.9 kg/m^2) and comply with ASTM C847.

2. Self-Furring Woven Wire Lath: Shall be minimum 17 gauge, galvanized with openings not exceeding 1-1/2 in x 1-1/2 in (38 mm x 38 mm) meeting ASTM C1032.

3. The lath is of the proper type, installed tight, properly fastened, and meets the requirements of ASTM C1063, ASTM C847 (expanded metal), ASTM

C933 (Welded Wire), or ASTM C1032 (Woven Wire), and local building code requirements.

D. Accessories (by others):

1. Type, style and manufacturer shall be indicated on construction documents.

2. Depth of accessories (grounds) shall be sized for the plaster thickness.

3. In corrosive environments, accessories manufactured of PVC or zinc are recommended.

4. Steel accessories shall meet ASTM C841.

5. PVC accessories shall meet ASTM D1784 and ASTM C1063.

E. Plaster Base Coat:

1. Dryvit CCP Base – Sanded: A fiberglass reinforced, cement plaster mix utilizing alkali resistant fibers and proprietary cementitious admixtures which is field mixed with water and Dryvit AC-100 activator (when specified). CCP Base – Sanded is packaged in 80 lb (36.3 kg) bags.

2. Dryvit CCP Base – Concentrate: A fiberglass reinforced, cement plaster mix utilizing alkali resistant fibers and proprietary cementitious admixtures which is field mixed with clean, graded plaster sand meeting ASTM C897, water and Dryvit AC-100 activator (when specified). CCP Base – Concentrate is packaged in 80 lb (36.3 kg) bags.

F. Machine Coated Dryvit EPS Shapes and Starter Boards: Shall be supplied by Acrocore or other manufacturer that subscribes to the Dryvit third party certification and quality assurance program.

G. Primer: Dryvit Color Prime™, Color Prime-W, or Primer with Sand™: A water-based, pigmented acrylic primer applied over the cured CCP base coat to improve adhesion and provide a more uniform appearance of the finish.

H. Dryvit Coating:

1. Demandit® Smooth: Integrally colored smooth exterior wall coating enhanced with proven mildew resistance. A minimum of 2 coats are required.

2. Weatherlastic® Smooth: Integrally colored, elastomeric, smooth exterior wall coating enhanced with proven mildew resistance. A minimum of 2 coats are required.

I. Dryvit Finish(es): 100% acrylic finishes with integral color and texture. Shall be the type, color and texture as selected by the architect/owner and shall be one of the following types:

1. Standard DPR (Dirt Pickup Resistance): Water-based, acrylic coating with integral color and texture and formulated with DPR chemistry:

a. Quarzputz® DPR: Open-texture
b. Sandblast® DPR: Medium texture
c. Freestyle® DPR: Fine texture
d. Sandpebble® DPR: Pebble texture
e. Sandpebble® Fine DPR: Fine pebble texture

2. Elastomeric DPR (Dirt Pickup Resistance): Water-based, elastomeric acrylic coating with integral color and texture and formulated with DPR chemistry:

a. Weatherlastic® Quarzputz
b. Weatherlastic® Sandpebble
c. Weatherlastic® Sandpebble Fine
d. Weatherlastic® Adobe

3. Coatings, Primers and Sealers: As recommended by manufacturer for system installed.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prior to installation of plaster (Dryvit CCP3), it is the contractor's responsibility to ensure that:

1. The surfaces to receive plaster are free of dust, loose particles, oil and other conditions that would affect the adhesion, installation or performance of CCP3 materials.

2. The lath is of the proper type, installed tight, properly fastened, and meets the requirements of ASTM C1063, ASTM C847 (expanded metal), ASTM C933 (Welded Wire), or ASTM C1032 (Woven Wire), and local building code requirements.

3. All accessories including corner aids, control and expansion joints, casing beads, etc. are properly fastened and positioned according to contract drawings and local building code requirements.

4. Doors, windows, decks, and other openings and penetrations have been properly flashed in accordance with building code and contract documents and CCP3 Installation Details DS826.

5. Metal roof flashing has been installed in accordance with the manufacturer's requirements, Asphalt Roofing Manufacturers Association (ARMA) Standards and Commercial Cement Plaster 3 Installation Details DS826, or as otherwise necessary to maintain a watertight envelope.

6. The substrate is flat within 1/4 in (6.4 mm) in 10 ft (3.0 m).

B. The contractor shall notify the general contractor and/or owner and/or architect of all discrepancies. Do not proceed until unsatisfactory conditions are resolved.

3.2 PREPARATION

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

B. Prepare smooth, solid substrates for plaster in accordance with ASTM C926.

3.3 INSTALLATION, GENERAL

A. Installation, General: Installation of these materials shall be in compliance with ASTM C926 and ASTM C1063.

B. Portland Cement Plaster Lathing and Furring Installation Standard: Install lathing and furring materials indicated for Portland cement plaster to comply with ASTM C1063.

C. Install supplementary framing, blocking, and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, furnishings, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable published recommendations of gypsum plaster manufacturer or, if not available, of the "Gypsum Construction Handbook" published by United States Gypsum Co.

D. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition/wall work abuts overhead structure, isolate the work from structural movement sufficiently to prevent transfer of loading into the work from the building structure. Install slip- or cushion-type joints to absorb deflections but maintain lateral support.

E. Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing or accessories.

F. Sound-Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.

3.4 INSTALLATION OF METAL LATH

A. Metal Lath: Install in accordance with ASTM C1063.

1. Partition Framing and Vertical Furring: Install flat-diamond-mesh lath.

2. Flat-Ceiling and Horizontal Framing: Where interior or exterior lath is attached to horizontal wood supports, either of the following attachments shall be used in addition to the methods of attachment described in referenced standards listed in CBC Table 2507.2.

a. Secure lath to alternate supports with ties consisting of a double strand of No. 18 W & M gage galvanized annealed wire at one edge of each sheet of lath. Wire ties shall be installed not less than 3 inches (76 mm) back from the edge of each sheet and shall be looped around stripping, or attached to an 8d common wire nail

driven into each side of the joist 2 inches (51 mm) above the bottom of the joist or to each end of a 16d common wire nail driven horizontally through the joist 2 inches (51 mm) above the bottom of the joist and the ends of the wire secured together with three twists of the wire.

b. Secure lath to each support with 1/2 inch wide (12.7 mm), 1-1/2 inch long (38mm) No. 9 W & M gage, ring shank, hook staple placed around a 10d common nail laid flat under the surface of the lath not more than 3 inches (76 mm) from edge of each sheet. Such staples may be placed over ribs of 3/8 inch (9.5 mm) rib lath or over back wire of welded wire fabric or other approved lath, omitting the 10d nails.

3. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh or woven-wire lath, as shown on the plans.

3.5 INSTALLATION OF METAL LATH AND FURRING

A. Lathing Materials and Accessories: Install in accordance with ASTM C1063 – Installation of Lathing and Furring for Portland Cement Based Plaster, except where indicated or specified otherwise herein.

B. Metal Furring to Receive Metal Lath: Comply with requirements of ML/SFA "Specification for Metal Lathing and Furring" applicable to each installation condition indicated.

C. Install expanded metal lath for the following applications where plaster base coats are required. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated that comply with referenced lathing installation standards.

D. Suspended and furred ceilings using 3.4 lbs. per sq. yd. minimum weight diamond mesh lath.

E. Vertical metal framing and furring.

F. Exterior sheathed soffits and wall surfaces using 3.4 lbs. per sq. yd. minimum weight self-furring diamond mesh lath.

3.6 INSTALLATION OF ACCESSORIES

A. Install in accordance with ASTM C1063 and at locations indicated on Drawings.

B. Reinforcement for External (Outside) Corners:

1. Install lath-type, external-corner reinforcement and/or cornerbeads at exterior locations.

2. Install cornerbead at interior locations.

C. Control Joints: Locate as approved by Architect for visual effect and per ASTM C1063 requirements, as follows:

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

   a. For Portland Cement-Based Plaster (ceilings and walls), install to create panels no larger than 100 square feet with no dimension exceeding 10 feet.

2. At distances between control joints of not greater than 18 ft. (5.5 m) o.c.

3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.

4. Where control joints occur in surface of construction directly behind plaster.

5. 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.

3.7 PLASTER APPLICATION

A. General: Comply with ASTM C926.

1. Do not deviate more than plus or minus 1/8 inch in 10 ft. from a true plane in finished plaster surfaces when measured by a 10 ft. straightedge placed on surface.

2. Grout hollow metal frames, bases, and similar work occurring in plastered areas, with base coat plaster material, and prior to lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least 6 inches at each jamb anchor clip

3. 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.

4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Mixing and Application Instructions: Refer to the product literature for specific mixing and application instructions of each product.

1. CCP Base shall be moist cured for a minimum of 48 hours following application.

2. CCP Base shall be completely dry and cured for a minimum of 7 days prior to application of primer and finish.

3. The installation of Machine Coated Dryvit EPS Shapes and Starter Boards shall be in accordance with Dryvit Publication DS854.

C. Finish Coats: To match existing campus plaster finish.

D. Elastomeric Paint Finish: Refer to Section 09 91 00 – Painting.

E. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

F. Concealed Interior Plasterwork:

1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.

2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.

3.8 FIELD QUALITY CONTROL

A. The lath and water-resistive barrier installation shall be inspected as required by DSA prior to plaster materials being applied, per CBC Sections 2503.2 and 2504.2.

B. The contractor shall be responsible for the proper application of the CCP3 materials.

C. Dryvit assumes no responsibility for on-site inspections or application of its products

3.9 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.

3.10 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work after plastering is complete. 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 09 29 00 – GYPSUM BOARD ASSEMBLIES

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. Extent of each type of gypsum board required is indicated on Drawings.

B. Section Includes: Gypsum Board, Cement Board, and Texture Finishes.

1.3 RELATED REQUIREMENTS

A. Section 06 10 00 – Rough Carpentry.

B. Section 08 31 13 – Access Doors and Frames.

C. Section 09 67 25 – Decorative Interior Wall Surfacing System

D. Section 09 77 20 – Fiberglass Reinforced Plastic (FRP) Wall Panels

E. Section 09 91 00 – Painting.

1.4 REFERENCES

A. 2022 California Building Code (CBC) with Amendments.

B. ASTM International (ASTM):

1. ASTM C423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

2. ASTM C475/C475M – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

3. ASTM C514 – Standard Specification for Nails for the Application of Gypsum Board.

4. ASTM C665 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

5. ASTM C834 – Standard Specification for Latex Sealants.

6. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.

7. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases t

o Wood Studs or Steel Studs.

8. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

9. ASTM C1396/C1396M – Standard Specification for Gypsum Board.

10. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

11. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Section 01 33 00 – Submittals.

B. Product Data: For each type of product.

C. Samples: If requested.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

B. Gypsum drywall contractor is to review finished work with painter and Project Coordinator, and to provide any additional finishing of gypsum board required until accepted by painting contractor, Architect, and Project Coordinator.

C. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Gypsum Association (GA):

1. GA 214 – Recommended Levels of Gypsum Board Finish

2. GA 216 – Application and Finishing of Gypsum Panel Products

3. GA 253 – Application of Gypsum Sheathing

4. GA 600 – Fire Resistance Design Manual

E. South Coast Air Quality Management District (SCAQMD): SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

F. Underwriters Laboratories (UL):

1. UL 2818 – GREENGUARD Certification Program for Chemical Emissions for Building Materials, Finishes and Furnishings, Current Version.

2. UL Fire Resistance – Fire Resistance Directory, Current Version.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

C. Minimum Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40°F (4°C). For finishing of gypsum board maintain not less than 50°F (10°C) for 48 hours prior to application and continuously thereafter until drying is complete.

D. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. CertainTeed Corp.

2. Georgia-Pacific Gypsum

3. National Gypsum Co.

4. USG Corporation.

2.2 PERFORMANCE REQUIREMENTS

A. Moisture- and Mold-Resistant Assemblies: Provide and install moisture- and mold-resistant glass-mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 and ASTM C1177 where indicated on Drawings and in all locations which might be subject to moisture exposure during construction.

2.3 GYPSUM BOARD, GENERAL

A. General: Provide gypsum board of types indicated in maximum lengths and widths available to minimize end-to-end joints in each area and that correspond with support system indicated.

1. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, in 5/8 inch thickness to comply with ASTM C840 for application system and support spacing indicated.

B. Fire-Ratings: Provide systems listed in applicable code or by Underwriter's Laboratory, Gypsum Association (GA) File No's in GA-600 Fire Resistance Design Manual or other listing approved by applicable authorities.

2.4 STANDARD GYPSUM BOARD

A. Gypsum Board: Shall comply with requirements of ASTM C1396.

1. Core: Regular gypsum core

2. Long Edges: Tapered.

3. Thickness: 5/8 inch, unless otherwise indicated on drawings.

2.5 FIRE-RESISTANCE RATED GYPSUM BOARD

A. Gypsum Board, Type X: Shall comply with requirements of ASTM C1396.

1. Core: Fire-resistance rated (Type X) gypsum core

2. Long Edges: Tapered.

3. Thickness: 5/8 inch, unless otherwise indicated on drawings.

2.6 GYPSUM BOARD WITH ENHANCED MOLD AND MILDEW RESISTANCE

A. Gypsum Board, Mold and Moisture Resistant: Shall comply with requirements of ASTM C1396, and Mold and Mildew Resistance requirements of ASTM D3273, as noted below:

1. Core: Mold and moisture resistant gypsum core

2. Long Edges: Tapered.

3. Thickness: 5/8 inch, unless otherwise indicated on drawings.

B. Gypsum Board, Type X, with Mold and Mildew Resistance: Shall comply with Type X requirements of ASTM C1396, and Mold and Mildew Resistance requirements of ASTM D3273, as noted below:

1. Core: Mold and moisture resistant, fire-resistance rated (Type X) gypsum core.

2. Long Edges: Tapered.

3. Thickness: 5/8 inch, unless otherwise indicated on drawings.

2.7 CEMENTITIOUS BACKER BOARD

A. Cement Backerboard: Shall comply with requirements of ASTM C1325 and ANSI A118.9.

1. Core: Cementitious, water-durable.

2. Long Edges: Tapered.

3. Thickness: 5/8 inch, unless otherwise indicated on drawings.

4. Surface: Fiberglass mesh on front and back.

5. Density: 72 lbs. per cu. ft.

6. Water Absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C473.

2.8 GYPSUM CEILING BOARD

A. Exterior Soffit Board: Shall comply with requirements of ASTM C1396.

1. Core: Regular gypsum core

2. Long Edges: Beveled /Tapered.

3. Thickness: 1/2 inch, unless otherwise indicated on drawings.

4. Surface: 100 percent recycled content paper with extra resistance to moisture and sagging.

B. Exterior Soffit Board – Fire Rated: Shall comply with Type X requirements of ASTM C1396, as noted below:

1. Core: Fire-resistance rated gypsum core

2. Long Edges: Beveled /Tapered.

3. Thickness: 5/8 inch, unless otherwise indicated on drawings.

4. Surface: 100 percent recycled content paper with extra resistance to

moisture and sagging.

5. Fire Resistance: Complies with Type X requirements of ASTM C1396.

2.9 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047. Galvanized or aluminum-coated steel sheet or rolled zinc.

1. Shapes:

a. Cornerbead.

b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. L-Bead: L-shaped; exposed long flange receives joint compound.

d. U-Bead: J-shaped; exposed short flange does not receive joint compound.

e. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

B. Exterior Trim: ASTM C1047. Hot-dip galvanized steel sheet or rolled zinc.

1. Shapes:

a. Cornerbead.

b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.10 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape:

1. Interior Gypsum Board: Paper Reinforcing Tape, unless otherwise indicated.

2. Exterior Gypsum Soffit Board: Paper.

3. Exterior Glass Mat Gypsum Soffit: Fiberglass mesh.

4. Glass-Mat Gypsum Sheathing Board: 10-by-10 fiberglass mesh.

5. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats. All

Compounds to be factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Prefilling: At open joints and damaged surface areas, use formulation recommended by gypsum board manufacturer for this purpose.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use taping compound formulated for this purpose.

   a. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.

3. Fill Coat: For second coat, use drying-type, factory-premixed, all-purpose compound formulated for use as both taping and topping compound, as recommended by gypsum board manufacturer for this purpose.

4. Finish Coat: For third coat, use drying-type, factory-premixed, all-purpose compound formulated for use as both taping and topping compound, as recommended by gypsum board manufacturer for this purpose.

D. Joint Compound for Exterior Soffit Applications:

1. Exterior Gypsum Soffit Board: As recommended by sheathing board manufacturer.

2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels: As recommended by backing panel manufacturer.

2.11 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002, unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Fasteners for Wood Framing:

1. 1-1/4 inch minimum corrosion resistant course thread bugle head.

2. As required in specified fire-rated assembly.

E. Gypsum Board Nails: ASTM C514.

F. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C919. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Refer to Section 07 92 00 – Joint Sealants for specific product information.

G. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool, in all stud cavities of framed walls, unless noted otherwise.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

H. Spot Joint Compound: ASTM C475, setting-type joint compound of type recommended for spot sealing hollow metal door frames.

I. Thermal Insulation: As specified in Section 07 21 00 – Building Insulation.

J. Vapor Retarder: As specified in Section 07 25 00 – Weather Barriers.

2.12 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.

1. Texture: As selected by District.

2. Texture: Spatter knock-down.

C. Acoustical Finish: Water-based, chemical-setting or drying-type, job-mixed texture finish for spray application.

1. Application Thickness: 1/2 inch.

2. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 450 or less.

3. NRC: 0.55 according to ASTM C423.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates to which gypsum board attaches or abuts including welded hollow-metal frames and framing, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than one framing member in alternate courses of board.

E. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

F. Install panels with face side out. Do not install imperfect, damaged or damp boards. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

G. Locate edge and end joints over supports, except in ceiling/horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

I. Form control joints and expansion joints at locations indicated at minimum required spacing or per manufacturer, with space between edges of boards, prepared to receive trim accessories. Coordinate locations and layouts with Architect.

J. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area, and may be limited to not less than 75 percent of full coverage.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

K. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

L. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

M. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

N. Fasteners: Space fasteners in gypsum boards in accordance with ASTM C840 and manufacturer's recommendations.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.

B. Single-Layer Application:

1. On Ceilings: Apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On Partitions/Walls 8'-0" or Less in Height: Gypsum panels may be applied vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Partitions/Walls 8'-0" up to 12'-0": To eliminate small panels and excessive joints, apply full height gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

4. On Partitions/Walls 12'-0" or Higher: Gypsum panels may be applied vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly.

5. Fastening Methods:

   a. Apply gypsum panels to supports with steel drill screws.

   b. Fasten with screws, or as required in specified fire rated assembly.

C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

2. Fastening Methods: Fasten base layers and face layers separately to supports with screws, as indicated or specified for fire rated assemblies.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings. Or if not indicated, at spacings and locations according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at external and outside corners.

2. LC-Bead: Use where indicated.

3. L-Bead: Use where edge trim can only be installed after gypsum board in installed.

4. U-Bead: Use at where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

   a. Install U-bead where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive edge trim with face flanges covered with joint compound.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.

2. LC-Bead: Use where indicated.

E. Aluminum Trim: Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated, and in locations indicated on Drawings. Provide type with face flange to receive joint compound except where U-Bead (semi-finishing type) is indicated.

3.5 FINISHING GYPSUM BOARD

A. General: Apply joint treatment at gypsum board joints (both directions), interior angles, edge trim, flanges of corner bead, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints rounded or beveled edges and damaged surface areas, using setting-type joint compound.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840. Sand between coats and after last coat:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 2: Permanently adhered panels (substrates for tile, and substrates for acoustical tile).

3. Level 3: Concealed spaces behind semi-permanent panels, such as millwork or casework, removable panels, etc.

4. Level 4: Typical, unless otherwise noted (at panel surfaces that will be exposed to view unless otherwise indicated).

5. Texture on surfaces as determined by Architect; smooth texture on surfaces to receive vinyl wall coverings.

E. Glass-Mat Gypsum Sheathing Panel: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Cementitious Backer Units: Finish in accordance with manufacturer's written instructions.

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes in strict accordance with texture finish manufacturer’s instructions. Apply primer to surfaces that are clean, dry, and smooth, to all surfaces to achieve texture finish.

B. Texture Finish Application: Mix and apply finish in strict accordance with manufacturer’s instructions, using powered spray equipment, to produce a uniform

texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 09 65 13 – RESILIENT WALL BASE AND ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of resilient base and accessories is shown on drawings and in schedules.

B. Work Includes: Rubber Wall Base.

1.3 RELATED SECTIONS

A. Section 03 30 00 – Cast in Place Concrete

B. Section 09 29 00 – Gypsum Board Assemblies.

C. Section 09 77 20 – Fiberglass Reinforced Plastic (FRP) Wall Panels

D. Section 09 91 00 – Painting.

1.4 REFERENCES

A. 2022 California Building Code, with Amendments.

B. ASTM International (ASTM):

1. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials

2. ASTM E648 – Standard Test Method for Critical Radiant Flux of Flooring systems Using a Radiant Energy Source.

3. ASTM E662 – Test Method for Specific Density of Smoke Generated by Solid Materials.

4. ASTM F137 – Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus

5. ASTM F386 – Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces

6. ASTM F925 – Standard Test Method for Resistance to Chemicals of Resilient Flooring.

7. ASTM F1515 – Standard Test Method for Measuring Light Stability of Resilient Vinyl Flooring by Color Change

8. ASTM F1861 – Standard Specification for Resilient Wall Base

C. National Fire Protection Association (NFPA):

1. NFPA 255 – Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

2. NFPA 258 – Test Method for Specific Density of Smoke Generated by Solid Materials.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide each type of base and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

B. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installing work similar to that required for this project.

C. Fire Performance Characteristics: Provide accessories which comply with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1. ASTM E648 /NFPA 253, Critical Radiant Flux of Floor Covering Systems: Class 1.

2. ASTM E662/NFPA 258, Specific Optical Density of Smoke Generated by Solid Materials: 450 or less.

3. ASTM E84/NFPA 255, Surface Building Characteristics of Building Materials: Class C.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of accessory.

B. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.

C. Samples: Submit manufacturer's standard color samples of each type, color, and pattern of accessories required, showing full-range of color and pattern variations.

D. Certification for Fire Test Performance: Submit certification from an independent testing laboratory acceptable to authorities having jurisdiction those accessories complies with fire test performance requirements.

E. Proof of Compliance: Submit Proof of Compliance, signed by the manufacturer's representative, that waxing and finishing of accessories complies with all manufacturers' recommendation.

F. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of accessory and accessory required.

1.7 PROJECT CONDITIONS

A. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive resilient wall base and accessories shall be clean, fully enclosed, weather tight with the permanent HVAC set at a uniform temperature of 65°F-85°F for 48 hours prior too during, and thereafter installation of resilient wall base. Resilient wall base and adhesive shall be conditioned in the same manner. Resilient wall base must be unboxed & acclimated in area of use at least 48 hours prior to installation. Minimum temperature shall be a 65°F after installation.

1.8 SEQUENCING AND SCHEDULING

A. Install resilient wall base and accessories after other finishing operations, including painting, have been completed. Do not install accessories over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by accessory manufacturer's recommended bond and moisture test.

1.9 WARRANTY

A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. Warranty Period: 1 year limited warranty commencing on Date of Substantial Completion. Notice of any defect must be made in writing to manufacturer within thirty (30) days after buyer learns of the defect.

2. Limited Wear Warranty: 3 year limited wear warranty.

1.10 MAINTENANCE

A. Extra Materials (if part of Contract): Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 01 Closeout Submittal Section.

1. Quantity: Furnish quantity of Resilient Wall Base equal to 5% of amount installed.

2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

B. Maintenance of finished floor covering to be conducted per Manufacturer’s Maintenance Guide.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Resilient Wall Base and Accessories:

   a. Burke Flooring, a Division of Burke Industries, Inc.

   b. Flexco Div., Textile Rubber Co.

   c. Roppe Rubber Corp.

2.2 RUBBER WALL BASE

A. Provide vulcanized thermoset rubber base complying with ASTM F1861, Type TS, Group I (solid), with matching end stops and preformed or molded corner units, and as follows:

1. Height: 4"

2. Thickness: 1/8"

3. Length: Product to come in minimum 100' continuous rolls.

4. Wall Joints: No more than 1 wall base joint per wall on walls greater than 16' long. Walls less than 16' to have no joints.

5. Style: Standard Top-Set Cove.

6. Finish: Matte

7. Colors: As selected by Architect from manufacturer's standard range.

8. Locations: As shown on plans.

2.3 MOULDINGS

A. 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from standard colors available; not less than 1" wide.

1. This section is responsible for all edge strips, including but not limited to those edges of resilient flooring, sheet vinyl flooring, carpet, etc.

B. Metal Trim: Manufacturer's standard metal transition trim – provide wall transitions and as elsewhere indicated on drawings.

2.4 ADHESIVES

A. Adhesives (Cements): Waterproof, stabilized type as recommended by manufacturer to suit material and substrate conditions.

PART 3 – EXECUTION

3.1 INSPECTION/PREPARATION

A. Require Installer to inspect surfaces to determine that they are satisfactory.

B. Do not allow accessory work to proceed until surfaces are satisfactory.

C. Clean surfaces to be covered and inspect flooring/wall conditions prior to installations.

D. Installation of base should not begin until the work of all other trades has been completed, especially overhead trades. Areas to receive resilient wall base shall be clean, fully enclosed, weather-tight, and maintained at a uniform temperature of at least 65°F for 24 hours before, during, and after the installation is completed. The resilient wall base and adhesives shall be conditioned in the same manner. The wall surface shall be clean, dry and free of all foreign material, such as dust, paint, grease, oils, solvents, sealers, and old adhesive residue which may interfere with proper adhesion. Do not install on interior surfaces which will be exposed to moisture or excessive temperature changes. All coiled wall base shall be unrolled and allowed to lay flat for a period of at least 24 hours at 65°F prior to installation.

3.2 INSTALLATION

A. Install accessories using method indicated in strict compliance with manufacturer's printed instructions. Extend base into toe spaces, door reveals, and into closets and similar openings. Note requirements for finishing inside accessible work areas.

B. General:

1. A 3/32" V-notched trowel is recommended. Adhesive should be spread on the back of the base and to within a 1/4" from the top or spread on the wall. If using a cartridge then bead the adhesive to within about an inch from the top. If using a multiple-hole nozzle on your cartridge, use a 2-hole nozzle for 2.5", a 3-hole for 4" and a 5-hole nozzle for 6".

2. If the wall or floor is uneven, trim some wall base ends before adjoining pieces. Use a razor-edged utility knife to trim, cutting from the face to the back.

3. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

4. Scribe, cut, and fit floor base to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

5. Apply wall base to the wall within 20 minutes after spreading adhesive. Be sure to "work" the wall base back toward the starting point. This slightly compresses the pieces together and eliminates the possibility of gapping at the seams due to improper installation technique. Always press firmly toward the last piece installed using a hand and a clean rag or a clean hand roller. Base that is installed on a curved or irregular surface may need bracing until adhesive sets.

6. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base

in lengths as long as practicable, with preformed corner units. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

7. Resilient wall base shall be rolled, with a J-hand roller, after installation, to ensure proper bonding.

C. Corners:

1. To form outside corners, fold the base at the proper point and scribe the backside with a V-knife or a Cove Base Gouging Tool. Remove no more than 20% of the base thickness. Heat the cut backside area with a hot air gun. Apply heat carefully, too much heat will deform or blister the base. Crease the base at the fold with your hands or a hand roller. Let cool to the touch. Apply adhesive and install. Press firmly to the wall and brace if needed. Use a wet clean cloth to cool the base if hot from heating process.

2. Always maximize the length of the wall base measured from the edge of an outside corner. Extend the job formed corner wall base length on each side of the corner at minimum of 6 inches. The longer the length of wall base extends back from the corner, the stronger the installation will be in the face of abuse that can occur during subsequent maintenance events.

D. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on floor base as marked on subfloor. Use chalk or other non-permanent marking device.

E. Install stair treads and nosing per manufacturer’s recommendations for products used.

F. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

G. Apply edge strips where shown on drawings, and after flooring installation. Secure units to substrate with adhesive, complying with edge strip manufacturer's recommendations.

END OF SECTION.

SECTION 09 67 23 – FLUID-APPLIED FLOORING – EPOXY

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trowel applied monolithic epoxy flooring.

2. Perimeter edging and integral 6" high, 1/2-inch radius coved base.

B. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Section 09 05 61 – Common Work Results for Flooring Preparation.

1.2 REFERENCES

A. ASTM D2240 – Standard Test Method for Rubber Property - Durometer Hardness.

B. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials

C. ASTM E648 – Critical Radiant Flux of Floor Covering Systems

D. ADA Standards – ADA Title [II] [III] Regulations and the ADA Standards for Accessible Design.

E. California Building Code (CBC):

1. Chapter 8, Interior Finishes

2. Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Facilities and Publicly Funded Housing

F. California Fire Code (CFC)

G. NFPA 101 – Life Safety Code

H. NFPA 253 – Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

I. SMAQMD – Sacramento Metropolitan Air Quality Management District Regulations.

1.3 SUBMITTALS

A. Action Submittals:

1. Product Data for each system component and accessory item

2. Certified Copies of Field Quality Assurance Test Reports

3. Shop Drawings showing traffic areas that will receive non-slip finish and equipment and fixture layout that will receive standard smooth finish

B. Information Submittals:

1. Manufacturer's Installation Instructions

2. Certificates of Compliance regarding specified performance requirements

C. Closeout Submittals: Manufacturer's Maintenance Instructions

1.4 QUALITY ASSURANCE

A. Flooring system components shall be compliance with VOC content limits in SMAQMD.

B. Installed flooring system shall have ASTM C1028, Coefficient of Friction, as follows.

1. Dry/Level Surfaces: 0.6, minimum.

2. Wet/Sloped Surfaces: 0.8, minimum.

C. Installed flooring system shall be CBC Section 803.1, Class A interior finish with the following surface burning characteristics.

1. ASTM E84 Flame Spread: 25, maximum.

2. ASTM E84 Smoke Developed: 450, maximum.

3. ASTM E648, Critical Radiant Flux: NFPA 253, Class II, minimum 0.22 watts per square centimeter.

D. Manufacturer: Company with minimum 10 years' experience manufacturing poured epoxy flooring for commercial projects similar in scale and complexity to those required for this Project.

E. Installer: Company with minimum five (5) years' experience installing poured epoxy flooring for commercial DSA inspected, Projects similar in scale and complexity to those required for this Project.

1. Installer: Approved by the materials manufacturer.

2. Installer shall have completed at least five (5) comparable projects that are more than two (2) years old; submit list with names and telephone numbers of knowledgeable client contacts.

F. Field Sample: For each color and finish of fluid applied flooring, install a Field Sample with one corner as an exploded view showing each step in the process of surface preparation and installation.

1. Size: Minimum 4- by 5-feet.

2. Location: Acceptable to Architect.

3. Modify materials and methods of installation for each Field Sample as required to obtain Architect's approval.

4. Document materials and methods used to obtain Architect's approval of each Field Sample. Maintain at least one copy of these documents in a readily accessible location on Site while this work is in progress.

5. Maintain access to and protect Field Sample from damage while this work is in progress.

6. Upon acceptance of related work, Field Sample that remains in acceptable condition may remain as part of the work if approved by Owner.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in un-opened containers, factory mixed and packaged.

B. Store materials in a dry, secure area.

1.6 PROJECT REQUIREMENTS

A. Do not install flooring when temperature is below 60°F or above 90°F.

B. Maintain this temperature range, 24 hours before, during and 72 hours after installation of flooring.

C. Restrict traffic from area where flooring is being installed or is curing.

1.7 WARRANTY

A. Manufacturer shall warrant installed flooring to be and to remain free from defect for a period of one (1) year [at least 3-years] from Date of Substantial Completion. Upon written notice from Owner, manufacturer shall promptly, without cost, and with least practicable inconvenience to Owner correct such defects.

B. Evidence of defect in material, installation or both shall be delamination from substrate or degradation of surface finish individually or in combination.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products of the following manufacturers form the basis of design and quality intended for this Project.

1. Crossfield Products Corp., Compton, CA. Product: Dex-O-Tex

2. [Stonhard, Inc., Maple Shade, NJ]

3. Tnemec Company, Kansas City, MO

4. [[Tera-Lite, Inc./Revolan Systems, San Jose, CA.]]

5. {Sherwin Williams - General Polymers, Cincinnati, OH}

6. Prime Coat Coating Systems, Waukegan IL.

7. BASF, Product: MasterTop 1245 CLAD (formerly Selby 425)

8. Or equal, approved in accordance with Division 01 requirements for substitutions.

B. Resinous Flooring: Dex-O-Tex, Cheminert K {Tek-Crete SL (self-leveling), urethane mortar} {Tek-Crete SL B (self-leveling) urethane mortar, Broadcast aggregate} {{Tek-Crete TT, troweled Urethane Mortar}}, meet or exceed the following physical properties when tested in accordance with the cited referenced standard test method.

1. Thickness: 1/4 inch.

2. Compressive Strength (ASTM C579): 11,000 [[11,500]] {8,100} {{8,400}} psi.

3. Tensile Strength (ASTM C307): 1,643 [[2,500]] {1,000} {{1,080}} psi.

4. Flexural Modulus of Elasticity (ASTM C580): 4,300 [[4,500]] {2,000} {{2,000}} psi.

5. Water Absorption (MIL D3134): 0.30 [[0.25]] {0.64} {{0.64}} percent max.

6. Surface Hardness (ASTM D2240): 85.5 Durometer Shore "D" [[Durometer Shore D – 83]] {Durometer Shore D 85-90} {{Durometer Shore D85-90}}

7. Abrasion Resistance (ASTM D1044): 0.0 gr. [[1000 cycles, wt. loss]]

8. Impact Resistance (MIL-D-3134, Para 4.7.3): 0.024-inch max.

9. Adhesion Impact Resistance (Gardner Impact Tester): No chipping, cracking, or delamination and not more than 0.014-inch indentation Adhesion (A.C.I. Comm. No. 503.1): 400 psi (100 percent failure in concrete)

10. Electrical Conductivity (NFPA 56A): Di-electric

11. Flammability-Critical Radiant Flux (ASTM E648): Greater than 1.07 watts/cm2

12. Colors:

    a. Solid colors: As selected by Architect from manufacturer’s full range of available colors.

    b. Grouted with selected variegated aggregates, top coated with clear finish coat.

13. [Skid Resistant Epoxy Coating with aluminum Oxide: Posi-Tred O, skid-resistant. Profile: Medium Profile, 23 mils [Fine Profile, 12 mils] [Coarse Profile, 50 mils]. Color as selected by Architect.]

14. [Color quartz Topcoat: Terracolor aggregate.]

15. {Tek-Crete SL B: Aggregate; natural mineral aggregate.}

16. {Tek-Crete SL B: Top Coat; pigmented sealer; Dex-O-Tex Quik-Glaze}

17. Dex-O-Tex Cheminert SC Membrane under flooring system.

18. Antimicrobial Additive: Anti-microbial biocide.

19. Integral Cove Base and Top Coat: Tek-Crete VRT

20. Vapor Control System: where moisture readings exceed 3 lbs/1000sq ft./24 hour period; Dex-O-Tex VaporControl Primer 200 [Specified in Section 07 25 00].

C. Resinous Flooring: Tera-Lite, Tera-Gem III Industrial Flooring System (IFS) {Tera-Gem III Chemical Resistant Flooring System (CRS)} {{Tera-Gem III Decorative Quality Troweled Flooring System (DQ)}}, epoxy flooring, meet or exceed the following physical properties when tested in accordance with the cited referenced standard test method.

1. Thickness: ¼ inch [1/8 inch]

2. Compressive Strength (ASTM C579): 11,500 {{10,500}} psi.

3. Tensile Strength (ASTM C307): 6,000 {{5,000}} psi.

4. Flexural Modulus of Elasticity (ASTM C580): 4,500 {{4,700}} psi.

5. Water Absorption (MIL D3134): 0.25 percent max.

6. Surface Hardness (ASTM D2240): Shore D – 83 {{82}}

7. Abrasion Resistance (ASTM D1044): 1000 cycles, wt. loss

8. Impact Resistance (MIL-D-3134, Para 4.7.3): No cracking or delamination at 16 ft. lbs.

9. Adhesion Impact Resistance (Gardner Impact Tester): No chipping, cracking, or delamination and not more than 0.014-inch indentation Adhesion (A.C.I. Comm. No. 503.1): 400 psi (100 percent failure in concrete)

10. Electrical Conductivity (NFPA 56A): Di-electric

11. Flammability (ASTM E635): Self-extinguishing

12. Colors:

a. Solid colors: As selected by Architect from manufacturer's full range of available colors.

b. Grouted with selected variegated aggregates, top coated with clear finish coat.

13. Primer: Two-component epoxy primer, liquid components, mix 2 parts of A to1 part of B by volume. Stir with a mechanical agitator for 1-2 minutes. Distribute mixed material evenly over the floor surface using rollers, squeegees or spray. Spread rate will vary from 70 to 150 sq. ft. per gallon. Do not apply over standing water or let primer set before applying next coat.

14. Basecoat: Three-component, troweled polymer composite epoxy resin, curing agent, organic pigment and silica aggregate {{color quartz}} for Tera-Gem III IFS {CRS} {{Tera-Gem III for DQ}}. Liquid components at a ratio of 2 parts A to 1 part B by volume. To one weight equivalents of mixed liquid components add approximately 7-weight equivalent of aggregate. Mix all components using an electrical drill motor agitator or a plaster mixer. Mix all components for 2-3 minutes or until uniformly wetted, trowel to a thickness of ¼ inch.

15. Sealer: Liquid components with inorganic pigments {{DQ Clear liquid components}}, apply two (2) pigmented seal coats using the base coat liquid components, application rate approximately 125 sq. ft. per gallon.

16. Anti-skid: No. 70 mesh silica sand or Flintshot. Applied to second seal coat.

17. {{Quartz decorative finish: SpectraQuartz for Tera-Gem III DQ, color or blend as selected by Architect}}:

D. Flooring: Terracolor

1. Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

a. Thickness: ¼ inch

b. Compressive Strength (ASTM C579): 10,716 psi

c. Tensile Strength (ASTM C307): 1,843 psi

d. Surface Hardness (ASTM D2240): Durometer "D" 81

e. Abrasion Resistance (ASTM D1044): 0.0 gr.

f. Indentation (MIL-D-3134): <1.0 percent

g. Impact Resistance (Gardner Impact Tester): No chipping, cracking, or delamination

h. Adhesion (A.G.I. Comm. No. 503.1):>400 psi (100 percent failure in concrete)

i. Electrical Conductivity (NFPA 56A): Di-electric

j. Flammability (ASTM E648/NFPA 253/FTMS 372): Greater than 1.07 watts/cm² (Class I)]

E. Flooring: DEX-O-TEX Decor-Flor

1. Provide flooring system that meet or exceed the listed minimum typical physical properties at 75°F (24°C) tested according to referenced standard test method:

a. Compressive Strength (ASTM C579): 10,500 psi

i. Resin, Hardener & Aggregate: 738 kg/cm2

b. Tensile Strength (ASTM C307): 1,800 psi

i. Resin, Hardener & Aggregate: 127 kg/cm2

c. Flexural Strength (ASTM C580): 4,000 psi (281 kg/cm2)

d. Surface Hardness (ASTM D2240 Shore): D 80-85

e. Indentation Characteristics:

i. Steadily Applied Load (MIL-D-3134): 0.005 inch

ii. Para. 4.7.4.2.1, 2000 lbs. on 1 inch steel ram imposed for 30 minutes over concrete substrate, indented, (0.127 mm)

f. Indentation Characteristics (MIL-D-3134, Para. 4.7.3):

i. Impact Load: 0.011 inch

ii. 2 lb. 0.908 kg. Indent from steel ball dropped twice from 8 ft. height, (0.28 mm)

g. Adhesion (ASTM D4541): > 400 psi

i. 100 percent failure in concrete: 28.1 kg/cm2

h. Water Absorption (MIL-D-3134): < 1.0%

i. Abrasion Resistance (ASTM D4060) (CS17, 1000gr load, 1000 cycles): 0.04 gr

j. Flammability (ASTM D635): Self-Extinguishing, Bonded to Concrete

k. Skid Resistance: Varies depending upon surface texture selected.

F. Stonclad GS as manufactured by Stonhard, Inc., Maple Shade, NJ, nominal 1/4-inch-thick system comprised of two-component moisture tolerant, penetrating epoxy

primer, three-component troweled mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments. Aggregate broadcast and a high performance, two-component, clear epoxy sealer.

G. Stonblend GSI is a nominal 3/16 in./5 mm flooring system. It combines decorative looks with excellent chemical and wear resistance and cleanability. Its surface provides a moderate degree of slip resistance while remaining resistant to staining, marring, and yellowing. It is comprised of:

1. Stonblend Primer: Two-component, penetrating, UV resistant epoxy rimer

2. Stonblend GSI Base: Three-component, troweled mortar consisting of epoxy resin, curing agent and colored quartz silica aggregate

3. Stonblend Grout Coat: Two-component, clear, UV resistant epoxy sealer

4. Stonshield Sealer: Two-component, clear UV resistant, leveling epoxy sealer

5. Stonseal GS7 Clear Flat: Two-component, non-reflective, waterborne, aliphatic polyurethane coating.

H. Resinous Flooring: Stonhard STONRES RTZ, three component resilient urethane flooring system, 3/16-inch nominal thickness, with rubber aggregates mortar; two-component grout coat and two-component clear coat. Meet or exceed the following physical properties when tested in accordance with the cited referenced standard test method. **Not Epoxy**

1. Tensile Strength (ASTM C307): 1200 psi.

2. Surface Hardness (ASTM D2240, Shore A): 85

3. Percent elongation (ASTM D638): 150 percent

4. Impact Resistance (ASTM D2794): greater than 60 inch/pounds

5. Static Load Limit (ASTM F970, 125-pound load): 0.002 inch

6. Residual Indentation (ASTM F1914): Less than 1 percent

7. Abrasion Resistance (ASTM D4060): 0.3 gm

8. Flammability-Critical Radiant Flux (ASTM E648): Class 1

9. Slip resistance (ASTM F1679): 0.6 Dry

10. Color: as selected by Architect from manufacturer's full range of available colors.

2.2 MATERIALS

A. {AquArmor Ceramic Carpet Decorative Flooring System as manufactured by Sherwin Williams - General Polymers., Cincinnati, OH, is a nominal 1-8 inch - 3/16-inch-thick system which produces a chemical resistant, tough, cleanable finish for floors.

B. Flooring System:

1. Primer:

a.	3460 plus 20 percent potable		250 sq. ft./gal water (6-8 Mils WFT)

2. Slurry at 1/8 inch:

a.	3460	1:4	100 sq. ft/2.5 gal.
b.	5150		27-30 lbs/2.5 gal.
c.	5900F	To Excess	0.6 lbs/sq.ft.

3. Bonding/Broadcast:

a.	3561	4:1	65-70 sq. ft./gal
b.	5900F	To Excess	0.4 lbs/sq.ft.

4. Grout:

a.	3745	2:1	100 sq. ft./gal Premeasured unit

5. Topcoat:

a.	3745	2:1	200 sq. ft./gal Premeasured units

2.3 ACCESSORIES

A. Waterproofing Membrane: Type recommended or produced by manufacturer for flooring system, for type of service and floor condition indicated. Fluid-Applied, Dex-O-Tex Cheminert SC Membrane or equal. [[not needed for Tera-Lite III]]

1. Primer: Manufacturer's standard.

2. [Option: Fabric reinforcement place in wet membrane and top coated.]

B. Anti-Microbial Additive: Incorporate antimicrobial chemical additive to prevent growth of most bacteria, fungi, algae and actinomycetes.

C. Vapor Control System: per Section 09 05 61 Common Work Results for Flooring Preparation [Tera-Lite III; Aquafin Vaportight Coat-SG3, epoxy-based].

D. Primer: Manufacturer's bond coat.

E. Floor transitions: Saw cut concrete and chamfer (key in edge) to match level of existing flooring [Specified in Section 09 65 13].

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify Site conditions are ready for the work of this Section. Notify Architect and Inspector of Record at least 48-hours prior to installation of testing and at conclusion of tests.

1. Concrete shall be cured minimum 28 days prior to application of sealer.

2. Conduct ASTM F1869 calcium chloride dome tests to verify that concrete floors are dry within moisture vapor emissions limits of flooring system manufacturer. Set one test for each 1,000 sf. of floor area but at least in four (4) in each different areas or location.

3. Conduct ASTM F710 alkalinity testing of concrete substrate; pH levels shall not exceed the recommendations of the floor coating manufacturer, the adhesive manufacturer, or both.

4. Conduct Relative Humidity Test Method in accordance with ASTM F2170 with a Wagner Rapid RH probe to verify relative humidity and surface pH, ASTM F710, of concrete floor slabs, the method requires drilling holes at diameter not to exceed outside diameter of probe by more than 0.04 inch to depth equal to 40 percent of slab's thickness (elevated structural slab shall be tested at depth equal to 20 percent of slab thickness).

   a. Place probe to full depth of test hole, place cap over probe.

   b. Permit test site to acclimate, or equilibrate, for 72 hours prior to taking relative humidity readings.

   c. Remove cap and press button on the probe to obtain reading.

   d. Relative humidity readings for substrates receiving non-permeable flooring are 75 percent or lower.

   e. Testing shall require three (3) tests in first 1,000 square feet, with one additional test per each additional 1,000 square feet of concrete slab surface.

   f. Alkalinity Testing: follow procedures per ASTM F710, ranges shall not exceed those recommended by the flooring manufacturer.

B. Do not begin installation until unsatisfactory conditions are corrected. Beginning installation means acceptance of existing conditions and preparatory work of others.

3.2 PREPARATION

A. Install Vapor Emission Treatment Systems per Section 09 05 61 where tests reveal presence of more than acceptable moisture level in accordance with Test Method ASTM F1869 and ASTM F2170.

B. Clean substrate; remove dirt, oil, grease, construction markings, and foreign matter that could adversely affect floor coating appearance or performance.

1. Surface shall be free of soil, dust, base material, oil, grease, paint, curing compounds and other foreign matter.

2. Surface shall be cleaned and allowed to dry thoroughly. Cleanse dirty or contaminated floors with approved cleaner as per manufacturer's instructions. Rinse thoroughly with clean water.

3. Contaminated Concrete Surfaces: clean concrete surfaces by sandblasting, steel shot-blasted, scarified, water blasted, or other approved technique by the flooring manufacturer.

C. Repair minor defects. The substrate was prepared under Sections 03 30 00; remove ridges, fill depressions and repair cracks as required by floor coating manufacturer to execute specified warranty.

1. Apply, trowel and float filler to leave a smooth, flat, hard surface, free of bumps or depressions of any size.

2. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Apply primer as recommended by the materials manufacturer.

F. Install waterproof membrane per manufacturer's recommendations.

3.3 INSTALLATION

A. Mix components according to manufacturer's recommendations.

B. Apply primer (bonding coat) per manufacturer's recommendation.

C. Trowel apply ¼ inch [1/4 inch for Terracolor] thick body coat. Build-up in minimum of two (2) coats.

D. {Body Coat: Over prepared surface, screed mortar mix at nominal ¼ inch thickness. Allow material flow out and being to settle. Back roll with a spike roller or looped roller to distribute material smooth even finish.}

E. Slip Resistant Finish:

1. Broadcast slip resistant finish into wet coating at rate recommended by manufacturer to achieve specified coefficient of friction. Backroll to encapsulate and distribute aggregate.

2. Remove Excess Aggregate: Remove all loose or unsound aggregate from the cured surface. Vacuum up all dust and fine particles from the surface, remove any ridge lines and detail all imperfection in the textured surface.

3. [In kitchen and food service areas, scheduled for this flooring, apply slip resistant finish only in traffic areas of floor. Do not apply slip resistant finish in locations that will be under equipment, furnishings or fixtures and similar difficult to clean locations.

4. [Power sand to remove trowel marks.

F. [[Sealer: Apply two (2) seal coats using the base coat liquid components. Sand between coats. Apply the first seal coat. Let the surface set. Mix and place the second seal coat similarly to the first coat, application rate approximately 125 sq. ft. per gallon. During second seal coat broadcast a graded silica aggregate for anti-skid and backroll.]] ****No sealer required for Tek-Crete SL*****

G. {Pigmented Sealer for Tek-Crete SL B: Dex-O-Tex Quik-Glaze, apply over slurry mortar.}

H. Integral Base Application: Apply vertical areas with same materials or base material specified. Height of integral base application: 6 inches, including ½ inch coved radius, unless otherwise indicated. Mask off base to provide a straight, neat, level top edge.

I. Apply clear sealer, or pigmented where scheduled, top coat per manufacturer's instructions.

3.4 PROTECTION

A. Protect finished installation from traffic until curing is complete.

END OF SECTION

SECTION 09 77 20 – FIBERGLASS REINFORCED PLASTIC (FRP) WALL PANELS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets adhered to unfinished gypsum wallboard, with PVC trim.

1.3 RELATED SECTIONS

A. Section 09 29 00 – Gypsum Board.

B. Section 09 65 13 – Resilient Wall Base and Accessories

C. Section 09 67 23 – Fluid-Applied Flooring – Epoxy.

D. Section 09 91 00 – Painting.

E. Division 22 – Plumbing, for Service Sinks.

1.4 REFERENCES

A. 2022 California Building Code, with Amendments.

B. ASTM International (ASTM):

1. ASTM D256 – Izod Impact Strengths

2. ASTM D570 – Water Absorption

3. ASTM D638 – Tensile Strengths & Tensile Modulus

4. ASTM D790 – Flexural Strengths & Flexural Modulus

5. ASTM D2583 – Barcol Hardness

6. ASTM D5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.

7. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's data to indicate compliance with these specifications, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site.

1.6 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:

1. Wall Required Rating: Class A (ASTM E84).

B. Sanitary Standards: System components and finishes to comply with:

1. Local Health Department requirements.

2. USDA.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with adequate heat (70°F) and ventilation consistent with good working conditions for finish work

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.

1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.9 WARRANTY

A. Furnish a one (1) year guarantee against defects in material and workmanship.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers include, but are not limited to, the following:

1. Marlite, Inc. (www.marlite.com)

2. Crane Composites, Inc. (www.cranecomposites.com)

2.2 PANELS

A. General: Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D5319.

B. Coating: Multi-layer print, primer and finish coats or applied over-layer.

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

D. Front Finish: As Indicated on the Drawings.

1. Color: Chosen from Manufacturer's Standard Colors.

2. Surface: Pebbled or Smooth.

3. Fire Rating: Class A (I) Fire Rating.

4. Size (nominal): 4'-0" W x 8'-0" L x 0.120"D or 4'-0" W x 10'-0" L x 0.120"D. Choose largest size to fit each installation location, minimizing seams.

E. Tolerance:

1. Length and Width: +/-1/8" (3.175mm)

2. Square: Not to exceed 1/8" for 8'-0" foot panels.

F. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.

1. Flexural Strength: 1.0 x 10^4 psi per ASTM D790.

2. Flexural Modulus: 3.1 x 10^5 psi per ASTM D790.

3. Tensile Strength: 7.0 x 10^3 psi per ASTM D638.

4. Tensile Modulus: 1.6 x 10^5 psi per ASTM D638.

5. Water Absorption: 0.72% per ASTM D570.

6. Barcol Hardness (scratch resistance): 40 per ASTM D2583.

7. Impact Strength: ASTM D5420, 12 in-lb (0.64 J), showing no visible damage on finish side.

2.3 MOLDINGS

A. PVC Trim: Thin-wall semi-rigid extruded PVC, designed to restrict the growth of mold or pathogens.

B. Corners / Corner Guards: As recommended by manufacturer and/or as shown on the plans.

2.4 ACCESSORIES

A. Fasteners: Non-staining nylon drive rivets (if required). Match Panel colors. Length to suite project conditions.

B. Adhesive: Adhesive as recommended by manufacturer. Adhesive to comply with ASTM C557.

C. Sealant: Clear or White.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

1. Verify that stud spacing does not exceed 24" on-center.

B. Repair defects prior to installation. Level wall surfaces to panel manufacturer’s requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8" clearance for every 8 foot of panel.

1. Cut and drill with carbide tipped saw blades or drill bits or cut with shears.

2. Pre-drill fastener holes 1/8" oversize with high speed drill bit.

a. Space at 8" max. on center at perimeter, approx. 1" from panel edge.

b. Space at in field in rows 16' on center, with fasteners spaced at 12" max. on center.

C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.

1. Install panels with manufacturer's recommended gap for panel field and corner joints.

    a. Adhesive trowel and application method to conform to adhesive manufacturer’s recommendations.

    b. Drive fasteners for snug fit. Do not over-tighten.

D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.

1. All moldings must provide for a minimum 1/8" (3mm) of panel expansion at joints and edges, to insure proper installation.

2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations. Do not use abrasive cleaners.

3.4 PROTECTION

A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 09 91 00 – PAINTING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: The following for priming and painting of all new construction as well as all of the dry rot repair areas noted in the plans, including, but not limited to:

1. Surface preparation.
2. Products and application.
3. Surface finish schedule.

B. Alternate # 1: Section 01 22 00 details Alternate # 1 which is to repaint the entire existing campus, as detailed and shown on the drawings. Also in this alternate, the General Contractor to provide credit from base bid the work for priming and painting of the dry rot repair areas noted on the plans.

C. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. 01 22 00 – Alternates and Unit Pricing.
3. 05 50 00 – Metal Fabrications.
4. 06 46 29 – Pre-Primed Wood Fascia.
5. 07 46 46 – Cementitious Soffit Panels.
6. 07 62 00 – Flashings and Sheet Metal.
7. 07 71 23 – Gutters and Related Flashings.
8. 08 11 13 – Hollow Metal Doors and Frames.
9. 08 31 00 – Access Doors and Panels.
10. 09 29 00 – Gypsum Board Assemblies.
11. Division 22 – Plumbing.
12. Division 23 – Mechanical.

1.2 REFERENCES

A. ASTM D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.

1.3 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. Preparation of all surfaces to receive final finish.

B. Painting and finishing work of this section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical work on site, in building spaces, and above or on the roof.

E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.

C. List each material by catalog number and cross-reference specific coating with specified finish system.

D. Provide manufacturer's certificate that products proposed meet or exceed specified materials.

E. Submit samples under provisions of Section 01 33 00.

F. Submit two (2) samples 8-1/2 x 11 inch in size of each paint color and texture applied to cardboard. Resubmit samples until acceptable color, sheen and texture is obtained.

G. On same species and quality of wood to be installed, submit two (2) 4 x 8-inch samples showing system to be used.

1.6 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five (5) years' experience.

B. Applicator: Company specializing in commercial painting and finishing with five (5) years documented experience.

C. Regulatory Requirements:

1. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.

2. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

3. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.

4. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.

5. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.

D. Field Samples:

1. Provide field samples under provisions of Section 01 33 00.

2. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 sq. ft. of surface area.

3. Provide full-coat finishes until required coverage, sheen; color and texture are obtained.

4. Simulate finished lighting conditions for review of field samples.

5. After finishes are accepted, the accepted surface may remain as part of the work and will be used to evaluate subsequent coating systems applications of a similar nature.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store and protect under provisions of Section 01 66 00.

B. Deliver products to site in sealed and labelled containers; inspect-to verify acceptance.

C. Full unopened 1 GAL can (new) - Container labelling to include paint Formula, manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.

D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:

1. Provide continuous ventilation and heating facilities to maintain interior surface and ambient temperatures above 50 degrees F with a maximum humidity level of 50 percent for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

2. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

3. Minimum Application Temperatures for Latex Paints: 50°F for interiors; 50°F for exterior; unless required otherwise by manufacturer's instructions.

4. Minimum Application Temperature for Varnish and Urethane Finishes: 65°F for interior or exterior, unless required otherwise by manufacturer's instructions.

5. Provide lighting level of 80 feet candles measured mid-height at substrate surface.

1.9 OWNER'S INSTRUCTIONS

A. Extra Material:

1. If product used was SCUSD Paint shop's #1 choice listed in these technical specs, please provide 1-quart only unopened container of each color and surface texture to Owner along with physical draw down and formula; however, if any other product other than our first choice is used, do not provide any attic stock and instead only provide physical draws with formula for each color used.

a. Separate draw downs and formula are required for each paint product, color, and sheen used.

2. Label each container with paint mixture formula, color, texture, and room locations in addition to the manufacturer's label.

1.10 WARRANTY

A. All "Deep Tone" colors shall be warranted for 10-year color retention with a delta loss of no more than 75 cie lab units.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Unless specifically identified otherwise, product designations included at end of section are those of the Dunn Edwards, www.dunnedwards.com and shall serve as the standard for kind, quality, and function.

B. Subject to compliance with requirements, other manufacturers offering equivalent products are:

1. Dunn Edwards, www.dunnedwards.com.

2. Kelly Moore, https://kellymoore.com/professional/contractors/

3. Sherwin Williams, https://www.sherwin-williams.com/painting-contractors/project-solutions/commercial

C. Substitutions: Under provisions of Section 01 25 13.

2.2 MATERIALS

A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. "Deep Tone" colors to be composed of 100 percent acrylic pigments, factory ground, with a colored base.

D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

E. Chemical Components of Interior Paints and Coatings: Shall not exceed the limitations of Green Seal's Standard GS-11 for VOC content and the following restrictions:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.

2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.

3. Anticorrosive Coatings: VOC content of not more than 250 g/L.

F. Varnishes and Sanding Sealers: VOC content of not more than 350 g/L.

G. Stains: VOC content of not more than 250 g/L.

H. 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).

I. Restricted Components: Paints and coatings shall not contain any of the following:

1. Acrolein.
2. Acrylonitrile.
3. Antimony.
4. Benzene.

5. Butyl benzyl phthalate.
6. Cadmium.
7. Di (2-ethylhexyl) phthalate.
8. Di-n-butyl phthalate.
9. Di-n-octyl phthalate.
10. 1, 2-dichlorobenzene.
11. Diethyl phthalate.
12. Dimethyl phthalate.
13. Ethylbenzene.
14. Formaldehyde.
15. Hexavalent chromium.
16. Isophorone.
17. Lead.
18. Mercury.
19. Methyl ethyl ketone.
20. Methyl isobutyl ketone.
21. Methylene chloride.
22. Naphthalene.
23. Toluene (methylbenzene).
24. 1, 1, 1-trichloroethane.
25. Vinyl chloride.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.

4. Exterior Located Wood: 15 percent, measured in accordance with ASTM D2016.

a. Beginning of installation means acceptance of existing surfaces.

3.2 PREPARATION

A. Work Not to Be Painted:

1. Painting is not required on surfaces in concealed and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and

duct shafts.

2. Do not paint metal surfaces such as stainless steel, chromium plate, brass, bronze, and similar finished metal surfaces.

3. Do not paint anodized aluminum or other surfaces which are specified to be factory pre-finished.

4. Do not paint sandblasted or architecturally finished concrete surfaces.

5. Do not paint prefinished acoustic materials or acoustic suspension systems.

6. Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or identifications.

7. Do not paint exterior hot-dipped galvanized materials/products as specified elsewhere.

B. Surface Preparation:

1. Remove all tacks, stickers, staples adhesive glue, picture hangers, protruding nails, tape and adhesive glue, and all other foreign materials from surfaces prior to priming or painting. Mask off and protect existing room identification tags including Asbestos tags on door frames.

2. All exterior surfaces to be painted will be pressure washed to remove all loose paint, blisters, bridged cracks, surface-chalk and loose debris at no less than 3200-PSI, or sand blasted.

3. If prior is not possible, washing all surfaces with TSP made by Synco or Jasco, by hand means, scraping and sanding of all surfaces is required prior to pre-priming for proper patching and painting of surfaces.

4. Prior to any painting, any wood or metal deficiencies should be replaced including but not limited to, doors, facial boards, overhang wood, siding, trim etc.

5. All glossy surfaces WILL be sanded prior to any paint application. NO EXCEPTIONS.

6. Clean all roofing tar from facial boards and metal flashing etc.

7. All factory primed new material wood, metal etc, will be sanded prior to priming and painting.

8. All surfaces to be patched will be pre-primed with the proper material as per manufacture specifications for substrate.

9. Any efflorescence will be primed as per Dunn-Edwards EFF-Stop concrete and masonry filler manufactures specifications.

10. Wash all doors, casings and other surfaces with TSP made by Synco or Jasco to remove oily dirt, dust, smoke, and other residues that could prevent

proper adhesion of any paint products.

11. For all fillers and patching compounds used, surfaces will be primed before, after application, and before finish paint being applied.

12. Do not paint over all murals until artist waiver is filled out and provided. Please check with the SCUSD Paint Shop Supervisor before project starts.

13. All prep work will be done like the SCUSD standard NO EXCEPTIONS. This includes patching, scraping, sanding, caulking, and removal of all drips, sags, runs and removal of all foreign matter on or in painted surface.

14. All interior window trim, door trim, cabinets, cubbyholes, pin-board, counter tops in addition, wall panel joints shall be caulked.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply prime coat to surfaces which are to be painted or finished.

D. Apply each coat to uniform finish.

E. Sand lightly between coats to achieve required finish.

F. Allow applied coat to dry according to the Manufacturers Specifications before the next coat is applied.

G. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Prime back surfaces of interior and exterior woodwork with primer paint.

J. Prime back surfaces of interior woodwork scheduled to-receive stain or varnish finish with water-based Urethane varnish.

K. Paint mill finished door seals to match door or frame.

L. Paint primed steel glazing stops in doors to match door or frame.

M. Cloudiness, spotting, lap marks, brush marks, runs, sags, spikes and other surface imperfections will not be acceptable.

N. Where spray application is used, apply each coat of the required thickness. Do not double back to build up film thickness of two (2) coats in one pass.

O. Where roller application is used, roll and redistribute paint to an even and fine

texture. Leave no evidence of roller laps, irregularity of texture, skid marks, or other surface imperfections.

P. Finishing Mechanical and Electrical Equipment:

1. Refer to Division 23 and Division 26 for schedule of color coding and identification banding of equipment, ductwork, piping, and conduit.

2. Paint shop primed equipment. Do not paint shop prefinished items.

3. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

4. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

5. Replace identification markings on mechanical or electrical equipment when painted accidentally.

6. Paint interior surfaces of air ducts, and connector and baseboard heating cabinets that are visible through grilles and louvers with one (1) coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and connector and baseboard cabinets to match face panels.

7. Paint exposed conduit and electrical equipment occurring in finished areas with existing matching wall color.

8. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

9. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.

10. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

11. Paint grilles, registers, and diffusers which do not match color of adjacent surface.

12. Paint all mechanical and electrical equipment, vents, fans, and the like occurring on roof.

13. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts.

14. Do not paint over labels or equipment identification markings.

15. Do not paint mechanical room specialties such as compressors, boilers, pumps, control panels, etc.

16. Do not paint switch plates, light fixtures, and fixture lenses.

3.4 CONSTRUCTION

A. Priming:

1. All new or bare galvanized metal will first be etched and then primed with appropriate galvanized latex or oil base primer, use cleaner and primmer measures as per manufactures specification.
2. All door and Casings may be sprayed. Doors may also be tight rolled with a 3/8th inch nap roller. All casings to be brushed or laid off with a brush. ABSOLUTELY NO EXCEPTIONS.
3. All holes and cracks are to be filled with the proper exterior patching compound and latex caulking with silicone.
4. All rusty ferrous and ferrous metal are to be primed with a rust-inhibitive red, gray or white oxide all galvanized metal will be primed with a galvanized primer.

B. Finish Coat:

1. All existing walls and overhangs to be coated with 100% acrylic exterior eggshell exterior paint.
2. All fascia boards to be coated with 100% acrylic exterior semi-gloss paint.
3. All metal poles, ungalvanized OR painted handrails, and iron gates are to be finished in water-borne alkyd urethane semi-gloss finish paint.
4. All doors and casings to have water-borne alkyd urethane finish, including tops, bottoms, and proper edges of doors and casings according to trade standards. All doors can be sprayed or tight rolled with a 3/8th inch nap roller or sprayed. All Casings must have sprayed or brushed finishes. NO EXCEPTIONS.
5. All concrete pillars are to be done in water-borne alkyd urethane semi-gloss paint.
6. All trim finishes are to be done in water-borne alkyd urethane semi-gloss paint.
7. All colors and product material to be used are to be APPROVED by the SCUSD paint shop Supervisor before application NO EXCEPTIONS.
8. Interior lower walls below door header to be painted with water-borne alkyd urethane.
9. Interior doors, door trim and painted cabinets to be painted with water-borne alkyd urethane.
10. Interior kitchens and baths to be painted with water-borne alkyd urethane.

3.5 REPAIR / RESTORATION

A. Patching:

1. After completion of painting in any one room or area, repair surfaces damaged by other trades.

2. Touch-up or re-finish as required to produce intended appearance.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 00.

B. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary.

C. The Owner will engage the services of an independent testing agency to sample paint material being used.

D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

E. The testing agency will perform appropriate quantitative materials analysis and other characteristic testing of materials as required by the Owner.

F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing and repaint surfaces to acceptable condition.

3.7 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.8 PROTECTION OF COMPLETED WORK

A. Protect finished installation under provisions of Division 01.

B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.

C. Confirm that no dust generating activities will occur following application of coatings.

3.9 SCHEDULES

A. Color Schedule:

1. Three (3) colors shall be used; colors shall be selected by Owner / Architect:

   a. Color # 1 – Dark Tone: Fascia, trim, gutters, downspouts, doors, door frames.

   b. Color # 2 – Light Tone: Soffits

   c. Color # 3 – Light / Mid Tone: Building Walls, Siding, Stucco.

B. Color Schedule Guidelines:

1. Paint and finish colors shall be selected by the Architect from manufacturer's entire range to match District standard colors or compliment those colors with the approval of the SCUSD Paint Shop Supervisor.

2. Access doors, registers, exposed piping, electrical conduit and mechanical/electrical panels: Generally, the same color as adjacent walls.

3. Exterior and interior steel doors, frames and trim: Generally, a contrasting color to adjacent walls.

4. Doors generally are all the same color, but of a contrasting color from frame and trim.

5. Exterior and interior steel fabrications: Generally, a contrasting color to adjacent walls.

6. Exposed interior mechanical/ductwork: Generally, a contrasting color to adjacent walls or ceiling.

7. Ceilings / soffits are generally to be painted a different color than walls.

8. Approximately 20 percent of overall painting work will be required to be "Deep Tone" colors. This work will require one (1) additional coat of paint beyond that as specified.

9. All existing walls and overhangs to be painted should be as determined in this section.

10. All fascia boards should be painted as determined in this section. Please check with SCUSD Paint Shop Supervisor for correct formula.

11. Exterior Body color to be as determined in this section; some school colors to be determined. Check with SCUSD paint shop Supervisor. Exterior trim colors to be determined by SCUSD paint shop Supervisor and school site.

12. Interior kitchens and baths to be painted to match existing paint finish material.

13. All pin boards if not replaced or re-covered with appropriate material, shall be patched then painted with SCUSD approved pin board paint and color.

C. Exterior Painting Schedule:

1. Concrete Substrates, Masonry, Clay, Stucco, Non-Traffic Surfaces:

a. Prime Coat: Primer, alkali resistant, waterbased, interior/exterior, Dunn-Edwards, Eff-Stop Premium, ESPR00.

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield, EVSH30, 100% acrylic, (Gloss Level 3).

or

d. Topcoat: Latex, exterior, low sheen, Dunn-Edwards, Evershield, EVSH40, 100% acrylic, (Gloss Level 4).

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).

or

f. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

g. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

2. CMU Substrates:

a. Prime Coat: Block filler, latex, interior/exterior, Dunn-Edwards, Smooth BLOCFIL Select SBSL00 or Eff-Stop Premium ESPR00.

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield, EVSH30, 100% acrylic, (Gloss Level 3).

or

d. Topcoat: Latex, exterior, low sheen, Dunn-Edwards, Evershield, EVSH40, 100% acrylic, (Gloss Level 4).

3. Wood Substrates:

a. Prime Coat: Primer, waterbased, exterior, Dunn-Edwards, Ultra-Grip Premium UGPR00 or EZ-Prime Premium EZPR00

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield, EVSH30, 100% acrylic, (Gloss Level 3).

or

d. Topcoat: Latex, exterior, low sheen, Dunn-Edwards, Evershield, EVSH40, 100% acrylic, (Gloss Level 4).

or

e. Topcoat: Latex, exterior, semi-gloss, Dunn-Edwards, Evershield, EVSH50, 100% acrylic, (Gloss Level 5).

4. Ferrous Metal Substrates: Waterborne Urethane Alkyd Enamel System:

a. Prime Coat: Primer, rust inhibitive, waterborne alkyd, interior/exterior, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series or Enduraprime rust preventative primer ENPR00.

b. Intermediate Coat: Waterborne urethane alkyd, interior/exterior matching topcoat.

c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).

or

d. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

5. Non-Ferrous Metal Substrates: Waterborne Urethane Alkyd Enamel over a Latex Primer System:

a. Prime Coat: Primer, waterbased, interior/exterior, Dunn-Edwards Ultrashield Galvanized Metal Primer ULGM00.

b. Intermediate Coat: Waterborne urethane alkyd, interior/exterior, matching topcoat.

c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).

or

d. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

D. Interior Painting Schedule:

1. Gypsum Board Substrates:

a. Prime Coat: Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Select VNSL00.

b. Intermediate Coat: Latex, interior, matching topcoat

c. Topcoat: Latex, interior/exterior, eggshell, Dunn-Edwards, Evershield, EVSH30, (Gloss Level 3).

or

d. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell,

Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

f. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

2. Wood Substrates:

a. Prime Coat: Primer, acrylic, for interior wood, Dunn-Edwards, Ultra-Grip Select UGSL00 or Dunn-Edwards, Decoprime DCPR00.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3)

or

d. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

3. Ferrous Metal Substrates: Ultra-Premium Low Odor / Zero VOC Latex over a Waterborne Alkyd Primer System:

a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series or Enduraprime rust preventative primer ENPR00.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3)

or

d. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

4. Non-Ferrous Metal Substrates:

a. Pre-Treatment: Water based, Krud Kutter, Metal Clean & Etch SCME-01

b. Prime Coat: Primer, water based, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00.

c. Intermediate Coat: Latex, interior, matching topcoat.

d. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3)

or

e. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

or

f. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

Cross-Over Chart			
Paint Type	**Dunn-Edwards BOD**	**Kelly Moore**	**Sherwin Williams**
100% Acrylic Eggshell Exterior Paint	EVSH30 Evershield 100% Acrylic	1294 Envy Exterior 100% Acrylic	KxxW000xx Series Emerald Exterior Acrylic Latex
100% Acrylic Low Sheen Exterior Paint	EVSH40 Evershield 100% Acrylic	1294 Envy Exterior 100% Acrylic	KxxW000xx Series Emerald Exterior Acrylic Latex
100% Acrylic Semi-Gloss Exterior Paint	EVSH50 Evershield 100% Acrylic	1298 Envy Exterior 100% Acrylic	KxxW000xx Series Emerald Exterior Acrylic Latex
Water-Borne Alkyd Urethane Eggshell Interior/Exterior Paint	ASHL30 Aristoshield Urethane Alkyd	1997 Epic Urethane Alkyd Enamel	KxxW0xxxx Series Emerald Urethane Trim Enamel
Water-Borne Alkyd Urethane Low Sheen Interior/Exterior Paint	ASHL40 Aristoshield Urethane Alkyd	1997 Epic Urethane Alkyd Enamel	KxxW0xxxx Series Emerald Urethane Trim Enamel
Water-Borne Alkyd Urethane Semi-Gloss Interior/Exterior Paint	ASHL50 Aristoshield Urethane Alkyd	1998 Epic Urethane Alkyd Enamel	KxxW0xxxx Series Emerald Urethane Trim Enamel

END OF SECTION

DIVISION 10 – SPECIALTIES

10 14 23 – Signage
10 21 13 – Toilet Compartments and Cubicles
10 28 00 – Toilet, Bath, and Washroom Accessories
10 28 23 – Janitorial Accessories

PAGE INTENTIONALLY LEFT BLANK.

SECTION 10 14 23 – SIGNAGE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic signs at building entrances, classrooms, restrooms, and as identified on drawings.

B. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Section 08 11 13 – Hollow Metal Doors and Frames.

3. Section 09 29 00 – Gypsum Board Assemblies.

4. Divisions 22, 23 and 26 for Mechanical and Electrical Identification and Signs.

1.2 REFERENCES

A. Accessible signs shall conform with the following requirements as indicated:

1. California Building Code (CBC) Title 24, 2022 Edition.

2. ADA Accessibility Guidelines (ADAAG, latest adopted edition).

3. Contracted Grade 2 Braille shall be used whenever Braille symbols are specifically required (CBC Section 11B-703.3 Braille).

4. Means of Egress Identification: CBC 11B-216.4 & 11B-703.1.

5. Tactile Exit Signs: CBC 1013.4.

6. Restroom Identification Symbols: CBC 11B-216.8 & 11B-703.7.2.6.

7. Signs and Identification: CBC 11B-216.1 & 11B-703.1.

8. International Symbol of Accessibility: CBC 11B-703.7.2.1.

9. Direction and Information Signs: CBC 11B-703.1.

10. Symbols of Accessibility: CBC 11B-703.7.

11. Finish and Contrast: CBC 11B-703.5.1.

12. Character Proportions: CBC 11B-703.2.4.

13. Character Height: CBC 11B-703.2.5.

14. Raised Characters and Pictorial Symbol Signs: CBC 11B-703.2 & 11B-703.6.

15. Braille: CBC 11B-703.3.

16. Mounting Height and Location: CBC 11B-703.4.1 & 11B-703.4.2.

17. Symbols of Accessibility: CBC 11B-703.7.2.

18. Color of Accessibility Symbol: CBC 11B-703.7.2.1.

19. Entrance Signs: CBC 11B-216.6.

B. ASTM D4802 – Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.

C. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop drawings listing sign styles, lettering and locations and overall dimensions of each sign.

C. Two (2) samples illustrating full size sample sign with tactile characters, Braille and subsurface text or pictogram to demonstrate fabrication technique and Braille measurements which shall be used on proposed project.

D. Letters samples: 1-inch-high letters for proportions required in REGULATORY REQUIREMENTS.

E. Submit manufacturer's technical data and installation for each type of sign required.

F. Submit samples of background colors, character colors, and one-inch high print outs of "I," "O" and "X" from proposed type styles. Indicate which type styles shall be used for required tactile characters and for required visual characters.

G. Submit proposed sign schedule to comply with scoping requirements above.

H. All signage shall be designed and constructed to comply with signage specifications and drawings.

1.4 QUALITY ASSURANCE

A. Pre-installation Meeting:

1. Notify Architect when signs are ready for installation. Arrange for conference at job site. Do not proceed with installation until Architect's approval of specific locations and methods of attachment has been obtained.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and protect from damage. Store until immediately prior to Notice of Completion.

B. Manufacturers shall submit 3 references showing products for projects completed within the last 6 years. Both tactile and non-tactile signage shall be included in the work.

C. Manufacture's Two-Year Warranties.

1. Contractor shall provide labor and materials to repair or replace defective signs a directed by Owner. Defects shall include:

a. Tactile characters and/or Braille dots which come off or are removed.

b. Discoloration, wear and scratching off of the surface color.

D. All signs and sign components, except for damage by mishandling by Owner, including installation by Owner, or vandalism.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products of following manufacturers form basis for design and quality intended.

1. Gravotech. www.gravotech.com

2. Or approved equal.

2.2 MATERIALS

A. Plastic Signs:

1. ADA Tactile and Braille Signs: Sand-Carved signs; thermosetting high-pressure laminate using Graphic Process Sand-Carved signs, exterior-grade, graphics, Braille and tactile copy required. Square corners, square cut eased corners and edges per CBC 11B-703.7.2.6.4.

a. Unframed Signs: GTAC-INT sign material as manufactured by Gravotac. Sized as required for text or room number.

b. Framed Signs: Single piece Modular Frames, concealed screw mounting, by Gravotac or equal.

c. ADA TactManufacturer's standard process for producing copy complying with CBC and ADA Accessibility Guidelines. Text shall be

accompanied by California Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks, permanently fused to substrate.

d. Raised-Copy Thickness: Not less than 1/32 inch.

2. Non-Tactile Signs: Cast Acrylic Plastic Sheet; ASTM D4802 Category A-1, 1/4-inch overall thickness, laminated acrylic plastic sheets, Sub-surface Screened process graphics and symbols, exterior-grade at exterior locations, square 3/8-inch radius corners, square cut edge, drilled holes for countersunk screws, polished edges.

a. Unframed Signs: As noted above.

b. Framed Signs: 1/16 inch [1/8 inch] thick aluminum. [Square] [3/8 inch] [1/2 inch] [9/16 inch] radius corners.

c. Finish: black [satin silver] [satin gold] [bronze] anodized OR Powder coated with color to be selected by Architect.

3. Apply UV inhibitor overcoat for exterior signs.

4. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Aluminum Signs:

1. Aluminum Sheet for Anodic Finish: Alloy 5005-H32 per ASTM B209 in 0.102-inch thickness.

2. Framing Members and Posts: Special extrusions Alloy 6063-T5 per ASTM B221.

3. Aluminum sheet with die-raised copy, anodic finish applied before fabrication. Background finish enamel applied after fabrication. Color as selected by Architect from manufacturer's standard range of colors.

4. Fabrication: Raised copy, Tactile and Braille.

C. Stainless Steel Signs:

1. Stainless-Steel Plate, Sheet, and Strip: Provide stainless-steel plate, sheet, and strip, Type 302 or Type 304, complying with ASTM A666.

2. Fabrication: Raised copy, Tactile and Braille.

D. Chemically Deep-etched Zinc Signs:

1. Solid metal plate: 0.125 [0.40] [0.064] [0.153] [0.250] inch thick.

2. Fabrication: Raised copy, Tactile and Braille.

3. Finish: matte [semigloss] [gloss] [exterior gloss] sheen.

4. Background: swirl-brushed [sandblast] [painted] [plated] zinc background finish.

5. Factory applied color finishes, minimum two (2) colors. Colors: As selected by Architect.

6. For Sizes and Dimensions verify with Architect.

7. Rounded corners, 7/16-inch radius.

8. Square edges.

9. Etch depth: 0.08 inch

10. Concealed Mounting: welded studs [drilled and tapped holes]

11. Mounting Holes: Drilled and countersunk.

E. Fasteners: Stainless steel screws, flat head, pin-in-head torx screws for vandal-proof and clear silicone adhesive.

F. Lettering Type Style: Helvetica Regular, uppercase letters only, refer to REGULATORY REQUIREMENTS for letter-proportion compliance.

G. Restroom Signage:

1. Male Restroom Signage:

a. Doorways leading to male restrooms shall be identified by equilateral triangle 1/4 inch thick with edges 12 inches long, with vertex pointing upward in contrasting color from door color. Sign shall be mounted in center of door 60 inches from finish floor to center of sign.

b. Room shall be further identified by rectangular room identification sign 1/4 inch thick, 8 inch Height by 6 inch Length minimum unless indicated on Drawings upon which appears a male pictogram 6 inches high, and the word “MEN” immediately below on the same sign in contrasting color. Letters: 5/8 inches minimum and 2 inches maximum high in contrasting color, raised minimum 1/32 inch fully tactile, accompanied by the California Contracted Grade 2 Braille indicator immediately below. Sign shall be located on wall on latch side of door, 60 inches from finish floor to center of sign, centered horizontally within 18-inch space adjacent to latch side of door or on nearest adjacent wall.

c. Conform to all CBC requirements, CBC 11B.703.1 and 11B-703.7.2.6.1.

2. Female Restroom Signage:

   a. Doorways leading to female restrooms shall be identified by circle 1/4 inch thick 12 inches in diameter circle in contrasting color from door color. Sign shall be mounted in center of door, 60 inches from finish floor to center of sign.

   b. Room shall be further identified by rectangular room identification sign 1/4 inch thick, 8-inch Height by 6-inch Length minimum unless indicated on Drawings upon which appears a female pictogram 6 inches high, and the word "WOMEN" immediately below on the same sign in contrasting color. Letters: 5/8 inches minimum and 2 inches maximum high in contrasting color, raised minimum 1/32 inch fully tactile, accompanied by the California Contracted Grade 2 Braille indicator immediately below. Sign shall be located on wall on latch side of door, 60 inches from finish floor to center of sign, centered horizontally within 18-inch space adjacent to latch side of door or on nearest adjacent wall.

   c. Conform to all CBC requirements, CBC 11B.703.1 and 11B-703.7.2.6.2.

3. Gender Neutral Restroom:

   a. Doorways leading to unisex restrooms shall be identified by circle 1/4 inch thick, 12 inches in diameter with 1/4-inch-thick triangle superimposed on circle and within 12-inch diameter, total 1/2 inch thick in contrasting color from door color. Sign shall be mounted in center of door 60 inches from finish floor to center of sign. Color of triangle shall have 70 percent minimum contrast with color of circle.

   b. Room shall be further identified by rectangular room identification sign 1/4 inch thick, 8-inch Height by 6-inch Length minimum unless indicated on Drawings upon which appear as male and female pictograms and the word "RESTROOM" immediately below on the same sign in contrasting color. Letters: 5/8 inches minimum and 2 inches maximum high in contrasting color, raised minimum 1/32 inch fully tactile, accompanied by California Contracted Grade 2 Braille indicator immediately below, on same sign. The sign shall be located on wall on latch side of door, 60 inches from finish floor to center of sign, centered horizontally within 18-inch space adjacent to latch side of door or on nearest adjacent wall.

   c. Conform to all CBC requirement, CBC 11B.703.1 and 11B-703.7.2.6.3.

4. Restroom signs – Non-Wheelchair Accessible:

   a. Provide restroom signs with similar font, size and fabrication as accessible signs without the ISA (International Symbol of Accessible) and without tactile construction.

b. Next to the Non-Wheelchair Accessible sign provide an additional sign same construction, with the wording: “WHEELCHAIR ACCESSIBLE RESTROOM LOCATED” with ARROW below the wording directing to the nearest location.

5. Substitute "BOYS" or "GIRLS" where appropriate.

2.3 FABRICATION

A. Regulatory Requirements:

1. Tactile Character Type: Tactile characters on signs shall be raised 1/32-inch (0.794 mm) minimum and shall be sans serif uppercase characters accompanied by Contracted (Grade 2) Braille. Helvetica Regular, uppercase letters only, refer to REGULATORY REQUIREMENTS for letter-proportion compliance. Italic, oblique script, highly decorative or unusual style forms not permitted. CBC Section 11B-703.2. Fabricate sign so that raised letter cannot be peeled off.

2. Character Proportions: Raised characters on signs shall be selected from fonts where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the uppercase letter “I”.

3. Tactile Character Height: Raised characters shall be a minimum of 5/8 inch (15.9 mm) and a maximum of 2 inches (51 mm) high. CBC Section 11B-703.2.5.

4. Stroke thickness of the uppercase letter “I” shall be 15 percent maximum of the height of the character. CBC Section 11B-703.2.6.

5. Character spacing measured between the two closest points of adjacent raised characters within a message. Where characters have rectangular cross sections, spacing shall be 1/8 inch minimum and four (4) times the stroke width, maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch minimum and four (4) times the stroke width maximum at the base of the cross sections, and 1/8 inch minimum and four (4) times the stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch minimum.

6. 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.

7. Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background. Provide white characters on Navy Blue background to match District standard.

8. Braille: California (Contracted) Grade 2 Braille. Dot base diameter shall be 0.059 inch (1.5 mm) to 0.063 inch (1.6 mm). Dots shall be 0.100-inch (2.5 mm) on center in each cell with 0.300-inch (7.6 mm) space between corresponding dots in ad-jacent cells. Distance between corresponding dots

from one cell directly below, 0.395 to 0.400 inch. Dots shall be raised 0.025 to 0.037 inch above the background. Braille dots shall be domed or rounded.

9. Polish all edges.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work.

B. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

A. Install signs only after surfaces are finished, in all restrooms, in center of door, or on wall adjacent to latch side as specified herein.

B. Mounting:

1. Mounting Height and Location: Signs with raised characters and Braille shall be located 48 inches minimum to the baseline of the lowest line of Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surfaces. Mounting location shall be located so that a clear space of 18 inch minimum by minimum by 18 inch minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45-degree open position. CBC Section 11B-703.4.

2. Tactile Plastic Signs: Stainless steel screws (not just adhesive), pin torx, vandal-proof screw appropriate for substrate.

3. Non-tactile Plastic Signs:

a. Install with four (4) stainless steel countersunk flathead screws, pin torx, vandal-proof. Pre-drill holes to prevent breaking plastic, use countersunk drill bits to flush screw head with sign surface.

b. If required for proper installation and/or as approved by District, install with clear silicone adhesive meeting ASTM C834, with zero clearance between plastic and face of substrate. Double face adhesive tape not permitted.

c. Metal Signs: Install with four (4) flathead countersunk No. 8 stainless steel vandal-proof screws at pre-drilled holes, top of screw heads shall flush with sign surface, concealed mounting.

C. Clean and polish.

3.3 FIELD QUALITY CONTROL

A. DSA Inspections: Signs and identifications or other information shall be field inspected after installation and approved by Division of the State Architect prior to the

issuance of a final certificate of occupancy, or final approval where no certificate of occupancy is issued. The inspection shall include, but not limited to, verification (after installation) that Braille dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with CBC, Section 11B-703.1.1.2.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 10 21 13 – TOILET COMPARTMENTS AND CUBICLES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Toilet Compartments.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 06 10 00 – Rough Carpentry.

C. Section 09 29 00 – Gypsum Board.

D. Section 09 67 23 – Decorative Flake Troweled Mortar System

E. Section 09 67 24 – Decorative Flake Mortar Flooring System

F. Section 09 67 25 – Decorative Interior Wall Surfacing System.

G. Section 10 28 00 – Toilet, Bath, and Washroom Accessories.

1.3 REFERENCES

A. National Fire Protection Association 101 Life Safety Code, Chapters 5, 6, 8-30.

B. ANSI A117.1: Accessible and Usable Buildings and Facilities.

C. Title 24, California Code of Regulations, Parts 2, 3, and 5.

D. ADA, Accessibility Guidelines for Buildings and Facilities, Federal Register Volume 56, Number 144, Rules and Regulations.

E. US Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Program.

F. ASTM International (ASTM):

1. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

3. ASTM D2197 – Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.

4. ASTM D6578 – Standard Practice for Determination of Graffiti Resistance.

1.4 PERFORMANCE REQUIREMENTS

A. Graffiti Resistance: Partition material shall have the following graffiti removal characteristics when tested in accordance with ASTM D6578 Standard Practice for Determination of Graffiti Resistance in accordance with Section 9, “Graffiti Removal Procedure Using Manual Solvent Rubs”:

1. Cleanability: Five (5) required staining agents shall be cleaned off material.

B. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2197 Standard Test Method for Adhesion of Organic Coating by Scrape Adhesion, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester:

1. Scratch Resistance: Maximum Load Value shall exceed 10 kilograms.

C. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2794 Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact), using .625" hemispherical indenter with 2-lb impact weight:

1. Impact Resistance: Maximum Impact Force value shall exceed 30 inch-lbs.

D. Fire Resistance: Partition material shall comply with the following requirements, when tested in accordance with ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials:

1. Smoke Developed Index: Not to exceed 450.

2. Flame Spread Index: Not to exceed 75.

3. Material Fire Ratings:

a. National Fire Protection Association (NFPA): Class B.

b. International Code Council (ICC): Class B.

1.5 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Manufacturer’s Data:

1. Product data sheets.

2. Installation instructions.

3. Cleaning and maintenance instructions.

4. Replacement parts information.

C. Shop Drawings:

1. Provide required number of copies of all shop drawings.

2. Show fabrication and erection of compartment assemblies, to extent not fully described by manufacturer's data sheets.

3. Show anchorage, accessory items and finishes.

4. Provide location drawings for bolt hole locations in supporting members for attachment of compartments.

D. Samples:

1. Furnish scale model of compartments, including stile, shoe, door, door hardware, divider panel, and mounting brackets.

2. Furnish sections showing stile anchoring and leveling devices, concealed threaded inserts, panel, stile, and edge construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver items in manufacturer's original unopened protective packaging.

B. Store materials in original protective packaging to prevent physical damage or wetting.

C. Handle so as to prevent damage to finished surfaces.

1.7 WARRANTY

A. Furnish ten-year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.

B. Furnish one-year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

1.8 ATTIC STOCK

A. Provide two additional latches and associated hardware per toilet room included in scope of work.

B. Provide one additional 12-inch-wide style per toilet room included in scope of work.

C. Provide one additional 36-inch-wide stall door per toilet room included in scope of work.

PART 2 – PRODUCTS

2.1 MANUFACTURER (DISTRICT STANDARD)

A. Model numbers for toilet partitions manufactured by Bobrick Washroom Equipment, Inc., represented by R. E. Edwards & Associates (925-829-2942), are listed to

establish a standard of quality for design, function, materials, workmanship, and appearance. Other manufacturers may be submitted for evaluation by the architect by following the conditions of the substitutions clause. Unless approval is obtained ten days prior to the bid date, all bids shall be based on the standard of quality. The architect shall be the sole judge as to the acceptability of all products submitted for substitution.

B. Toilet partitions shall be the product(s) of a single manufacturer.

2.2 MOUNTING CONFIGURATIONS

A. Toilet Partitions/Shower Dividers/Dressing Compartments shall be:

1. Overhead-Braced (1092.67 Sierra™ Series)

2.3 COMPONENTS/MATERIALS

A. Stiles, Panels, Doors, and Screens shall be all be manufactured from Solid Color Reinforced Composite material.

B. Toilet Partition Material:

1. Toilet partitions shall be constructed of Solid Color Reinforced Composite material, which is composed of dyes, organic fibrous material, and polycarbonate/phenolic resins. Material shall have a non-ghosting, graffiti-resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure. Edges of material shall be the same color as the surface.

2. Subject to compliance with the material performance requirements, toilet partitions manufactured by others may be constructed from Solid Surface materials including, but not limited to:

a. Dupont Corian Privacy Plus Partitions.
b. WilsonArt Solid Surface.

3. Toilet partitions constructed of High-Density Polyethylene (HDPE) or High-Density Polypropylene will not be acceptable.

C. Finish Thickness:

1. Stiles and doors shall be 3/4" (19 mm).

2. Panels and benches shall be 1/2" (13 mm).

D. Hardware:

1. All hardware shall be Bobrick “1092.67DS Optional Institutional Hardware”. Where Specifications and/or Drawings conflict with Bobrick “1092.67 Optional Institutional Hardware” requirements, the Bobrick “1092.67 Optional Institutional Hardware” requirements shall prevail.

2. Provide optional Door Plate Bobrick Part No. 1002510 at top and bottom of each partition door.

3. All hardware to be 18-8, type-304 stainless steel with satin finish.

4. Hardware of chrome-plated “Zamak”, aluminum, or plastic is unacceptable.

E. Latch:

1. Sliding door latch shall be 14 gauge (2 mm) and shall slide on nylon track.
2. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation will not be acceptable.

3. Latch track shall be attached to door by machine screws into factory-installed threaded brass inserts.

4. Threaded brass inserts shall be factory installed for door hinge and latch connections and shall withstand a direct pull exceeding 1,500 lbs. per insert.

5. Through bolted, stainless steel, pin-in-head Torx sex bolt fasteners shall be used at latch keeper-to-stile connections and shall withstand direct pull force exceeding 1,500 lbs. per fastener.

F. Hinges:

1. Hinge shall be 16-gauge (1.6-mm) continuous piano hinge.

2. All doors shall be equipped with self-closing hinge.

3. Continuous piano hinge shall be attached to door and stile by theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts

4. Fasteners secured directly into the core are not acceptable.

5. Door shall be furnished with two 11-gauge (3-mm) stainless steel door stop plates with attached rubber bumpers to resist door from being kicked in/out beyond stile.

6. Door stops and hinges shall be secured with stainless steel, pin-in-head Torx machine screws into threaded brass inserts.

7. Threaded brass inserts shall withstand a direct pull force exceeding 1,500 lbs per insert.

G. Mounting Bracket:

1. Mounting brackets shall be 18-gauge (1.2- mm) stainless steel and extend full height of panel.

2. U-channels shall be furnished to secure panels to stiles.

3. Angle brackets shall be furnished to secure stiles to walls and panels to walls.

4. Fasteners at locations connecting panels-to-stiles shall utilize through bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs. per fastener.

5. Wall mounted urinal screen brackets shall be 11 gauge (3 mm) double thickness.

H. Leveling Device: 7-gauge, 3/16" (5-mm) hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to base of solid color reinforced composite stile.

I. Stile Shoe: One-piece, 4" (102-mm) high, type-304, 22-gauge (0.8-mm) stainless steel with satin finish. Top shall have 90° return to stile. Shoe will be composed of one-piece of stainless steel and capable of being fastened (by clip) to stiles starting at wall line.

J. Headrail (Overhead Braced): Satin finish, extruded anodized aluminum (.125" / 3-mm thick) with anti-grip profile.

K. Full-Height Post: At all partition panels over 5’-0” in unsupported length, provide a full-height 1-1/4" x 1-1/4" stainless-steel post, Bobrick Part No. 1000070 and Anchor Package Part No. 1002703. Provide floor and ceiling saddles. Fasteners into concrete floor shall be stainless steel. The panel shall be anchored to post to help eliminate side to side flex of the panel. At locations where post is taller than 8'-0" and/or is in a high vandalism area, provide custom stainless steel post with slip-joint as detailed on drawings.

L. Grab Bar Anchors for Toilet Partitions: At all locations as shown on drawings where grab bars are mounted on partition system, provide Bobrick 2586 Series stainless steel backing plate.

M. Coat Hook:

1. Coat Hook shall Bobrick Model B-233 and be constructed of stainless steel and shall project no more than 1-1/8" (29 mm) from face of door.

2. Coat hook shall be secured by to door by through-bolted, theft-resistant, pin-in-head Torx stainless steel screws. Through-bolted fasteners shall withstand a direct pull force exceeding 1,500 lbs. per fastener.

3. Coat Hook shall act as door bumper on in-swing doors.

4. Mounting Height: 48" maximum above finished floor.

N. Door Pull: Accessible stall door shall have a compliant loop or U-shaped door pull on inside and outside of door immediately below latch.

O. Door Bumpers: Provide wall door bumper for all doors where partition door will impact wall finish. Wall bumper shall be equal to Trimco, Model No. 1270CVPV. Mount on wall at height to match partition door handle.

2.4 FABRICATION

A. Vandal-Resistant Hardware Option: for Institutional Hardware option add suffix .67 to 1092 Series.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Check areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.

B. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

C. Do not begin installation of compartments until conditions are satisfactory.

3.2 ERECTION

A. Install compartments rigidly, straight, plumb, and level and in accordance with manufacturer's installation instructions.

B. Installation methods shall conform to manufacturer's recommendation for backing and proper support.

C. Conceal evidence of drilling, cutting, and fitting to room finish.

D. Maintain uniform clearance at vertical edge of doors.

E. Attach panel brackets securely to walls using anchor devices. All anchors shall be into solid wood blocking. No plastic expansion sleeves will be accepted.

F. Attach panels and pilasters to bracket with through-sleeve tamperproof bolts and nuts.

G. Anchor urinal screen panels to walls with continuous panel brackets. At free end, provide full-height post as noted in Paragraph 2.3.K.

H. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

I. Equip each door with one hinge, one door latch, and one coat hook and bumper.

J. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.

K. Adjust hinges to locate doors in partial opening position when unlatched. Return outswing doors to close position.

L. Contractor shall install backing/blocking as required for secure attachment.

M. Confirm all locations of full-height post and provide blocking in ceiling space. Contractor shall open ceiling as required to install 4x4 blocking for attachment of post.

N. At locations of grab bars mounted on partition system, Contractor shall carefully measure and drill panels for grab bar anchors.

O. Where full-height stainless steel brackets extend above ceramic tile wainscot, provide plywood shim between wall and bracket to act as spacer. Shim shall be narrower than brackets to allow for sealant joint. After shim installation, provide sealant joint between wall and bracket to completely enclose edge of plywood.

3.3 ADJUSTMENT AND CLEANING

A. Adjust hardware for proper operation after installation.

B. Set hinge cam on in-swinging doors to hold doors open when unlatched.

C. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

D. Clean exposed surfaces of compartments, hardware, and fittings.

E. Remove protective maskings. Clean surfaces.

F. Field touch-up of scratches or damaged enamel finish will not be permitted.

G. Replace damaged or scratched materials with new materials.

END OF SECTION

SECTION 10 28 00 – TOILET, BATH, AND WASHROOM ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Toilet and bath, shower, and washroom accessories.

2. Framed mirror units.

3. Concealed anchor devices and backing plate reinforcements furnished to other Sections.

4. Attachment hardware.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 06 10 00 – Rough Carpentry.

C. Section 09 29 00 – Gypsum Board.

D. Section 09 67 25 – Decorative Interior Wall Surfacing System.

E. Section 10 21 13 – Toilet Compartments and Cubicles.

1.3 REFERENCES

A. ADAAG – Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CBC – California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

D. ASTM B456 – Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

E. ASTM A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00. Provide product data on accessories describing size, finish, details of function, attachment methods.

B. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

C. Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Conform to CBC, California Building Code, (CCR) Title 24, Part 2, and ADAAG or accessibility requirements.

2. Structural strength of grab bars, shower seats, fasteners and mounting devices shall conform to requirements of the CBC, California Building Code, (CCR) Title 24, Part 2, Section 1115B.8.3 and shall withstand the application of a 250 lb. point load.

B. Coordination:

1. Coordinate the work of this Section under provisions of Section 01 33 00.

2. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.6 WARRANTY

A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1-year warranty for materials and workmanship.

B. Manufacturer's Warranty for Electric Hand Dryers: Manufacturer's standard 10-year warranty on parts, except 3-year warranty on motor brushes from date of purchase.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Bobrick Washroom Equipment, Inc. (www.bobrick.com) (District standard)

B. American Specialties, Inc. (ASI) (www.americanspecialties.com)

C. Bradley Corporation (www.bradleycorp.com).

D. Deb.

E. Excel Dryer (www.exceldryer.com)

F. TORK.

G. Substitutions: Under provisions of Section 01 33 00.

2.2 MATERIALS

A. Sheet Steel.

B. Stainless Steel Sheet: Type 304.

C. Tubing: ASTM A269, stainless steel, Type 304.

D. Adhesive: Two component epoxy type waterproof.

E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Back paint components where contact is made with building finishes to prevent electrolysis.

E. Shop assemble components and package complete with anchors and fittings.

F. Provide steel anchor plates, adapters, and anchor components for installation.

G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

H. Toilet tissue dispensers located in accessible toilet rooms or stalls shall not have their flow restricted and shall be capable of continuous flow.

2.4 FINISHES

A. Galvanizing: ASTM A123 to 1.25 oz/sq yd.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats electrostatic baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.

E. Stainless Steel: No. 4 satin luster finish.

F. Mirror Glass: FS DD-G-451 Type I, Class 1, Quality of 2, 1/4 inch thick with silver coating, copper protective coating and non-metallic paint coating complying with FS DD-M-411.

G. Stainless Steel Mirror: Type 430, 20 gage, bright annealed stainless steel.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Accessories required to be accessible shall be mounted at heights according to CBC Section 1115B.9 and as indicated on the drawings.

D. Toilet paper dispensers and feminine napkin dispensers located on the grab bar side of an accessible toilet room or stall shall not project more than 3 inches from the finished surface of the wall nor be located closer than 1-1/2 inches clear of the tangent point of the grab bar.

E. Contractor shall install all necessary blocking, backing, and recessed openings for all toilet accessories.

F. At locations where grab bars are mounted to toilet partition material, provide optional anchor device, Bobrick #2586 at each flange.

G. Toilet Seat Cover Dispensers: Provide at staff toilet rooms or stalls, and at gender neutral toilet rooms only. Do not provide at student toilet rooms or stalls.

H. Sanitary Napkin Disposal: Provide at staff toilet rooms or stalls, at gender neutral toilet rooms, high school girls toilet rooms, and middle school girls toilet rooms.

I. Hand Dryers: Extend power to location of hand dryer and provide necessary backbox for connection. Provide in-wall blocking for unit support.

J. Keying Accessories:

1. Supply two keys for each accessory to Owner.

2. Master key all accessories.

3.4 SCHEDULE

ITEM	MANUFACTURER	MODEL	NOTES
Grab Bars	Bobrick	B-6808	Length as required
Toilet Paper Dispenser	Bobrick	B-2888	Surface mount
Toilet Paper Dispenser	Bobrick	B-3888	Semi-recessed
Feminine Napkin Disposal	Bobrick	B-270	Surface mount
Feminine Napkin Dispenser	Bobrick	B-3706	Semi-Recessed for new construction projects
Soap Dispenser	SC Johnson Professional	#91628	Black Proline Curve Dispenser Green Tip
Soap Dispenser Foam Soap	SC Johnson Professional	#32084	Stoko Refresh 800ml Refill
Electric Hand Dryer	Excel Dryer, Inc.	XLERATOR XL-W	120V. Provide at multi-use toilet rooms
Hand Dryer Recess Kit	Excel Dryer, Inc.	XLERATOR 40502	ADA Compliant Recess Kit
Hand Dryer Wall Guard	Excel Dryer, Inc.	XLERATOR 89S	Stainless Steel
Paper Towel Dispenser	Tork Matic	5510282	Provide at staff toilets and classroom sinks
Mirror (non-tilt)	Bobrick	B-290	Minimum size 18" x 36"
Toilet Seat Cover Dispenser	Bobrick	B-221	Provide at staff toilet rooms

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 10 28 23 – JANITORIAL ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Janitorial Accessories:

1. Utility Shelf with Mop and Broom Holders and Rag Hooks

1.3 RELATED REQUIREMENTS

A. Section 06 10 00 – Rough Carpentry.

B. Section 09 29 00 – Gypsum Board Assemblies.

C. Section 09 77 20 – Fiberglass Reinforced Plastic (FRP) Wall Panels.

D. Division 22 – Plumbing, for floor sink and connection to water.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets for each product specified, including the following:

1. Installation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Cleaning and maintenance instructions.
4. Replacement parts information.

B. Schedule: Submit a schedule, indicating the type and quantity to be installed in each janitor room. Use room numbers as indicated on the Drawings.

C. Setting Drawings: Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

1.5 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years' successful experience manufacturing similar products.

B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

C. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to 2022 CBC, ADA, and ICC/ANSI A117.1 requirements, as applicable.

1.6 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard 1-year warranty for materials and workmanship.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories which may be incorporated in the work include, but are not limited to, the following:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation
4. Pioneer Eclipse

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage (.034") minimum, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, ASTM B19; rods, shapes, forgings, and flat products with finished edges, ASTM B16; Castings, ASTM B30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A366, 20-gage (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B456, Type SC 2.

F. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

2.3 CUSTODIAL/JANITORIAL ACCESSORIES

A. Utility Shelf with Mop and Broom Holders and Rag Hooks:

1. Basis of Design: Bobrick Model B-224x36 with 4 mop/broom holders and 3 rag hooks.

2. Shelf: 18-8, Type 304, 18 gauge (1.2mm) stainless steel with satin finish; 8 inches (203mm) deep, 1-1/2 inch (38mm) return edge.

3. Length: 36 inches (915mm).

4. Mounting Brackets: Welded to shelf, 18-8, Type 304, 18 gauge (1.2mm) stainless steel with satin finish.

5. Mop and Broom Holders: Replaceable, spring-loaded rubber cams with anti-slip coating; accommodates handles from 7/8 inch to 1-1/4 inch (20mm to 30mm) in diameter; with plated steel retainers.

6. Rag Hooks: 18-8, Type 304, 16 gauge (1.6mm) stainless steel with satin finish; secured to shelf with rivets.

7. Drying Rod: 18-8, Type 304, 1/4 inch (6mm) diameter stainless steel with satin finish.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:

1. Verify blocking has been installed properly.

2. Verify location does not interfere with door swings or use of fixtures.

3. Comply with manufacturer's recommendations for backing and proper support.

4. Use fasteners and anchors suitable for substrate and project conditions

5. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.

6. Conceal evidence of drilling, cutting, and fitting to room finish.

7. Test for proper operation.

3.2 CLEANING AND PROTECTION

A. Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.

B. Touch-up, repair or replace damaged products until Substantial Completion.

3.3 SCHEDULES

A. For schedules, see plans.

END OF SECTION.

DIVISION 22 – PLUMBING

PAGE INTENTIONALLY LEFT BLANK.

SECTION 22 00 50 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Valve boxes.
2. Access Doors.
3. Insulation.

1.2 RELATED REQUIREMENTS

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

B. This Section is a part of each Division 22 Section.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.

B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.

C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.

1. CSA – Canadian Standards Association International.

2. ANSI – American National Standards Institute.

3. ASTM – ASTM International

4. CCR – California Code of Regulations.

a. Title 8 – Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.

5. NCPWB – National Certified Pipe Welding Bureau.

6. CEC – California Electrical Code.

7. NEMA – National Electrical Manufacturers' Association.

8. NFPA – National Fire Protection Association.

9. OSHA – Occupational Safety and Health Act.

10. UL – Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.

a. California Building Code, 2022.
b. California Electrical Code, 2022.
c. California Energy Code, 2022.
d. California Fire Code, 2022.
e. California Green Building Standards Code, 2022.
f. California Mechanical Code, 2022.
g. California Plumbing Code, 2022.
h. California Code of Regulations, Title 24.
i. California Health and Safety Code.
j. CAL-OSHA.
k. California State Fire Marshal, Title 19 CCR.
l. National Fire Protection Association.
m. Occupational Safety and Health Administration.
n. Other applicable state laws.

2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.

2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in

the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.

3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.

4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

C. Prior to the start of construction, contact local gas company representative and coordinate location of gas meter and piping. In addition, coordinate time required for installation, in order to avoid delay to the Project.

D. Coordination:

1. General: Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.

2. Electrical Coordination:

a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

i. Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.

ii. If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

iii. Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

3. Mechanical Coordination:

a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.

b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.

c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”

d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS – GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.

C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.

1. Partial or incomplete submittals will not be considered.

2. Quantities are Contractor's responsibility and will not be reviewed.

3. Provide materials of the same brand or manufacturer for each class of equipment or material.

4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.

5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.

6. Organize submittals in same sequence as in Specification Sections.

7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

    a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.

    b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.

    c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.

    d. Catalog cuts and published material may be included with supplemental scaled drawings.

D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.

1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.

B. Shop Drawings.

C. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.

2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 68 75. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.

2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.

3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient $I_p = 1.5$ shall be used for gas piping bracing calculations.

b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2022 California Building Code

4. Additional Requirements: In addition to the above, conform to all state and local requirements.

5. Contractor to provide complete Submittal packages for all plumbing items clearly separated by system. At a maximum, submittals to be broken into the following packages:

a. Plumbing – Common Work, Valves & Accessories, Insulation, and Piping.

i. When required by schedule, a separate Plumbing Underground submittal package will be reviewed upon request.

b. Plumbing – Fixtures

c. Plumbing – Equipment

d. Plumbing Seismic Shop Drawings

i. Seismic Shop drawings to show bracing requirements and locations as required by Mason OPM-0043-13.

ii. Seismic shop drawings are submitted whether bracing is required or not. Where bracing is not required, drawings shall be submitted with a statement stating that systems have been reviewed and, no seismic supports are required.

e. Incomplete submittals or submittals broken down by spec section shall be returned un-reviewed.

1.9 INFORMATIONAL SUBMITTALS

A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Refer to Division 01 for complete instructions.

2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents.

Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.

a. Sets shall incorporate the following:

i. Product Data.

ii. Shop Drawings.

iii. Record Drawings.

iv. Service telephone number, address and contact person for each category of equipment or system.

v. Complete operating and maintenance instructions for each item of plumbing equipment and systems.

vi. Copies of guarantees/warrantees for each item of equipment and systems.

vii. Test data and system balancing reports.

viii. Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.

ix. Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.

x. Control diagrams and literature.

xi. A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.

xii. Check test and start reports for each piece of plumbing equipment provided as part of the Work.

xiii. Commissioning and Preliminary Operation Tests required as part of the Work.

b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

B. Record Drawings:

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.

2. Upon completion of the work, deliver to Architect the following:

a. Originals of drawings showing the Work exactly as installed.

b. One complete set of reproducible drawings showing the Work exactly as installed.

c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.

d. Provide Contractor's signature, verifying accuracy of record drawings.

e. Obtain the signature of the Project Inspector for all record drawings.

1.11 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:

1. Reason for substitution request.

2. Complete submittal information as described herein; see "Submittals."

3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.

4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.

5. Explanation of impact on connected utilities.

6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.

G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.

C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.

E. All materials and products shall be new and shall match existing.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor’s Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

PART 2 – PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS AND PRODUCTS

A. No material installed as part of this Work shall contain asbestos.

B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.3 VALVE BOXES

A. General:

1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular “vault” type adequately sized for condition and similar in construction to those specified above.

2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.

3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.4 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30

inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.

1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:

1. Milcor:

a. Style K (plaster).
b. Style DW (gypsum board).
c. Style M (Masonry).
d. Style "Fire Rated" where required.

2.5 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.6 PIPE IDENTIFICATION

A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.

B. The legends and flow arrows shall conform to ASME A13.1.

2.7 INSULATION WORK

A. General:

1. For insulating domestic hot water pumps, refer to Section 22 50 00, Plumbing Equipment,

2. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl

ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

3. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

4. The term "piping" used herein includes pipe, valves, strainers and fittings.

5. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.

6. Provide pre-formed PVC valve and fitting covers.

7. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.

8. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

9. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.

10. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:

   a. Pipe 3/4 inches and smaller: 1 inch thick.
   b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
   c. Pipe 2 inches and larger: 2 inches thick.

2. Insulate domestic hot water piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer's recommended jacketing. Insulation thickness shall be the following:

   a. Pipe 3/4 inches and smaller: 2 inches thick.
   b. Pipe 1 inch and larger: 3 inches thick.

3. Insulate domestic cold water piping located within building, outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick

molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.

4. Insulate domestic cold water piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.

5. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.

6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.

7. Insulate electrically heat-traced grease waste piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer’s recommended jacketing. Insulation thickness for all pipe sizes: 3 inches.

8. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor’s option.

9. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.

    a. Fitting covers:

        i. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        ii. Tee covers.
        iii. Flange and union covers.
        iv. End caps.
        v. Beveled collars.
        vi. Valve covers.
        vii. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

b. Jacket thickness:

i. Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
ii. Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

PART 3 – EXECUTION

3.1 FRAMING, CUTTING AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.2 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.3 PIPING SYSTEM REQUIREMENTS

A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.

Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.4 PRIMING AND PAINTING

A. Perform priming and painting on the equipment and materials as specified herein.

B. See Division 09 Painting Section(s) for detailed requirements.

C. Priming and Painting:

1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

a. Black Steel Piping:

i. Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.

ii. Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.

2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.

3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.5 EXCAVATING

A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive

processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

C. Maintain all warning signs, barricades, flares, and red lanterns as required.

D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.6 BACKFILLING

A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.

B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.

1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.

C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.

D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.7 PIPING SYSTEMS INSTALLATION

A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

B. General:

1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.

2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.

3. Install piping to permit application of insulation and to allow valve servicing.

4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.

5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.

6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.

7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.

8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.

9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.

10. Install horizontal valves with valve stem above horizontal.

11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.

12. Verify final equipment locations for roughing-in.

13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.

14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.

15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.

16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

C. Sleeves:

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.

2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

D. Floor, Wall, and Ceiling Plates: Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

E. Firestopping:

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.

   a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.

3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.

4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.

5. All above Systems to be installed in strict accordance with manufacturer's instructions.

6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their

intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

F. Flashing:

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.

   a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.

   b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.

2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

G. Hangers and Supports:

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide “bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

   a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.

      i. Provide copper-plated or felt-lined hangers for use on copper tubing.

2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.

3. Riser clamps: B-line model B3373, or equal.

4. Pipe Hanger and Support Placement and Spacing:

a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Steel Gas	Copper Brazed or Soldered (Note 3)	CPVC & PVC (Note 2)
1/2 - 1”	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2”	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3”	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4”	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

i. Note 1: Provide mid-story guides.

ii. Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.

iii. Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.

b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.

c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 2)	Steel Gas	Copper Brazed or Soldered (Notes 2, 3)	CPVC & PVC (Note 1)
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

i. Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.

ii. Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.

iii. Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.

d. Horizontal cast iron piping support spacing:

i. Support piping at every other joint for piping length of less than 4 feet.

ii. For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.

iii. Hanger shall not be installed on the coupling.

iv. Provide support at each horizontal branch connection.

v. Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.

vi. Provide a brace on each side of a change in direction of 90 degrees or more.

5. Suspended Piping:

a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

Pipe Size	Rod Size Diameter
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

b. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.

c. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.

d. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.

e. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.

f. Steel Connectors: Beam clamps with retainers.

6. Support to Structure:

a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.

i. Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062---MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

ii. Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.

iii. Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.

7. Rubber Neoprene Pipe Isolators:

a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.

b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.

c. Acceptable Suppliers:

i. Vertical runs: Acousto-Plumb or equal.

ii. Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.

9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.

11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.

12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.8 UNION AND FLANGE INSTALLATION

A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.

B. Install unions in piping NPS 2” and smaller, and flanges in piping NPS 2-1/2” and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.

C. Locate the unions for easy removal of the equipment, tank, or valve.

3.9 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.10 CONCRETE WORK

A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.

B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.11 PIPE PROTECTION

A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:

1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Roystron Products, or equal.

    a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Roystron Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-l0 or V-20", "Scotchwrap 50", Slipknot l00, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.

B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.

D. Cleaning: Clean all piping thoroughly before wrapping.

1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

E. Sleeve copper piping/tubing installed below slab with “Polywrap-C” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer’s recommendations and instructions.

F. Sleeve copper piping/tubing installed outside building below grade with “Polywrap-C” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer’s recommendations and instructions.

G. Sleeve cast iron and ductile iron pipe below grade and below slab with “Polywrap” polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer’s recommendations and instructions.

H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.12 PIPE IDENTIFICATION

A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.

1. Apply legend and flow arrow at approximately 10’-0” intervals in science classrooms and science prep rooms.

C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.

D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.

E. Apply markings after painting and cleaning of piping and insulation is completed.

3.13 EXPANSION ANCHORS IN HARDENED CONCRETE

A. Refer to Structural Drawings.

B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES

report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.

C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.

E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.14 PIPING SYSTEM PRESSURE TESTING

A. General:

1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.

2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:

1. Authority having jurisdiction shall witness tests of piping systems.

2. Notify Architect at least seven days in advance of testing.

3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.

4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.

5. Isolate from system equipment that may be damaged by test pressure.

6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.

a. Authority having jurisdiction shall witness final connection to system.

C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

System Tested	Test Pressure PSI	Test With
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Domestic Water	125	Water

1. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

3.15 TRACER WIRES

A. Provide tracer wire for non-metallic gas and water pipe in ground outside of buildings. Use AWG #14 tracer wire with low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints. Tracer wire insulation shall be colored yellow for gas piping, blue for water piping.

B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than l/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.16 OPERATION OF SYSTEMS

A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:

1. Complete all requirements listed under "Check, Test and Start Requirements."

2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.

3. Filters, strainers etc. are in place.

4. Bearings have been lubricated, and alignment of rotating equipment has been checked.

5. Equipment has been run under observation, and is operating in a satisfactory manner.

B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.17 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.

2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.

3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.

4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.18 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.

1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.

2. Correct rotation of motors and ratings of overload heaters are verified.

3. Specified filters are installed and spare filters have been turned over to Owner.

4. All manufacturers' certificates of start-up specified have been delivered to the Owner.

5. All equipment has been cleaned, and damaged painted finishes touched up.

6. Missing or damaged parts have been replaced.

7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.

8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.

9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.

10. Preliminary test and balance work is complete, and reports have been forwarded for review.

11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.

12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.

2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.

3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.

4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Review of Contractor's Tests:

1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

D. Test Logs:

1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:

1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

3.19 CERTIFICATES OF INSTALLATION

A. Contractor shall complete applicable “Certificates of Installation” forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

3.20 DEMONSTRATION AND TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.

2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.

3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner’s representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:

a. Listing of Owner-designated personnel completing training, by name and title.

b. Name and title of training instructor.

c. Date(s) of training.

d. List of topics covered in training sessions.

4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 22 05 53 – PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. Section 09 91 00 – Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.4 SUBMITTALS

A. See Section 01 33 00 – Submittals, for submittal procedures.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.

2. Letter Height: Equipment, control panels 1 inch.

3. Letter Height: Thermostats and small control components, 1/4 inch.

4. Background Color: Black.

2.3 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. Access Doors and Similar Operational Instructions: Minimum 3/4" high letters.

B. Stencil Paint: As specified in Section 09 91 00, semi-gloss enamel, colors conforming to ASME A13.1.

2.5 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

D. Service Markers: Identify buried plugged or capped pipe with concrete marker, 4 inch diameter by 30 inches long, set flush with grade. Provide engraved brass nameplate identifying pipe stub.

PART 3 – EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 90 00.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify domestic hot water heating equipment, including water heaters, pumps, expansion tanks, etc. with plastic nameplates.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

K. Provide red ceiling dots to locate valves above T-bar type panel ceilings. Locate in corner of T-bar panel closest to equipment.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 22 10 00 – PLUMBING PIPING SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Valves.
3. Domestic water piping specialties.
4. Gas piping specialties.
5. Drain and waste piping specialties.

1.2 RELATED REQUIREMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods

B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Provide welding certificate for all gas pipe welders.

C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

1.7 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.

C. NFPA/ANSI Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."

D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. Fabricate and install natural gas systems in accordance with California Plumbing Code.

F. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

PART 2 – PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS

A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.

B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.

1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or

more. Brace riser joints at each floor and at 15 foot maximum intervals (also see Specification Section 22 00 50).

C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.

1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.

2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.

D. Vent Pipe:

1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.

2. 2-1/2 inch and smaller: Cast iron soil pipe and fittings as specified for sizes 3 inch and larger, Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.

3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.

E. Type DWV copper tubing or No-Hub cast iron pipe and fittings may be used for concealed rainwater leaders. Where no-hub piping is used, the fittings and couplings shall match those used for waste piping.

F. Water Pipe (Hot Water, and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 00 50 for pipe protection requirements for below slab copper piping.

G. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.

2.3 SITE PIPING AND FITTINGS TO 5 FEET FROM BUILDINGS

A. Buried Drain, Waste, and Vent Piping:

1. Install piping from street connection to the property line in accordance with local requirements.

2. 4 inches and larger: PVC, ASTM D3034 - SDR 35; use matching Ring Tite fittings.

3. 3 inches and smaller: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler pipe, or equal. Provide ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540. Pipe and fittings shall be the product of a single manufacturer.

B. Water Service Piping:

1. Sizes 2 inches and larger (not under building): Gasket style PVC conforming to ASTM D2241-SDR21, Class 200 with gasket type fittings or ductile iron mechanical joint couplings. Gasket fittings shall be one piece injection molded PVC fittings, equal to Flo-Seal water main fittings for PVC pressure pipe, 200 psi, ASTM D-3139.

2. Sizes less than 2 inches: Type K copper tubing, hard temper, with wrought copper fittings. See Section 22 00 50 for pipe protection requirements for below grade copper piping.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   a. J.M. Eagle.
   b. P.W. Pipe.
   c. Ipex Series Pipe.

C. Water Service Piping Above Grade:

1. Sizes 3 inches and larger: Class 150 flanged ductile cast iron water pipe conforming to AWWA/ANSI C150/A21.50 and manufactured in accordance with AWWA/ANSI C151/A21.51. Fittings shall conform to AWWA/AWWA C110/A21.10, Class 250 pattern. Pipe and fittings shall have factory applied cement-mortar lining in accordance with AWWA/ANSI C104/A21.4. Flanges shall conform to ASME/ANSI B16.1.

2. Piping 2-1/2 inches and smaller: Type K copper tubing, hard temper, with brazed wrought copper fittings.

2.4 PIPE JOINING MATERIALS

A. Refer to piping Articles in this Section for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated

   a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.

   b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.

2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.

3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.

4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.

D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.

E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Solvent Cements for Joining CPVC Piping: ASTM F 493.

1. CPVC solvent cement shall have VOC content of 490 g/L or less.

2. Adhesive primer shall have VOC content of 550 g/L or less.

3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

1. PVC solvent cement shall have VOC content of 510 g/L or less.

2. Adhesive primer shall have VOC content of 550 g/L or less.

3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

2.5 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

A. General: Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 68 75.

1. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.

a. Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 68 75.

B. Gate Valves: Not allowed, provide ball valve.

C. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.

2. 2-1/2 inches: Apollo 77C-LF10, or equal.

D. Swing Check Valves:

1. Minimum 200 psi CWP, bronze or brass body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Milwaukee UP509, Nibco T-413LF, Kitz 822T, or equal.

2. Provide valves with the following:

a. Seats: suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.

b. Bodies: ductile iron or cast iron.

c. Discs: Bronze or stainless steel.

d. Stems or Shafts: Stainless steel. Install valves with stems horizontal.

e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. 2 through 12 inches: Watts Regulator Co., model DBF-03.

2.6 DOMESTIC WATER PIPING SPECIALTIES

A. Hose Bibbs:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. Acorn Engineering Co.
b. Woodford Manufacturing Co.

2. Hose Station: Leonard THS-25-VB-CW, Symmons, or equal.

B. Wall Hydrants:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

   a. Acorn Engineering Co.
   b. Woodford Manufacturing Co.
   c. Mifab, Inc.

C. Water Hammer Arrestors:

1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.

2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.

3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   a. Josam Company, series 75000.
   b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
   c. Mifab, series WHB.

D. Reduced Pressure Backflow Preventers for Potable Water Systems:

1. Provide reduced pressure principle backflow preventer conforming to lead free requirements of California Health and Safety Code Section 11 68 75.

   a. Reduced-pressure principle backflow preventer assembly, consisting of shutoff valves on inlet and outlet, and strainer on inlet., Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.

   b. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

i. 2 inches and smaller: Wilkins 975XL2, Febco LF825YRP, Watts LF919.
ii. 2-1/2 thru 10 inches: Wilkins 475AXL, Febco LF860RP.
iii. 2-1/2 and 3 inches: Watts LF009.

2. Provide LeMeur, Hot-Box, WattsBox, or equal, two piece reinforced aluminum, fiberglass, welded angle with expanded metal, backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.

3. Provide substantial padlock and chain to lock valves in open position, and turn key over to Project Inspector.

   a. Padlocks shall be as specified under Section 08 70 00.

   b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.

4. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.

5. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.

6. Provide two concrete filled, 6-inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.

E. Reduced Pressure Backflow Preventers for Non-Potable Water Systems:

1. Refer to Section 21 10 00 for backflow preventers for fire protection service.

2. Provide reduced-pressure principle backflow preventer consisting of assembly, including shutoff valves on inlet and outlet, and strainer on inlet, equal to Febco 825Y or 880, as required Wilkins, Aames, or equal. Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.

3. Provide LeMeur, Hot-Box, or equal, two piece backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.

4. Provide substantial padlock and chain to lock valves in open position, and turn key over to Project Inspector.

   a. Padlocks shall be as specified under Section 08 70 00.

   b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.

5. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.

6. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.

7. Provide two concrete filled, 6-inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.

8. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   a. Ames.
   b. Febco Sales, Inc.
   c. Watts Regulator Company.
   d. Clow.

F. Relief Valves:

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

   a. Watts Regulator Company.
   b. Cash (A.W.) Valve Manufacturing Corporation.
   c. Zurn Industries, Inc.; Wilkins-Regulator Division.

G. Trap Primers:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

   a. MiFab, Inc.
   b. Precision Plumbing Products.
   c. Sioux Chief Manufacturing Company.

2.7 DRAIN AND WASTE PIPING SPECIALTIES

A. Cleanouts:

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts

where indicated on drawings, and whenever sanitary sewer exits building. All two-way cleanouts shall have (2) risers, each in opposing directions.

a. Provide cleanouts in waste drop from each sink and urinal.

b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.

2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.

3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).

4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.

5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.

a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.

b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

6. Cleanouts exterior to building in landscaped areas: Zurn Z-1449-BP, or equal, cleanout ferrule with tapered bronze plug. Where located at grade, provide 18 by 18 by 6 inch concrete pad; Trowel concrete smooth and edge; set flush with finished grade.

7. Cleanouts in drive areas: Zurn -1400-HD-KC, or equal, with heavy-duty top and ABS plastic plug.

8. Cleanouts in acid waste systems: Zurn ZN-1404, or equal, cleanout access housing, with ductile cast iron body and nickel bronze top. Extend acid waste piping within the cleanout, and terminate with threaded cap. Secure acid waste pipe inside cleanout access housing with setscrews provided.

B. Floor Drains:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:

a. J.R. Smith.
b. MIFAB.
c. Watts.
d. Zurn.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.

B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.

C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.

D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

3.2 INSTALLATION OF WATER PIPING

A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.

B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.

1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.

2. Install water hammer arresters above accessible ceilings, or install access doors for service.

C. In freezing locations arrange water piping to drain as shown.

D. Install piping on room side of building insulation.

E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

F. For all faucets, hose bibbs, or other water outlets delivering industrial hot and/or cold water, provide a sign, permanently mounted, indicating "CAUTION: NON-POTABLE WATER, DO NOT DRINK". Each sign shall be permanently engraved with black uppercase letters on a yellow background. Letters shall be minimum 1-1/4 inch high.

3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS

A. Make joints in PVC sewer pipe with PVC-type couplings and rubber rings.

B. Check final location of rubber rings within the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron adapter fittings, installed as recommended by the manufacturer.

1. Ring-Tite cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the pipe with PVC couplings.

C. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.

E. Grade all vent piping so as to free itself quickly of any water condensation.

F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.

G. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.

H. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

3.4 PIPE JOINTS AND CONNECTIONS

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.

3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

D. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.

2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3. PVC Piping: Join according to ASTM D 2855.

E. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.

1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.

F. Cast Iron Soil Pipe:

1. No-Hub fittings shall be made with a torque wrench.

2. Hub joints shall be with Ty-Seal couplings.

3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.

4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

G. Welded Pipe:

1. Make up with oxyacetylene or electric arc process.

2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.

3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

H. PVC Sewer and Drainage Pipe (outside building as allowed only): Four inches and larger shall be bell and spigot, assembled in accordance with manufacturer's recommendations. Joint shall be tested in accordance with ASTM D3212. Solvent weld joints below 4 inches in size, schedule 40 PVC with matching fittings, assembled per manufacturer’s instructions.

I. Polyethylene and Polypropylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.

J. Make joints in PVC water pipe with PVC couplings and rubber rings, Manville Ring-Tite, PW Pipe, or equal. Check final location of rubber rings with the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron or PVC adapter fittings, installed as recommended by the manufacturer. Ring-Tite PVC or cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the water pipe with PVC couplings.

K. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.

2. Anchor piping securely on the system side of each flexible connection.

3.5 INSTALLATION OF VALVES

A. Install valves as indicated on Drawings and in the following locations:

1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.

3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.

2. Install horizontal valves with valve stem above horizontal, except butterfly valves.

3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

4. Locate valves for easy access and provide separate support where necessary.

5. Install valves in position to allow full stem movement.

6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.

7. Butterfly valves conforming to the paragraph “Butterfly Valves” may be used in lieu of gate or globe valves for locations above grade.

8. Ball valves conforming to the paragraph “Ball Valves” may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.

9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Swing Check Valves: Install in horizontal position with hinge pin level.

D. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.6 INSTALLATION OF CLEANOUTS

A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.

B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

3.7 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS

A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

B. Install vented P-trap below each drain. Where trap primers are indicated, install trap primer connection in the P-trap.

3.8 TRAP PRIMER INSTALLATION

A. Install as indicated in manufacturers printed literature, with 1/2 inch, Type L, hard copper piping to trap primer connection on floor drains and floor sinks where indicated on Drawings. At Contractor’s option, Type K annealed copper tubing without joints may be used be used below slab only. See Section 22 00 50 for pipe protection requirements for below slab copper piping/tubing.

B. Install trap primer piping with 1/4 inch per foot slope, to insure that the line will drain fully to the floor drain or floor sink.

1. Provide ball valve to the inlet at each trap primer location.

C. Install trap primer and distribution unit exactly as called for in manufacturers printed installation instructions. Connect to domestic water piping from the top of the water line, in order to prevent foreign material from entering directly into primer assembly.

D. Mount trap primer in wall, in sheet metal box, with Karp or equal access door. Size access door and box to suit valve operation, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door where installed in occupied spaces.

E. Where one trap primer will be used for more than one trap, provide a distribution unit with feeder piping for a maximum of four traps sized for equal pressure drop to each trap.

3.9 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.

B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

3.10 DOMESTIC WATER SYSTEM STERILIZATION

A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.

1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

3.11 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

3.12 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.13 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION

SECTION 22 40 00 – PLUMBING FIXTURES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water supplies and stops.
2. Plumbing fixture hangers and supports.
3. Refrigerator ice maker outlet boxes.
4. Dishwasher air gap fittings.
5. Solids interceptors.
6. Washing machine hose/supply boxes.

1.2 RELATED REQUIREMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:

1. 2022 California Building Code – CBC
2. 2022 California Plumbing Code – CPC
3. 2022 California Health and Safety Code

4. American National Standards Institute - ANSI
5. Federal Standards - F.S.
6. National Sanitary Foundation – NSF International

C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”

D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.

F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.

G. Americans with Disabilities Act (ADA).

H. California Green Building Standards Code Requirements:

1. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Tank-Type Toilets.

2. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

PART 2 – PRODUCTS

2.1 PLUMBING FIXTURES

A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.

1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.

2. Take location and mounting heights for roughing-in from Architectural Drawings.

3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.

4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

2.2 MATERIALS

A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

C. Handles on all faucets and stops shall be all metal chromium plated.

D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.

1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.

C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.

D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.

F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.

G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

2.4 MANUFACTURERS

A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.

B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Vitrified China Plumbing Fixtures:

    a. American Standard, U.S. Plumbing Products.
    b. Eljer Plumbingware Div., Wallace-Murray Corp.
    c. Kohler Co.
    d. VitrA.

2. Modular Lavatories:

    a. Bradley.
    b. Acorn.
    c. Willoughby Industries, Inc.

3. Plumbing Trim:

    a. McGuire Manufacturing Co., Inc.
    b. Delta Commercial.
    c. Chicago Faucet Co.
    d. T&S Brass and Bronze Works, Inc.

4. Flush Valves:

    a. Sloan Valve Co.
    b. Zurn Industries, Hydromechanics Div.
    c. Toto USA, Inc.

5. Faucets:

    a. Chicago Faucet Co.
    b. Symmons Scott.
    c. T&S Brass and Bronze Works, Inc.
    d. Delta Commercial.

6. Fixture Seats:

    a. Church Seat Co.
    b. Bemis Mfg. Co.
    c. Beneke Corp.

7. Water Coolers and Drinking Fountains:

    a. Murdock
    b. Haws Corporation.

8. Service Sinks:

    a. American Standard.
    b. Kohler Co.
    c. Williams Serviceptor.
    d. Florestone.
    e. Acorn.

9. Stainless Steel Sinks:

    a. Elkay Mfg. Co.

b. Just Mfg. Co.
c. Haws Corporation.

10. Showers:

a. Acorn.
b. Bradley.
c. Symmons.
d. Powers.

11. Emergency Equipment:

a. Haws Corporation.
b. Gardian.
c. Symmons.
d. Bradley.
e. Encon.

12. Fixture Carriers:

a. Josam Mfg. Co.
b. J. R. Smith.
c. Tyler Pipe; Wade Div.
d. Zurn Industries; Hydromechanics Div.
e. Mifab, Inc.

2.5 FLUSH VALVE REQUIREMENTS

A. Metering flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered bypass and be chloramine resistant synthetic rubber with internal components suitable for l80 degree hot water to l50 pounds pressure, plastic or leather diaphragm not acceptable.

B. Electronic flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered by pass and be chloramine and resistant synthetic rubber with rubber and internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable. All flush valve solenoids and sensors shall be UL listed.

2.6 FIXTURE CONNECTIONS

A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.

B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Dearborn Brass, Commercial series with brass nuts.
    b. Delta Commercial.
    c. McGuire Manufacturing Co., Inc.

C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.

D. Plumbing fixture traps connected to special waste systems shall be constructed of materials to suit the waste system.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

    a. Orion.
    b. Enfield

E. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

2.7 WATER SUPPLIES AND STOPS

A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.

B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.

C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.

D. Provide chrome plated cast brass escutcheon.

E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. McGuire Manufacturing Company, Inc., model LFH2167LK.
2. T & S Brass and Bronze Works, Inc., model B-1305.

2.8 PLUMBING FIXTURE HANGERS AND SUPPORTS

A. Floor-affixed supports for off-the-floor plumbing fixtures shall comply with ASME A112.6.1M.

B. Residential type fixture supports are not acceptable.

C. Install wall mounted water closets with combination support and waste fittings, with feet of support securely anchored to floor.

D. Install floor mounted water closets with J.R. Smith, Zurn, or equal government pattern cast iron closet flanges with brass bolts, nuts, washers, and porcelain caps secured with Spackle.

E. Install the following fixtures on concealed support with feet of support securely anchored to floor. Anchor top of support to wall construction in an approved manner.

1. Wall hung lavatories.

2. Wall mounted urinals.

3. Wall Mounted Water Closets

4. Drinking fountains.

5. Electric water coolers.

2.9 PLUMBING FIXTURES

A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.

B. Special Requirements For Accessible Fixtures:

1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.

2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded “closed-cell” vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

PART 3 – EXECUTION

3.1 PRODUCT HANDLING AND PROTECTION

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

3.2 PREPARATORY PROVISIONS

A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.3 INSPECTION AND PREPARATION

A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.

C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.

E. Refer to Division 26 for wiring for electronic flush valves.

3.4 FAUCET INSTALLATION

A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.

B. Adjust metering faucets to run for 10 to 15 seconds.

3.5 CLEAN AND PROTECT

A. Clean plumbing fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during the remainder of the construction period.

C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

3.6 FIELD QUALITY CONTROL

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

3.7 EXTRA STOCK

A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 22 50 00 – PLUMBING EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial electric water heaters.

2. Expansion tanks.

3. Insulation.

1.2 RELATED REQUIREMENTS

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

B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, capacity and ratings, with selection points clearly indicated.

1.4 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

B. Trade names or catalog numbers stated herein indicates grade or quality of materials desired.

C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.

D. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.

E. Pump types and sizes regulated by the US Department of Energy's "Energy Conservation Standards for Pumps" 10 CRF Parts 429 and 431 shall be marked with a compliant PEI_{CL} or PEI_{VL} (Pump Energy Index, constant or variable load) value, basic model number, and RPM on the nameplate. Regulated pumps shall be listed in the Hydraulic Institute (HI) Energy Rating database (er.pumps.org) and be assigned an Energy Rating as defined in the HI 40.5 program guide.

F. CEC Compliance: Comply with California Electrical Code (Title 24, Part 3) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

G. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code", as applicable to installation of gas-fired water heaters.

H. CSA/UL Labels:

1. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.1-CSA 4.1 standards governing storage-type water heaters with input ratings of 75,000 BTU/hr. or less.

2. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters with input ratings of greater than 75,000 BTU/hr.

I. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

J. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:

1. Water Heaters 200 MBH and greater.

K. California Energy Commission Compliance: Provide written confirmation of listing of all water heaters in the "Appliance Efficiency Database."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

1.8 WARRANTY

A. Commercial Electric Water Heaters: Three-year minimum limited warranty on tank leakage.

B. Atmospheric Gas Fired Water Heaters: Three-year minimum limited warranty on tank.

C. Power Gas Fired Water Heaters: Three-year minimum limited warranty on tank.

D. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater: Three-year minimum limited warranty on tank.

E. Instantaneous Gas-Fired Water Heater: three-year minimum limited warranty on heat exchanger and parts.

PART 2 – PRODUCTS

2.1 MATERIALS

A. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. General: Provide commercial electric water heaters of size, capacity, and electrical characteristics indicated on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL listing. Relief valve dip tube shall extend to within 3 inches of tank.

B. Heater: Working pressure of 150 psi, magnesium anode rod; glass lining on internal surfaces exposed to water.

C. Heating Elements: Heavy-duty, medium watt density, with incoloy sheath or zinc plated copper, thermostat stepped through magnetic contactor.

D. Safety Controls: Double-pole, manual-reset, high-limit, probe type electric water low water cutoff; both factory wired.

E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin resistant polyurethane or glass fiber insulation. Provide outer steel jacket with bonderized undercoat and baked enamel finish.

F. Provide the following accessories:

1. Brass drain valve.

2. 3/4 inch temperature and pressure relief valve.

G. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.

H. Controls: Adjustable immersion thermostat or surface mounted therm-o-disc; power circuit fusing.

I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Bradford White Corporation.

2. Lochinvar Corporation.

3. PVI Industries, LLC.

4. Rheem Manufacturing Company.

5. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

2.3 EXPANSION TANKS

A. Provide thermal expansion tanks of size and number as indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Construct tank of welded steel for working pressure of 125 psi. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity.

1. Tanks shall be IAPMO approved and listed for use with domestic water systems.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Amtrol, Inc.

2. A.O. Smith Water Products Company.

3. Watts Water Technologies, Inc.

2.4 INSULATION MATERIALS

A. General:

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2. Products shall not contain asbestos, lead, mercury, or mercury compounds.

3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

PART 3 – EXECUTION

3.1 EXAMINATION

A. The Contractor shall be responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section and shall not proceed until all unsatisfactory conditions have been corrected. Commencing work shall be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.2 ELECTRIC WATER HEATER INSTALLATION

A. Install electric water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.

C. Connect to hot and cold water lines with shutoff valve, check valve, and dielectric union in the cold water line, and ASME standard pressure and temperature relief valve and dielectric union in the hot water line. Connect drain and relief piping as noted on Drawings.

D. Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

E. After installation has been completed, seal bottom of heaters without feet to floor with silicone sealer.

3.3 DEMONSTRATION AND TRAINING

A. Provide a minimum of 16 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

3.4 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

3.5 OPERATIONAL TESTS

A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.6 CLEANING UP

A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

3.7 EQUIPMENT INSULATION SCHEDULE

A. Domestic hot water recirculation pump insulation shall be the following:

1. Mineral-Fiber Board: Thickness equal to insulation thickness for connected pipes and 3-lb/cu. ft. nominal density.

END OF SECTION

DIVISION 23 – HVAC

23 00 50 – Basic HVAC Materials and Methods
23 05 53 – Mechanical Identification
23 05 93 – Testing, Adjusting, and Balancing for HVAC

PAGE INTENTIONALLY LEFT BLANK.

SECTION 23 00 50 – BASIC HVAC MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electric motors.
2. Motor starters.
3. Strainers.
4. Gauges.
5. Thermometers.
6. Access Doors.
7. Flexible joints.

1.2 RELATED REQUIREMENTS

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

B. This Section is a part of each Division 23 Section.

C. Refer to Section 23 08 00. T-24 Commissioning of HVAC for Title 24 commissioning and acceptance testing requirements.

1.3 ADDITIONAL REQUIREMENTS

A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.

B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.

C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

1.4 REFERENCES AND STANDARDS

A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.

1. AABC – Associated Air Balance Council

2. AFBMA – Anti Friction Bearing Manufacturer's Association

3. AMCA – Air Moving and Control Association Inc.

a. Standard 210 – Laboratory Methods of Testing Fans

4. ANSI – American National Standards Institute

5. ARI – Air-Conditioning and Refrigeration Institute

6. ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers

7. ASME – American Society of Mechanical Engineers

8. ASTM – American Society for Testing and Materials

9. CCR – California Code of Regulations

    a. Title 8 – Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36

10. CSA – Canadian Standards Association International

11. CSFM – California State Fire Marshal

12. NCPWB – National Certified Pipe Welding Bureau

13. NIST – National Institute of Standards and Technology

14. NEMA – National Electrical Manufacturers' Association

15. NFPA – National Fire Protection Association

16. OSHA – Occupational Safety and Health Act

17. SMACNA – Duct Manuals

18. UL – Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.

    a. California Building Code, 2022.
    b. California Electrical Code, 2022.
    c. California Energy Code, 2022.
    d. California Fire Code, 2022.
    e. California Green Building Standards Code, 2022.
    f. California Mechanical Code, 2022.
    g. California Plumbing Code, 2022.
    h. California Code of Regulations, Title 24.
    i. California Health and Safety Code.
    j. CAL-OSHA.
    k. California State Fire Marshal, Title 19 CCR.
    l. National Fire Protection Association.
    m. Occupational Safety and Health Administration.
    n. Other applicable state laws.

2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.

2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.

3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.

4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

B. Arrange for utility connections and pay charges incurred, including excess service charges.

C. Coordination:

1. General: Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.

2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.

3. Electrical Coordination: Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

   a. Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.

   b. If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

   c. Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

4. Mechanical Coordination:

   a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.

   b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.

   c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”

   d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS – GENERAL

A. Refer to Division 01 Submittals Section(s) for additional requirements.

B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.

C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.

1. Partial or incomplete submittals will not be considered.

2. Quantities are Contractor's responsibility and will not be reviewed.

3. Provide materials of the same brand or manufacturer for each class of equipment or material.

4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.

5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.

6. Organize submittals in same sequence as in Specification Sections.

7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

    a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.

    b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.

    c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.

    d. Catalog cuts and published material may be included with supplemental scaled drawings.

D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract

Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.

1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.

F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.

B. Contractor to provide complete Submittal packages for each system. At a maximum, submittals to be broken into the following packages:

1. Mechanical – Dry Side package including: Ductwork, Diffusers/Grilles, and Accessories, etc.

2. Mechanical – Wet Side package including: Piping, valves, source equipment, pumps, accessories, etc.

a. When required by schedule, a separate Mechanical Underground submittal package will be reviewed upon request.

3. Mechanical – Source Equipment (e.g.: Packaged AC Units, Exhaust Fans, Air Handling Units, etc.)

4. Mechanical – Building Automation System

5. Mechanical – Duct coordination shop drawing package.

6. Mechanical – Seismic Shop Drawings

a. Seismic Shop drawings to show bracing requirements and locations as required by Mason OPM-0043-13.

b. Seismic shop drawings are submitted whether bracing is required or not. Where bracing is not required, drawings shall be submitted with a statement stating that systems have been reviewed and, no seismic supports are required.

7. Incomplete submittals or submittals broken down by spec section shall be returned un-reviewed.

a. Sustainable Design Submittals:

i. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.

ii. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

b. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

i. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.

ii. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.

iii. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.

1) Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.

2) In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a

California registered structural engineer, in accordance with 2022 California Building Code

iv. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.9 INFORMATIONAL SUBMITTALS

A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 80 00.

B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.

C. Check, Test, and Start forms, from equipment manufacturers.

D. Check, Test and Start reports.

1.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.

1. Sets shall incorporate the following:

a. Product Data.
b. Shop Drawings.
c. Record Drawings.
d. Service telephone number, address and contact person for each category of equipment or system.
e. Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
f. Copies of guarantees/warrantees for each item of equipment or systems.
g. Test data and system balancing reports.
h. Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
i. Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
j. Temperature control diagrams and literature.
k. Check test and start reports for each piece of mechanical equipment provided as part of the Work.
l. Commissioning and Preliminary Operation Tests required as part of the Work.

2. Post service telephone numbers and addresses in an appropriate place designated by Architect.

B. Record Drawings:

1. Refer to Division 01 for additional requirements.

2. Upon completion of the Work, deliver to Architect the following:

a. Originals of drawings showing the Work exactly as installed.

b. One complete set of reproducible drawings showing the Work exactly as installed.

c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.

d. Provide Contractor's signature, verifying accuracy of record drawings.

e. Obtain the signature of the Inspector of Record for Record Drawings.

1.11 SUBSTITUTIONS

A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.

C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.

D. Only one request for substitution will be considered for each item of equipment or material.

E. Substitution requests shall include the following:

1. Reason for substitution request.

2. Complete submittal information as described herein; see "Submittals."

3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.

4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.

5. Explanation of impact on connected utilities.

6. Explanation of impact on structural supports.

F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.

G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.

C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.

D. All materials and products shall be new.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.

B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.

B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PART 2 – PRODUCTS

2.1 GENERAL

A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.

B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.

C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS

A. No material installed as part of this Work shall contain asbestos.

B. California Green Building Code Compliance:

1. HVAC and refrigeration equipment shall not contain CFCs.

2. HVAC and refrigeration equipment shall not contain Halons.

2.3 ELECTRIC MOTORS

A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. U.S. Motors.
b. Century Electric.
c. General Electric.
d. Lincoln.
e. Gould.

B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service

supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.

C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.

1. Multispeed motors shall have separate windings for each speed.

D. Polyphase Motors with Additional Requirements:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

2. Motors Used with Variable Frequency Controllers:

a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.

d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.

2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

a. Permanent-split capacitor.
b. Split phase.
c. Capacitor start, inductor run.
d. Capacitor start, capacitor run.

3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:

   a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.

      i. Exceptions:

         1) Motors in fan-coils and terminal units that operate only when providing heating to the space served.

         2) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.

4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.

5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

7. Motors 1/20 HP and Smaller: Shaded-pole type.

8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 ACCESS DOORS

A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.

   1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.

B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.

C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.

D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.

E. Provide insulated doors where located in internally insulated ducts or casings.

F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.

H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:

1. Milcor

a. Style K (plaster).
b. Style DW (gypsum board).
c. Style M (Masonry).
d. Style "Fire Rated" where required.

2.5 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

PART 3 – EXECUTION

3.1 FRAMING, CUTTING, AND PATCHING

A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.

B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.

C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.2 ELECTRICAL REQUIREMENTS

A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.

B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.3 ACCESS DOOR INSTALLATION

A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.4 EXPANSION ANCHORS IN HARDENED CONCRETE

A. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer’s recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.

B. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

C. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.

D. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.5 TEMPORARY HEAT

A. The General Contractor will provide for all temporary heat at such times as may be required or directed by the Architect and pay all fuel and energy costs incurred.

B. Temporary heating facilities proposed for use by the Contractor will be subject to review of the Architect. Prior to use of any equipment for temporary heat, install temporary filters on all return air inlets, to preclude dust and construction debris from

entering the duct system. In addition, install filters in air handling units, and replace at the completion of temporary operation.

C. Filters used for temporary operation of systems shall be as specified for permanent filters specified herein.

D. Comply with Check, Test and Start Requirements for start-up of equipment prior to operation for temporary heat.

E. Contractor shall complete the permanent heating system as soon as possible, thereby making it available for temporary heat. When available, the system may be used as required at the direction of the Architect after systems are properly prepared for use as specified elsewhere. Contractor shall then be responsible for operating the system during periods required and the General Contractor shall pay the fuel and energy costs incurred. Operation of the heating system prior to the filing of "notice of completion" shall not change the Guarantee provisions in any way.

3.6 CHECK, TEST AND START REQUIREMENTS

A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer’s printed startup form to be used.

2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.

3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.

4. When work has been completed, provide copies of reports for review, prior to final observation of work.

B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.

C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner’s representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.7 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.

1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.

2. Correct rotation of motors and ratings of overload heaters are verified.

3. Specified filters are installed and spare filters have been turned over to Owner.

4. All manufacturers' certificates of start-up specified have been delivered to the Owner.

5. All equipment has been cleaned, and damaged painted finishes touched up.

6. Damaged fins on heat exchangers have been combed out.

7. Missing or damaged parts have been replaced.

8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.

9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.

10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.

11. Preliminary test and balance work is complete, and reports have been forwarded for review.

12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.

13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.

B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.

2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.

3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.

4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.

5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Before handing over the system to Owner replace all filters with complete new set of filters.

D. Review of Contractor's Tests: All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

E. Test Logs: Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

F. Preliminary Operation: The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

G. Operational Tests:

1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants

2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.

3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.

4. Control systems shall be completely operable with settings properly calibrated and adjusted.

5. Rotating equipment shall be in dynamic balance and alignment.

6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

H. Pre-Occupancy Building Purge:

1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.

2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

3.8 DEMONSTRATION AND TRAINING

A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.

2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.

3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:

a. Listing of Owner-designated personnel completing training, by name and title.

b. Name and title of training instructor.

c. Date(s) of training.

d. List of topics covered in training sessions.

4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 23 05 53 – MECHANICAL IDENTIFICATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Stencils.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. Section 09 91 00 – Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 – Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.4 SUBMITTALS

A. See Section 01 33 00 – Submittals, for submittal procedures.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

A. Letter Color: White.

B. Letter Height: Equipment, control panels 1 inch.

C. Letter Height: Thermostats and small control components, 1/4 inch.

D. Background Color: Black.

2.3 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

A. Ductwork: Minimum 1-1/4" high letters.

B. Access Doors and Similar Operational Instructions: Minimum 3/4" high letters.

B. Stencil Paint: As specified in Section 09 91 00, semi-gloss enamel, colors conforming to ASME A13.1.

PART 3 – EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 90 00.

D. Identify domestic hot water heating equipment, including water heaters, pumps, expansion tanks, etc. with plastic nameplates.

E. Identify air conditioning units, makeup air units and exhaust fans with plastic nameplates.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify thermostats relating to fan unit and/or zone unit with nameplates.

H. Identify valves in main and branch piping with tags.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

K. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

L. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

b. Dual-duct systems.

c. Variable-air-volume systems.

d. Multizone systems.

e. Fume hood systems.

2. Balancing Hydronic Piping Systems:

a. Constant-flow hydronic systems.

b. Variable-flow hydronic systems.

c. Primary-secondary hydronic systems.

3. Balancing Domestic Water Piping Systems.

1.2 RELATED REQUIREMENTS

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

1.3 REFERENCES AND STANDARDS

A. Associated Air Balance Council (AABC)

B. National Standards for Total System Balance, latest edition.

1.4 DEFINITIONS

A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC standards requirements. Differences in terminology between the Specifications and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

B. Similar Terms: The following table is provided for clarification only:

Similar Terms	
Contract Term	AABC Term
TAB Specialist	TAB Agency
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems
TAB Field Supervisor	Test and Balance Engineer

C. AABC: Associated Air Balance Council.

D. TAB: Testing, adjusting, and balancing.

E. TAB Organization: Body governing practices of TAB Specialists.

F. TAB Specialist: An entity engaged to perform TAB Work.

1.5 ACTION SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

1.6 INFORMATIONAL SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

1. Provide list of similar projects completed by proposed TAB field supervisor.

2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.

C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

D. Submit examinations report with qualifications data.

E. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

F. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.

G. Certified TAB reports.

1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.

H. Sample report forms.

I. Instrument calibration reports, to include the following:

1. Instrument type and make.

2. Serial number.

3. Application.

4. Dates of use.

5. Dates of calibration.

a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

1.7 CLOSEOUT SUBMITTALS

A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

1.8 QUALITY ASSURANCE

A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC. NEBB contractors will not be considered.

1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.

B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:

1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC.

    a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.

2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC as a TAB technician.

    a. TAB technician shall have minimum 4 years TAB field experience.

C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.

D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.

E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.

1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.

F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.

G. TAB Standard:

1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:

    a. AABC National Standards for Total System Balance, or

2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.

3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.

H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:

a. The Contract Documents examination report.

b. The TAB plan.

c. Coordination and cooperation of trades and subcontractors.

d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.

2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.

I. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect.

K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

L. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

M. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.9 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.10 WARRANTY

A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:

1. AABC Performance Guarantee.

B. Refer to Division 01 Specifications for additional requirements.

1.11 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

C. Coordinate TAB work with work of other trades.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contract Documents Examination Report:

1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:

a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.

b. Proposed corrective action necessary for proper system operation.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report conditions requiring correction discovered before and during performance of TAB procedures.

P. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:

1. General description of each air system and sequence(s) of operation.

2. Complete list of measurements to be performed.

3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.

4. Qualifications of personnel assigned to Project.

5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc.

6. Table indicating pressure relationships (positive, negative, or neutral) between building spaces.

7. Air terminal correction factors for the following:

a. Air terminal configuration.

b. Flow direction (supply or return/exhaust).

c. Effective area of each size and type of air terminal.

d. Air density.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.

2. Hydronic systems are filled, clean, and free of air.

3. Automatic temperature-control systems are operational.

4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation," Section 23 07 16 "HVAC Equipment Insulation," and Section 23 07 19 "HVAC Piping Insulation." Section 23 80 00 Heating, Ventilating, and Air Conditioning."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.

C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.

1. Use state-of-the-art instrumentation approved by TAB specialists governing agency..

2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.

D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.

E. For variable-air-volume systems, develop a plan to simulate diversity.

F. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

G. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

H. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

I. Verify that motor starters are equipped with properly sized thermal protection.

J. Check dampers for proper position to achieve desired airflow path.

K. Check for airflow blockages.

L. Check condensate drains for proper connections and functioning.

M. Check for proper sealing of air-handling-unit components.

N. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts." Section 23 80 00 "Heating, Ventilating, and Air Conditioning."

O. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

P. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.

2. Measure fan static pressures as follows to determine actual static pressure:

   a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

   b. Measure static pressure directly at the fan outlet.

   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

   d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up the exhaust fan system.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

D. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.

E. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.

2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.

F. Do not overpressurize ducts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.

2. Motor horsepower rating.

3. Motor rpm.

4. Efficiency rating.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter manufacturer’s name, model number, size, type, and thermal-protection-element rating.

a. Starter strip heater size, type, and rating.

3.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: 10.

2. Air Outlets and Inlets: 10.

3. Multiple outlets within single room: 10 for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for “Air Outlets and Inlets”.

4. Heating-Water Flow Rate: 10.

5. Cooling-Water Flow Rate: 10.

B. Set plumbing systems water flow rates within plus or minus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.

2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.

3. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.

2. Fan curves.

3. Manufacturers' test data.

4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.

2. Name and address of the TAB specialist.

3. Project name.

4. Project location.

5. Project Performance Guaranty

6. Architect's name and address.

7. Engineer's name and address.

8. Contractor's name and address.

9. Report date.

10. Signature of TAB supervisor who certifies the report.

11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

12. Summary of contents including the following:

a. Indicated versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

13. Nomenclature sheets for each item of equipment.

14. Data for terminal units, including manufacturer's name, type, size, and fittings.

15. Test conditions for fans and pump performance forms including the following:

a. Settings for outdoor-, return-, and exhaust-air dampers.

b. Conditions of filters.

c. Cooling coil, wet- and dry-bulb conditions.

d. Face and bypass damper settings at coils.

e. Fan drive settings including settings and percentage of maximum pitch diameter.

f. Inlet vane settings for variable-air-volume systems.

g. Settings for supply-air, static-pressure controller.

h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.

2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.

4. Pipe and valve sizes and locations.

5. Terminal units.

6. Balancing stations.

7. Position of balancing devices.

E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.

F. Test Reports – General: All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.

G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.

b. Location.

c. Make and type.

d. Model number and unit size.

e. Manufacturer's serial number.

f. Unit arrangement and class.

g. Discharge arrangement.

h. Sheave make, size in inches, and bore.

i. Center-to-center dimensions of sheave, and amount of adjustments in inches.

j. Number, make, and size of belts.

k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Filter static-pressure differential in inches wg.

f. Preheat-coil static-pressure differential in inches wg.

g. Cooling-coil static-pressure differential in inches wg.

h. Heating-coil static-pressure differential in inches wg.

i. Outdoor airflow in cfm.

j. Return airflow in cfm.

k. Relief airflow in cfm.

l. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.

m. Return-air damper position.

n. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.

o. Vortex damper position.

H. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.

b. Location.

c. Coil type.

d. Number of rows.

e. Fin spacing in fins per inch o.c.

f. Make and model number.

g. Face area in sq. ft.

h. Tube size in NPS.

i. Tube and fin materials.

j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.

b. Average face velocity in fpm.

c. Air pressure drop in inches wg.

d. Outdoor-air, wet- and dry-bulb temperatures in deg F.

e. Return-air, wet- and dry-bulb temperatures in deg F.

f. Entering-air, wet- and dry-bulb temperatures in deg F.

g. Leaving-air, wet- and dry-bulb temperatures in deg F.

h. Water flow rate in gpm.

i. Water pressure differential in feet of head or psig.

j. Entering-water temperature in deg F.

k. Leaving-water temperature in deg F.

l. Refrigerant expansion valve and refrigerant types.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

g. Sheave make, size in inches, and bore.

h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.

b. Location and zone.

c. Traverse air temperature in deg F.

d. Duct static pressure in inches wg.

e. Duct size in inches.

f. Duct area in sq. ft.

g. Indicated air flow rate in cfm.

h. Indicated velocity in fpm.

i. Actual air flow rate in cfm.

j. Actual average velocity in fpm.

k. Barometric pressure in psig.

K. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.

b. Serial number.

c. Application.

d. Dates of use.

e. Dates of calibration.

3.10 INSPECTIONS

A. Initial Inspection: After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

B. Check the following for each system:

1. Measure airflow of at least 10 percent of air outlets.

2. Measure water flow of at least 5 percent of terminals.

3. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

4. Verify that balancing devices are marked with final balance position.

5. Note deviations from the Contract Documents in the final report.

C. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.

2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.

3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

D. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.

3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

E. Prepare test and inspection reports.

3.11 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

DIVISION 26 – ELECTRICAL

PAGE INTENTIONALLY LEFT BLANK.

SECTION 26 00 09 – ELECTRICAL DEMOLITION

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor and equipment necessary to complete the demolition required for the item specified under this Division, including but not limited to:

1. Electrical demolition

1.2 SYSTEM DESCRIPTION

A. Disconnection, removal and relocation of all wiring, luminaires, outlets, conduit, and all other types of electrical equipment as described on Drawings.

B. Purpose is to remove, relocate and extend existing installations to accommodate new construction.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment necessary for patching and extending Work, as specified in other Sections.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly review conditions in the area of demolition prior to commencing Work to ensure complete understanding of existing installation in relationship to demolition Work.

3.2 GENERAL REQUIREMENTS

A. Remove all wiring, luminaires, outlets, conduit, and all other types of electrical equipment indicated to be removed. Devices that are to be removed may require reworking conduit and wiring in order to maintain service to other devices

B. Where remodeling interferes with circuits in areas that are otherwise undisturbed, circuits shall be reworked as required.

C. Existing devices and circuiting that are indicated are indicated only for informational purposes. Contractor shall visit the Project site and shall verify conditions as they exist and shall remove, relocate, and/or rework any electrical equipment or circuits affected (whether indicated or not) due to removal of existing walls, ceilings, etc. Coordinate all Work with that of other trades.

D. All equipment, luminaires, devices, etc., which are removed shall be delivered to the Owner for disposition. All items which are removed and not wanted by the Owner and which are not reused shall become the property of the Contractor and shall be legally removed from the Project site.

E. Cutting and patching necessary for the removal of Electrical Work shall be included.

3.3 WIRING

A. Removed abandoned wiring to source of supply.

3.4 EXISTING SYSTEMS

A. Electrical distribution system: Disable system only to make switchovers and connections. Obtain permission from Owner's designated representative at least 24-hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to Work area.

3.5 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that shall remain.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 01 00 – GENERAL REQUIREMENTS OF ELECTRICAL WORK

PART 1 – GENERAL

1.1 SUMMARY

A. This Section describes the general requirements for the electric work. These requirements apply to all sections of Division 26.

B. Provide electrical materials, equipment, services, rentals, labor and testing to complete the installation and testing of the electrical work specified in the Construction Documents.

1.2 GENERAL REQUIREMENTS

A. No exposed conduit or surface raceway, except in Mechanical yard or equipment rooms, shall be permitted without written approval from the Engineer.

B. Multi-wire branch circuits shall not be permitted. Provide a dedicated neutral for all branch circuits requiring a neutral.

C. Provide shop drawings, materials, labor and testing for all work not explicitly shown or specified in the Constructions Documents but is still required to be completed in order to have a complete and functioning system or facility as specified. Review the bid documents carefully and identify all areas in the constructions documents which require shop drawings and include them in the bid. For example, if an emergency generating system is specified with a remote tank and fuel transfer system and the interconnection wiring of the fuel transfer system was not explicitly included in the Construction Documents, then it is the Contractor's responsibility to provide shop drawings, services (e.g., structural engineer services), materials and labor necessary to complete and test the fuel transfer system so that specified Emergency Generating System meets codes requirements and functions as intended. This also includes but is not limited to mounting details, vendor supplied systems such as UPS, digital lighting, Telecom Systems, Audio Visual, Fire Alarm, etc. Shop drawings shall be submitted to the Engineer for review and approval. Shop drawings will be stamped in accordance with code and plan review requirements.

D. Provide a UL label or evidence of UL listing for all electrical material, unless the material is of a type for which a label or listing service is not provided.

1.3 CODE COMPLIANCE

A. Perform all work in accordance with the following codes:

1. California Electrical Code 2022
2. California Building Code 2022
3. California Fire Code 2022
4. California Mechanical Code 2022
5. California Plumbing Code 2022

6. California Building Standards Administrative Code 2022

7. California Green Building Standards Code 2022

8. California Energy Code 2022

9. All Applicable State and Local Codes and Regulations

1.4 PERMITS, FEES AND INSPECTIONS

A. Obtain all permits that are required for the work.

B. Call for all local building department inspections.

C. Obtain approvals from local building inspector prior to final observation by Engineer.

D. Advise Engineer, one week prior to:

1. Installation of underground work. Obtain Engineer's approval prior to backfill. The Engineer may direct uncovering of any work not so approved.

2. Start of interior rough-in work.

3. Installation of switchboards and motor control centers.

1.5 STANDARDS

A. Comply with the current applicable standards of the listed agencies for electrical materials and installation.

B. Underwriters Laboratories, Inc. (UL): Provide a UL label or evidence of UL listing for all electrical material, unless the material is of a type for which a label or listing service is not provided.

C. National Electrical Manufacturer's Association (NEMA).

D. American National Standards Institute (ANSI).

E. American Society for Testing Materials (ASTM).

F. Insulated Power Cable Engineers Association.

G. Certified Ballast Manufacturer's Association.

H. Institute of Electrical and Electronic Engineers (IEEE).

1.6 SUBMITTALS

A. Provide submittals for items specified in individual sections of Division 26, in accordance with the requirements of Division 1.

B. Procedure: Submit under provisions of Section 01 33 00 – Submittals.

C. Provide submittals for items listed documenting compliance with specification requirements.

1. Materials and Services

2. Contractor prepared Acceptance Test Procedures for Engineering review and approval.

3. Acceptance Test Results

4. Shop drawings

5. Operation and Maintenance Manual, in accordance with Section 01 78 23.

6. Record Drawings, in accordance with Section 01 78 39.

7. Other- Submittals required elsewhere in the Construction Documents.

1.7 MATERIALS AND SUBSTITUTIONS

A. Provide new material of the quality specified and satisfactory to the Engineer.

1. Provide major equipment which is the product of a manufacturer who has, for a period of not less than five years been in successful manufacture of similar equipment to that specified and who has a catalog covering ratings and specifications of proposed equipment.

1.8 DRAWINGS AND SPECIFICATIONS

A. Data given herein and on the plans are exact as could be secured, but their absolute accuracy is not guaranteed. Plans and specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels and other data will be governed by the structures. The contractor shall provide a layout plan of all electrical equipment showing actual dimensions and working clearances. The contractor is responsible for ensuring that all electrical equipment will fit and no working clearances are exceeded.

B. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the Owner.

C. Layouts of equipment, accessories, and wiring systems are diagrammatic but follow these as closely as possible. Examine Architectural, Structural, and Mechanical and other drawings, noting all conditions that may affect this work. Report conflicting conditions to the Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without so reporting the matter, he does so, on his own responsibility and shall alter work if directed by the Engineer at his own expense.

D. The right is reserved to make minor changes in locations of equipment and wiring systems shown, providing the change is ordered before conduit runs and/or work directly connected to same is installed and no extra materials are required.

1.9 UTILITY COORDINATION

A. Coordinate with the electric utility company and the telephone company whenever necessary, to determine service equipment requirements, conduit and backfill requirements, electric metering requirements and other requirements to provide complete utility services, adequate to supply the electrical and communication system(s) indicated. Provide materials that are specified in Division 26 in addition to conforming to utility company requirements.

B. Include in bid, all work required by the utility companies. All work required for utility services shall be in accord with contract documents, specifications, drawings and as required by the utility companies.

C. Use extreme caution when digging to avoid buried electrical cables.

1. Before digging, call: (800) 642-2444

1.10 HOMERUNS AND MAXIMUM NUMBER OF CIRCUITS

A. 120 VAC, 20 A circuit- Maximum of (9) #12 conductors in conduit (assume ambient temp for 120 Deg F, 90 Deg C wire). Homeruns may combine branch circuits by using a maximum of (20) # 10 conductors in 1.25” minimum diameter conduit.

1.11 CUT OVER

A. Prepare, submit and implement the cut over procedure. Provide all necessary materials, equipment, services, and rentals (e.g., generators, UPS, ATS) for the cut over. No disruption in power or any interference with Operations is permitted without Owner's approval. Have cut over coordination meetings with all necessary participants (Owner, Engineers, Vendors, Subcontractors) at least before preparing the cut over procedure and before conducting the approved procedure. Additional meetings may be required (e.g., resolve start up issues).

1.12 SUPERVISION

A. Provide adequate and competent supervision. Maintain complete control of the project execution and complete liability for the materials and work until the job is completed and accepted by the Owner.

1.13 MANUFACTURER'S INSTRUCTION

A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified.

B. Notify the Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.14 WORKMANSHIP

A. Firmly and permanently secure in place all electrical equipment to the structure so that it is level, plumb, and true with the structure and other equipment. Installation methods shall be as recommended by the National Electrical Contractors' Standard of Installation, except when methods specified or shown on the plans differ. The minimum installation standards shall be as required by the Codes.

1.15 PROTECTION

A. Protect all equipment and materials required for the performance of this work from damage by the elements, vandalism, or work during construction.

1. Do not subject the work and materials of other trades to damage during execution of the work in this division of the specifications.

1.16 COORDINATION WITH OTHER TRADES

A. Coordinate with other trades and promptly transmit all information required by them. Coordinate the sequence of construction with other trades to ensure that all work proceeds with a minimum of interference and delay. Perform all work that requires relocation due to negligence or absence of regard for the work of other trades.

1.17 EXAMINATION OF SITE

A. Examine the site prior to bid to determine existing site conditions that may affect the work. No allowance will be allowed for any extra work required due to a failure to recognize, or negligence to discover conditions prior to bid.

1.18 STRUCTURAL REQUIREMENTS

A. Secure all anchors for electrical equipment in a manner that will not decrease the structural value of any structure to an unsafe level. Inform the Engineer of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in the project.

1.19 IDENTIFICATION

A. Install nameplates on electrical equipment including:

1. Individual circuit breakers on switchboards, distribution panelboards and motor control centers.

2. Motor starters.

3. Pilot lights, selector switches, overload resets, timers and other pilot control devices.

4. Panelboards, switchboards, transformers, control cabinets and other major equipment.

5. Disconnect switches, time switches, contactors, relays and other miscellaneous equipment enclosures.

6. Light switches for which the control functions are not evident.

7. Provide labeling on receptacles and light switches which describe the source panel and circuit number. Use clear adhesive label with typed text. Example, "EH-3", that is panel "EH" circuit 3.

B. Describe item, control function of sequence or operation on each nameplate, as applicable.

C. Fabricate nameplates of laminated phenolic plastic, black front and back with white core. Bevel edges. Engrave through outer layer to produce white letters and numerals. For control pilot devices, engraved metallic plates, filled with enamel, are acceptable. Fasten nameplates to equipment with No. 4 Phillips, round head, cadmium steel, self-tapping screws.

1.20 TESTS AND REPORTS

A. Perform routine insulation-resistance, continuity, equipment settings and rotation tests for all affected distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein. Prepare inspection and test reports for all equipment as specified herein and submit to the Electrical Engineer for review and approval. Submit at least two weeks before the planned testing. Perform these inspections and test prior to or as part of system Acceptance Testing. Examples include:

1. Grounding systems, for resistance to earth. Provide additional grounding electrodes if main service or separately derived system ground resistance exceed 5 ohms.

2. Motor circuits with motor disconnected, for resistance to ground.

3. Control circuits for resistance to ground.

4. Lighting circuits, for resistance to ground.

5. Power feeders, for resistance to ground.

6. Switchboards, Motor Control Centers for resistance to ground.:

7. Main bus, power and control circuits, for resistance to ground.

   a. Check connection; tighten if necessary.

   b. Operation of each device.

   c. Set relays and trip settings in accord with the Engineer's directions.

   d. Check thermal overload heaters for size and reset operation.

8. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500-volt "Megger".

9. Set circuit protective devices to provide proper long-time, short-time and ground-fault tripping coordination

10. Coordinate phase rotation of all motors with installer to ensure proper direction of rotation. List motor data:

    a. Item of equipment.

    b. Nameplate data.

    c. Overload heater catalog number and rating.

1.21 DEMONSTRATIONS

A. After testing and final inspection, demonstrate operation of all affected systems and equipment to Engineer and Owner.

B. Arrange date of test with Owner.

C. Advise the manufacturers' representative to be present when required.

D. Instruct Owner's personnel in operation, adjustment and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

1.22 GUARANTEE

A. Guarantee the electrical work against defects in work or materials for one year after filing of Notice of Completion.

B. Undertake repairs within 24 hours after notice from the Owner.

C. If the operation of the electrical system fails to conform to Division 26 requirements, approved submittals, or operation and maintenance manuals, the Owner may operate the electrical system without liability to Owner. Repair or replace defective or unsatisfactory equipment or systems.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EQUIPMENT MOUNTING SEISMIC CRITERIA

A. Brace or anchor all electrical equipment to resist a horizontal force acting in any direction using the criteria of Section 1613A and 1615A, 2022 California Building Code, Title 24, Part 2.

B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the electrical and structural engineers.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 26 05 19 – BUILDING WIRE AND CABLE

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Building wire.

2. Cable.

3. Wiring connections and terminations.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. Underwriters Laboratories, Inc. (UL):

a. UL 4 – Armored Cable.

b. UL 44 – Thermoset-Insulated Wires and Cables.

c. UL 62 – Flexible Cord and Fixture Wire.

d. UL 83 – Thermoplastic-Insulated Wires and Cables.

e. UL 183 – Manufactured Wiring Systems.

f. UL 310 – Electrical Quick-Connect Terminals.

g. UL 486A & B – Wire Connectors.

h. UL 486C – Splicing Wire Connectors.

i. UL 486D – Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.

j. UL 493 – Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables.

k. UL 510 – Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.

l. UL 854 – Service-Entrance Cables.

m. UL 1569 – Metal-Clad Cables.

n. UL 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords.

o. UL 2196 – Standard for Tests of Fire Resistive Cables.

2. National Electrical Manufacturer Association (NEMA):

a. NEMA WC-70 – Power Cables Rated 2,000 V or Less for the Distribution of Electrical Energy.

3. Institute of Electrical and Electronic Engineers (IEEE):

a. IEEE 82 – Test Procedure for Impulse Voltage Tests on Insulated Conductors.

b. IEEE 576 – Recommended Practice for Installation, Termination, and Testing of Insulated Power Cable as Used in Industrial and Commercial Applications.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Submit Manufacturer's installation instructions.

4. Final test results.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

C. Independent Testing Agency qualifications: Refer to Section 26 01 00 – General Requirements of Electrical Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Building wire:

    a. Cerrowire

    b. General Cable

    c. Southwire Company

    d. Stabiloy (aluminum only)

    e. United Wire and Cable

2. Flexible cords and cables:

    a. Carol Cable Company

    b. Cerrowire

    c. PWC Corp

3. Wiring connectors and terminations:

    a. 3M Company.

    b. Ideal.

    c. Blackburn-Holub.

    d. Burndy.

    e. Thomas & Betts Corp.

    f. Beau Barrier.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 BUILDING WIRE

A. Conductor material:

1. Provide annealed copper for all wire, conductor, and cable, unless otherwise indicated.

2. All building wire shall be stranded, unless otherwise indicated.

B. Insulation material:

1. All insulated wire, conductor and cable shall be 600volt rated, unless otherwise noted on the Drawings.

2. Thermoplastic-insulated building wire.

3. Rubber-insulated building wire.

4. Copper feeders and branch circuits larger than #6 AWG: Type THW, XHHW or dual rated THHN/THWN.

5. Copper feeders and branch circuits #6 AWG and smaller: Type TW, THW, XHHW or dual rated THHN/THWN.

6. Feeders and branch circuits for direct-current (DC) in wet locations: Type XHHW-2.

7. Service Entrance: Type RHW or THWN.

8. Control Circuits: Type THW or dual rated THHN/THWN.

9. Identify system conductors as to voltage and phase connections by means of color-impregnated insulation.

2.3 WIRING CONNECTIONS AND TERMINATIONS

A. Bolted pressure connectors: Provide wide range-taking connectors with cast bronze compression bolts, designed for parallel taps, tees, crosses or end-to-end connections.

B. Electrical spring wire connectors:

1. Provide multi-part construction incorporating a non-restricted, zinc coated square cross-section steel spring enclosed in a steel sheet with an outer jacket of plastic and insulating skirt.

2. Self-striping pigtail and tap U-contact connectors shall not be used.

C. Compression type terminating lugs:

1. Provide tin-plated copper high-compression type lugs for installation with hand or hydraulically operated circumference-crimping tools and dies as stipulated by the lug Manufacturer or as indicated on Drawings. Notch or single point type crimping is NOT acceptable.

2. Two-hole, long barrel lugs shall be provided for size #4/0 and larger wire where terminated to bus bars. Use minimum of three crimps per lug, on sizes where possible.

D. Splicing and insulating tape: Provide black, ultraviolet proof, self-extinguishing, 7-mil thick vinyl general purpose electrical tape with a dielectric strength of 10,000volts suitable for temperatures from minus 18-degrees C to 105-degrees C.

E. Insulating putty:

1. Provide pads or rolls of non-corrosive, self-fusing, one-eighth inch thick rubber putty with PVC backing sheet. Scotch vinyl mastic pads and roll or equal.

2. Use putty suitable for temperatures from minus 17.8-degrees C to 37.8-degrees C with a dielectric strength of 570volts/mil minimum.

F. Insulating resin:

1. Provide two-part liquid epoxy resin with resin and catalyst in pre-measured, sealed mixing pouch. Scotchcast 4 or equal for wet or underground vaults, boxes, etc. splices or terminations.

2. Use resin with a set up time of approximately 30-minutes at 21.1-degrees C and with thermal and dielectric properties equal to the insulating properties of the cables immersed in the resin.

G. Terminal strips:

1. Provide box type terminal strips in the required quantity plus 25% spare. Install in continuous rows in terminal cabinets.

2. Use the box type terminal strips with barrier open backs and with ampere ratings as required.

3. Identify all terminals with numbering sequence being used for a system.

H. Crimp type connectors:

1. Provide insulated fork or ring crimp terminals with tinned electrolytic copper-brazed barrel with funnel wire entry and insulation support

2. Fasten crimp type connectors or terminals using a crimping tool recommended by the connector Manufacturer.

3. Provide insulated overlap splices with tinned seamless electrolytic copper barrel with funnel wire entry and insulation support.

4. Provide insulated butt splices with tinned seamless electrolytic copper barrel with center stop, funnel wire entry and insulation support.

I. Cable ties: Provide harnessing and point-to-point wire bundling with nylon cable ties. All cable ties shall be installed using tool supplied by Manufacturer of ties.

J. Wire lubricating compound:

1. UL listed for the wire insulation and conduit type and shall not harden or become adhesive.

2. Shall not be used on wire for isolated type electrical power systems.

K. Bolt termination hardware:

1. Bolts shall be plated, medium carbon steel heat-treated, quenched and tempered equal to ASTM A325 or SAE grade 5; or silicon bronze alloy ASTM B9954 Type B.

2. Nuts shall be heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B steel or silicon bronze alloy.

3. Flat washers shall be steel or silicon bronze, Type A plain standard wide series, confirming to ANSI B27.2. SAE or narrow series shall not be used.

4. Belleville conical spring washers shall be hardened steel, cadmium plated or silicon bronze.

5. Each bolt connecting lug(s) to a terminal or bus shall not carry current exceeding the following values:

   a. 1/4" bolt: 125amps

   b. 5/16" bolt: 175amps

   c. 3/8" bolt: 225amps

   d. 1/2" bolt: 300amps

   e. 5/8" bolt: 375amps

   f. 3/4" bolt: 450amps

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of wire and cable installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 APPLICATION

A. All wire, conductor and cable with their respective connectors, fittings and supports shall be UL listed for the installed application and ambient condition.

B. Feeders and branch circuits in wet locations shall be rated 75-degree C.

C. Feeders and branch circuits in dry locations shall be rated 90-degree C.

D. Feeders and branch circuits for direct-current (DC) systems, such as PV installations, in wet locations shall be type XHHW-2 copper conductors.

E. For wiring of the following, refer to the indicated Code Articles:

1. Fire pump systems shall comply with CEC Article 695.

2. Emergency systems shall comply with CEC Article 700.

3. Fire alarm systems shall comply with CEC Article 760.

4. Where the any above are required to be fire-resistive, refer to CEC Article 728.

F. Minimum conductor size:

1. Provide minimum AWG #12 for all power and lighting branch circuits.

2. Provide minimum AWG #14 for all line voltage signal and control wiring unless otherwise indicated.

G. Color coding:

1. For 120/208volt, 3-phase, 4-wire systems:

a. Phase A - Black

b. Phase B - Red

c. Phase C - Blue

d. Neutral - White

e. Ground - Green

2. Switch leg individually installed shall be the same color as the branch circuit to which they are connected, unless otherwise noted.

3. Travelers for 3-way and 4-way switches shall be a distinct color and pulled with the circuit switch leg or neutral.

3.3 WIRING METHODS

A. Install wires and cables in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.

B. Install all single conductors in raceway system, unless otherwise noted.

C. Parallel circuit conductors and terminations shall be equal in length and identical in all ways.

D. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than #10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.

E. 20amp power and lighting branch circuit containing no more than four (4) current carrying conductors (phases and neutrals). Use #10 AWG conductor for 120/208volt circuits located outside a 75-foot radius of panel source and for 277/480volt branch circuits located outside a 200-foot radius of panel source, unless otherwise noted.

F. 20amp power and lighting branch circuits containing no more than eight (8) current carrying conductors (phases and neutrals). Use #10 AWG conductors for 120/208volt circuits located outside a 65-foot radius of panel source and for 277/480volt circuits located outside a 150-foot radius of panel source.

G. Provide #10 AWG pig tails on all 20amp and 30amp wiring devices served by #8 AWG conductors and larger.

H. Splice cables and wires only in outlet boxes, junction boxes, pull boxes, manholes or handholes. Group and bundle with tie wrap each neutral with its associated phase conductor where more than one neutral is present in a conduit.

I. Install cable supports for all vertical feeders in accordance with the CEC Article 300. Provide split wedge type fittings, which firmly clamp each individual cable and tighten due to cable weight.

J. Neatly form, train, and tie the cables in individual circuits. For panelboards, cabinets, wireways, switches, and equipment assemblies.

K. Seal cable or wire, entering a building from underground or exiting walk-in cold box or freezer, between the wire or cable and conduit, where it exits the conduit, with a non-hardening approved compound, i.e. duct seal or equal.

L. Provide UL-listed factory-fabricated, solderless metal connectors of size, ampacity rating, material, type, and class for applications and for services indicated. Use connectors with temperature ratings equal to or greater than the wires that are being terminated.

M. Stranded wire shall be terminated using fitting, lugs or devices listed for the application. However, in no case shall stranded wire be terminated solely by wrapping it around a screw or bolt.

N. Flexible cords and cables supplied, as part of a pre-manufacturer fixture or unit assembly shall be installed according to Manufacturers published installation instructions.

3.4 WIRING INSTALLATION IN RACEWAYS

A. Install wire in raceway in accordance with IEEE 576, Manufacturer's written instructions, as indicated on the Drawings and as specified herein after interior of building has been physically protected from the weather and all mechanical Work likely to injure conductors has been completed. Pull all conductors into a raceway at the same time. Exercise care in pulling conductors so that insulation is not damaged. Use UL listed, non-petroleum base and insulating type pulling compound as needed.

B. Completely mandrel all underground or concrete encased conduits prior to installing conductors.

C. Completely and thoroughly swab raceway system before installing conductors.

D. Do not use block and tackle, power driven winch or other mechanical means for pulling conductors of size smaller than #1 AWG.

E. Wire pulling:

1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables.

2. Use rope made of nonmetallic material for pulling feeders.

3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors.

4. Pull in together multiple conductors or cables in a single conduit.

5. Pulling tensions and sidewall pressures shall not exceed 60% of the manufacturer's recommended maximum values. Pulling tension shall be continuously monitored during the pull by a calibrated dynamometer. If pulling tension is exceeded during the pull, immediately notify the engineer to determine if the cables will be considered damaged and require contractor replacement.

F. Install and test all cables in accordance with Manufacturer's instructions and warranty.

3.5 WIRE SPLICES, JOINTS AND TERMINATION

A. Join and terminate wire, conductors, and cables in accordance with UL 486A, C, CEC and Manufacturer's instructions.

B. Thoroughly clean wires before installing lugs and connectors.

C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

D. Splices and terminations shall be made mechanically and electrically secure.

E. Where it's determined that unsatisfactory splice or terminations have been installed, remove the devices and install approved devices at no addition cost.

F. Terminate wires in Terminal Cabinets, relay, and contactor panels, etc. using terminal strip connectors.

G. Insulate spare conductors with electrical tape and leave sufficient length to terminate anywhere in the panel or cabinet.

H. Install cable ties and maintain harnessing.

I. Encapsulate splices in exterior outlets, pull boxes and junction boxes using specified insulating resin kits. Make all splices watertight for exterior equipment and equipment in pump rooms.

J. Make up all splices and taps in accessible junction or outlet boxes with connectors as specified herein. Pigtails and taps shall be the same color as the feed conductor. Form conductor prior to cutting and provide at least 6-inches of tail and neatly packed in box after splice is made up.

K. Branch circuits (#10 AWG and smaller):

1. Connectors: Solderless, screw-on, reusable spring pressure cable type, 600volt, 105-degree C. with integral insulation, approved for copper conductors.

2. The integral insulator shall have a skirt to completely cover the stripped wires.

3. The number, size and combination of conductors as listed on the Manufacturers packaging shall be strictly complied with.

L. Feeder circuits: (#6 to 750 kCMIL)

1. Join or tap conductors from #6 AWG to 750 kCMIL using bolted pressure connectors or insulate mechanical compression (hi-press) taps with pre-molded, snap-on insulating boots or specified conformable insulating pad and over wrapped with two half-lapped layers of vinyl insulating tape starting and ending at the middle of the joint.

2. Terminate conductors from size #6 AWG to 750 kCMIL copper using bolted pressure or mechanical compression lugs in accordance with Manufacturer recommendation or as specified elsewhere.

3. Field installed compression connectors for cable sizes 250 kCMIL and larger shall have not less than two clamping elements or compression indents per wire.

4. Insulate splices and joints with materials approved for the particular use, location, voltage, and temperature. Insulate with not less than that of the conductor level that is being joined.

M. Termination hardware assemblies:

1. AL/CU lugs connected to aluminum plated or copper buss, shall be secured using a steel bolt, flat washer (two per bolt), Belleville washer and nut.

2. Copper lugs connected to copper bus, shall be secured using silicon bronze alloy bolt, flat washer (two per bolt), Belleville washer and nut.

3. The crown of Belleville washers shall be under the nut.

4. Bolt assemblies shall be torque to Manufacturer recommendation. Where manufacture recommendations are not obtainable, the following values shall be used:

a. 1/4" - 20 bolt at 80-inch pounds torque.

b. 5/16" - 18 bolt at 180-inch pounds torque.

c. 3/8" - 16 bolt at 20-foot pounds torque.

d. 1/2" - 13 bolt at 40-foot pounds torque.Fp

e. 5/8" - 11 bolt at 55-foot pounds torque.

f. 3/4" - 10 bolt at 158-foot pounds torque.

3.6 IDENTIFICATION

A. Refer to Section 26 05 53 – Electrical Identification for additional requirements.

B. Securely tag all branch circuits. Mark conductors with specified vinyl wrap-around markers. Where more than two conductors run through a single outlet, mark each conductor with the corresponding circuit number.

C. Color code conductors' size #8 and larger using specified phase color markers and identification tags, with exception of the grounded conductor which must have a continuous white or gray jacket if #6 or smaller.

D. Provide all terminal strips with each individual terminal identified using specified vinyl markers.

E. In manholes, pull boxes and handholes, provide tags of the embossed brass type and show the cable type and voltage rating. Attach the tags to the cables with slip-free plastic cable lacing units.

3.7 FIELD QUALITY CONTROL

A. Independent testing: Contractor shall arrange and pay for the services of an independent Testing Agency to perform all quality control electrical testing required herein. Independent Testing Agency shall meet the requirements as outlined in Section 26 01 00 – General Requirements of Electrical Work.

B. Prefunctional testing:

1. Visual and mechanical inspection:

a. Compare cable data with Contract Documents.

b. Inspect exposed sections of wires and cables for physical damage and proper connections.

c. Verify tightness of accessible bolted connections with calibrated torque wrench in accordance with Manufacturer's published data.

d. Inspect compression applied connectors for correct cable match and indention.

e. Verify visible cable bend meet or exceed ICEA and Manufacturer's minimum allowable bending radius.

f. If cables are terminated through window type current transformers, inspect to verify neutral and ground conductors are correctly placed for operation of protective devices.

g. Ensure wire and cable identification has been installed as specified herein.

2. Electrical testing:

   a. Contractor shall perform feeder and branch circuit insulation test after installation and prior to connection to utilization devices such as fixtures, motors, or appliances. Testing shall be as follows:

      i. 100% of all feeders 100amp rated and above.

      ii. 50% of all feeders smaller than 100amps.

      iii. 10% of all branch circuits at each individual panelboard.

   b. Perform insulation-resistance test using megohm meter with applied potential of 1000volt DC for a continuous duration of 60-seconds. Test conductors' phase-to-phase and phase-to-ground. Conductors shall test free from short-circuit and ground faults.

   c. Perform continuity test of all feeder and branch circuits to ensure correct cable connections. Test all neutrals for improper grounds.

   d. Contractor shall furnish instruments, materials, and labor for these tests.

3. Test values: Investigate resistance values less than 50-megohms.

4. Furnish test results in typewritten report form for review and inclusion in the operation and maintenance manuals.

END OF SECTION

SECTION 26 05 26 – GROUNDING AND BONDING

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Power system grounding.

2. Site lighting grounding.

3. Electrical equipment and raceway grounding and bonding.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Division 05: Building Steel.

3. Division 22: Cold Water Piping.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. Underwriters Laboratories, Inc. (UL):

a. UL 467– Grounding and Bonding Equipment.

2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

a. IEEE No. 142– Recommended Practice for Grounding of industrial and Commercial Power Systems.

b. IEEE No. 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

1.3 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral at service entrance equipment as described herein and indicated on Drawings.

B. Ground each separately derived system neutral as described herein and indicated on Drawings.

C. Except as otherwise indicated, the complete electrical installation including the neutral conductor, metallic conduits and raceways, cable trays, boxes, cabinets and equipment shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically indicated or specified.

D. Resistance:

1. Resistance from the main switchboard ground bus through the ground electrode to earth shall not exceed 5-OHMS unless otherwise noted.

2. Resistance from the farthest panelboard, switchboard, etc. ground bus through the ground electrode to earth shall not exceed 20-OHMS

1.4 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Submit Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Ground Rods:

a. Weaver.

b. Erico "Cadweld" Products, Inc.

2. Ground Wells:

a. Christy Concrete Products, Inc.

b. Forni Corp.

3. Ground Bushings, Connectors, Jumpers and Bus:

a. O-Z/Gedney.

b. Thomas & Betts Corp.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 GROUND CONDUCTORS

A. Refer to Specification Section 26 05 19 – Building Wire and Cable for conductor specifications.

B. General purpose insulated:

1. UL approved and code sized copper conductor, with dual rated THHN/THWN insulation, color identified green.

2. Where continuous color-coded conductors are not commercially available, provide a minimum 4" long color band with green, non-aging, plastic tape in accordance with CEC.

C. Bare conductors in direct contact with earth or encased in concrete: #4/0 AWG copper minimum, U.O.N.

D. Bonding pigtails: Insulated copper conductor, identified green, sized per code, and provide with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.3 DRIVEN (GROUND) RODS

A. Copper clad steel, minimum 3/4-inch diameter by 8 feet long, unless otherwise noted.

2.4 GROUND WELL BOXES FOR GROUND RODS

A. Precast concrete box nominal 9" throat diameter x 14" deep with light duty concrete cover for non-traffic areas or steel plate for traffic areas. Cover shall be embossed or engraved with "GROUND ROD".

2.5 INSULATED GROUNDING BUSHINGS

A. Plated malleable iron or steel body with 150-degree Centigrade molded plastic insulating throat and lay-in grounding lug.

2.6 CONNECTIONS TO PIPE

A. For cable to pipe: UL and CEC approved bolted connection.

2.7 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS OR SPLICES

A. Where required by the Drawings, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high-pressure compression type connectors.

1. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Cadweld or equal. Each particular type of weld shall use a kit unique to that type of weld.

2. High-pressure compression type connectors shall be used for cable-to-cable and cable-to-ground rod connections.

2.8 EXTRA FLEXIBLE, FLAT BONDING JUMPERS

A. Where required by Code, indicated on the Drawing, and specified herein.

2.9 INSTALLATION

A. Grounding electrodes:

1. Metal underground water pipe: Cold water metal piping system: Where the underground cold water service line is metal, indirect contact with the earth for 10-feet or more, the Contractor shall install a grounding electrode conductor from the main incoming cold water line ahead of the meter and extend to the main building reference ground bus in the main electrical room. The electrode shall be sized per CEC Article 250. Electrode connection should be accessible.

2. Concrete encased grounding electrode (UFER ground): Provide a #4/0 AWG minimum bare copper conductor encased along the bottom of concrete foundation or footings which are in direct contact with the earth and where there is no impervious water-proofing membrane between the footing and the soil. The electrode shall extend through a horizontal length of 30 feet minimum and shall be encased in not less than 2 or more than 5 inches of concrete separating it from surrounding soils. The electrode shall emerge from the concrete slab through a protective non-metallic sleeve and shall be extended to the main building reference ground bus.

3. Supplementary grounding electrode (ground ring, grid and driven rods): Provide, as indicated on the Drawings, driven ground rod(s) installed in listed ground well box(s) and filled with gravel after connection is made. Interconnect ground rod with structural steel and adjacent rods with minimum #2 AWG bare copper conductor. Ground rod shall not be less than 10 foot from any other electrode of another electrical system or from adjacent ground rod(s).

B. Grounding electrode conductor: Provide grounding electrode conductor as indicated on the Drawings or sized per CEC Article 250, whichever is greater.

C. Power system grounding:

1. Provide, unless otherwise indicated, a main building power system ground bus mounted on the wall in the main electrical room. Connect the following items using CEC sized copper grounding conductors to lugs on the main building ground bus:

a. Grounding conductor from building reference ground bus in main service switchboard.

b. Bonding conductor to metallic cold-water piping system.

c. Bonding conductor to building structural steel.

d. Separately derived system grounding conductors in same room.

2. At the building power system reference ground bus in the main service switchboard, connect the grounding electrode conductor from concrete encased UFER ground or other grounding electrode systems as indicated on the Drawing or herein.

D. Equipment bonding/grounding:

1. Provide a CEC sized insulated copper ground conductor in all 120volt AC through 600volt AC feeder and branch circuit distribution conduits and cables.

2. Provide a separate grounding bus at panelboards, switchboards. Connect all metallic enclosed equipment so that with maximum fault current flowing, shall be maintained at not more than 35volts above ground.

3. Conduit terminating in concentric, eccentric, or oversized knockouts at panelboards, cabinets, gutters, etc. shall have grounding bushings and bonding jumpers installed interconnecting all such conduits.

4. Provide bonding jumpers across expansion and deflection couplings in conduit runs, pipe connections to water meters, dielectric couplings in metallic cold-water piping system.

5. Provide internal ground wire in flexible conduit connected at each end via grounding bushing.

E. Site lighting grounding: Bond all metallic light poles and bollards. Provide ground rods where indicated on the Drawings.

2.10 FIELD QUALITY CONTROL

A. Independent Testing: Contractor shall arrange and pay for the services of an independent Testing Agency to perform all quality control electrical testing required herein.

B. Prefunctional testing:

1. Provide Testing Agency with Contract Documents for their review prior to the commencement of ground testing.

2. Visual and mechanical inspection:

   a. The Testing Agency shall inspect the grounding electrode and connections prior to concrete encasement, burial, or concealment.

   b. Check tightness and welds of all ground conductor terminations.

   c. Verify installation complies with the intent of the Contract Documents

3. Obtain and record ground resistance measurements both from electrical equipment ground bus to the ground electrode and from the ground electrode to earth. Furnish and install additional bonding and add grounding electrodes as required complying with resistance limits specified under this Section of the Specification.

4. A typewritten record of measured resistance values shall be submitted for review and included with the operation and maintenance manual furnished to the Owner at the time of Project closeout and before certificate of final payment is issued.

END OF SECTION

SECTION 26 05 29 – ELECTRICAL HANGERS AND SUPPORTS

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Conduit supports.

2. Equipment supports.

3. Fastening hardware.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Division 03: Cast-in-place concrete. Concrete equipment pads.

3. Division 05: Miscellaneous metals. Hangers for electrical equipment.

4. Division 09: Ceiling suspension systems. Slack support wires.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. Underwriters Laboratories, Inc. (UL):

2. UL 2239 – Hardware for the Supports of Conduit, Tubing and Cable.

1.3 SYSTEM DESCRIPTION

A. Provide devices specified in this Section and related Sections for support of electrical equipment furnished and installed under Division 26.

B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.4 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Data/catalog cuts for each product and component specified herein.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Submit Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Concrete fasteners:

a. Phillips "Red-Head".
b. Remington.
c. Ramset.

2. Concrete inserts and construction channel:

a. Unistrut Corp.
b. GS Metals "Globe Strut."
c. Thomas & Betts "Kindorf" Corp.

3. Conduit straps:

a. O-Z/Gedney.
b. Erico "Caddy" Fastening Products.
c. Thomas & Betts "Kindorf" Corp.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 CONCRETE FASTENERS

A. Provide expansion-shield type concrete anchors.

B. Provide powder driven concrete fasteners with washers. Obtain approval by Architect and Structural Engineer prior to use.

2.3 CONCRETE INSERTS

A. Provide pressed galvanized steel, concrete spot insert, with oval slot capable of accepting square or rectangular support nuts of ¼ inch to ½ inch diameter thread for rod support.

2.4 THREADED ROD

A. Provide steel threaded rod, sized for the load unless otherwise noted on the Drawings or in the Specifications.

2.5 CONSTRUCTION CHANNEL

A. Provide 1.5-inch by 1.5-inch, 12-gauge galvanized steel channel with 17/32-inch diameter bolt holes and 1-1/2 inch on center in the base of the channel.

2.6 CONDUIT STRAPS

A. One-hole strap, steel, or malleable iron, with malleable iron clamp-back spacer for surface mounted wall and ceiling applications.

1. Use malleable strap with spacers for exterior and wet locations.

2. Use steel strap without spacers for interior locations.

B. Steel channel conduit strap for support from construction channel.

C. Steel conduit hanger for pendant support with threaded rod

D. Steel wire conduit support strap for support from independent #12-gauge hanger wires.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of supporting device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Coordinate size, shape, and location of concrete pads with Division 03, Cast-in-place concrete.

B. Layout support devices to maintain headroom, neat mechanical appearance and to support the equipment loads.

C. Where indicated on the Contract Documents, install freestanding electrical equipment on concrete pads.

3.3 INSTALLATION

A. Furnish and install supporting devices as noted throughout Division 26.

B. Electrical device and conduit supports shall be independent of all other system supports that are not structural elements of the building, unless otherwise noted.

C. Fasten hanger rods, conduit clamps, outlet, and junction boxes to building structure using precast inserts, expansion anchors, preset inserts, or beam clamps.

D. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster or gypsum board partitions and walls.

E. Use expansion anchors or preset inserts in solid masonry walls.

F. Use self-drilling anchors, expansion anchor or preset inserts on concrete surfaces.

G. Use sheet metal screws in sheet metal studs and wood screws in wood construction.

H. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or acoustical ceiling suspension wires.

I. Do not drill structural steel members unless first approved in writing by the Architect or Structural Engineer.

J. Fabricate supports from structural steel or steel channel, rigidly welded, or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

K. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.

L. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

3.4 ERECTION OF METAL SUPPORTS

A. Cut, fit and place miscellaneous metal fabrications accurately in location, alignment and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.5 WOOD SUPPORTS

A. Cut, fit, and place wood grounds, nailers, blocking and anchorage accurately in location, alignment and elevation to support and anchor electrical materials and equipment.

3.6 ANCHORAGE

A. All floor mounted, free standing electrical equipment such as transformers, switchboards, distribution boards, etc. shall be securely fastened to the floor structure.

B. Anchorage of electrical equipment shall comply with the seismic requirements as outlined in Section 26 01 00 – General Requirements of Electrical Work.

END OF SECTION

SECTION 26 05 31 – CONDUIT

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Rigid steel conduit and fittings.
2. PVC insulated rigid steel conduit and fittings.
3. Intermediate metal conduit and fittings.
4. Electrical metallic tubing and fittings.
5. Flexible metallic conduit and fittings.
6. Liquidtight flexible metallic conduit and fittings.
7. Miscellaneous conduit fittings and products.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. Division 01: Cutting and patching.
3. Division 07: Sheet metal flashing and trim.
4. Division 09: Painting. Exposed conduit and other devices.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. <u>American National Standards Institute, Inc. (ANSI):</u>

a. ANSI C80.1 – Rigid Steel Conduit, Zinc-Coated.

b. ANSI C80.3 – Electrical Metallic Tubing, Zinc Coated.

c. ANSI C80.5 – Rigid Aluminum Conduit.

d. ANSI/ TIA-569-D – Telecommunications Pathways and Spaces.

2. Underwriters Laboratories, Inc. (UL):

a. UL 1 – Flexible Metal Conduit.

b. UL 6 – Rigid Metal Conduit.

c. UL 360 – Liquid-Tight Flexible Steel Conduit.

d. UL 514B – Conduit, Tubing and Cable Fittings.

e. UL 635 – Insulating Bushings.

f. UL 797 – Electrical Metallic Tubing - Steel.

g. UL 1242 – Intermediate Metal Conduit - Steel.

3. National Electrical Manufacturer Association (NEMA):

a. NEMA RN1 – PVC Externally coated Galvanized Rigid Steel Conduit.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Wor,k the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Submit Manufacturer's installation instruction. Provide written instructions for raceway products requiring glues, special tools, or specific installation techniques.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted and approved.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Metal conduit:

   a. Allied Tube and Conduit Co.

   b. Triangle PWC, Inc.

   c. Western Tube and Conduit Corp.

   d. Spring City Electrical Manufacturing Co.

   e. Alflex Corp.

   f. American Flexible Metal Conduit Co.

   g. Anaconda.

2. Fittings:

   a. Appleton Electric Co.

   b. OZ/Gedney.

   c. Thomas & Betts Corp.

   d. Spring City Electrical Manufacturing Co.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 GALVANIZED RIGID STEEL CONDUIT (GRS)

A. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and UL 6.

B. Standard threaded couplings, locknuts, bushings, and elbows: Only materials of steel or malleable iron are acceptable. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure; provide two locknuts at each box or can, inside and outside.

C. Three-piece couplings: Hot dip galvanized, cast malleable iron.

D. Insulating bushings: Threaded polypropylene or thermosetting phenolic rated 150-degree C minimum.

E. Insulated grounding bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.

F. Insulated metallic bushings: Threaded cast malleable iron body with plastic insulated throat rated 150-degrees C.

G. All fittings and connectors shall be threaded.

2.3 PVC INSULATED GALVANIZED RIGID STEEL CONDUIT (PVC GRS)

A. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with nominal 20 or 40 mil thermoplastic vinyl coating, heat fused and bonded to the exterior of the conduit.

B. Fittings: Conduit couplings and connectors shall be as specified for galvanized rigid steel conduit and shall be factory PVC coated with an insulating jacket equivalent to that of the coated material.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Conduit: Hot dip galvanized steel meeting the requirements of CEC Article 345 and conforming to ANSI C80.6 and UL 1242.

B. Fittings: Conduit couplings, connector and bushing shall be as specified for galvanized rigid steel conduit. Integral retractable type IMC couplings are also acceptable.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Conduit: Shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam and hot dip galvanized after fabrication. Conduit shall conform to ANSI C80.3 Specifications and shall meet UL requirements.

B. Set screw type couplings: Hot dip galvanized, steel, UL listed concrete tight. Use set screw type couplings with four setscrews each of conduit sizes over 2 inches. Setscrews shall be of case-hardened steel with hex-head and cup point to firmly seat in wall of conduit for positive grounding.

C. Set screw type connectors: Hot dip galvanized, steel, UL listed concrete tight with male hub and insulated plastic throat, 150-degree C temperature rated. Setscrew shall be same as for couplings.

D. Raintight couplings: Hot dip galvanized, steel; UL listed raintight and concrete tight, using gland and ring compression type construction.

E. Raintight connectors: Hot dip galvanized, steel, UL listed raintight and concrete tight, with insulated throat, using gland and ring compression type construction.

2.6 FLEXIBLE METALLIC CONDUIT (FMC)

A. Conduit: Shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design and conforming to UL 1.

B. Fittings: Connectors shall be of the single screw clamp variety with steel or cast malleable iron bodies and threaded male hubs with insulated throats. Exception: Pressure cast screw-in connectors shall be acceptable for luminaire connection in suspended ceilings and cut-in outlet boxes within existing furred walls.

2.7 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC)

A. Conduit: Shall be fabricated in continuous lengths from galvanized steel strips, interlocking spirally wound, covered with extruded liquidtight jacket of polyvinyl chloride (PVC) and conforming to UL 360. Provide conduit with a continuous copper-bonding conductor wound spirally between the convolutions.

B. Fittings: Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push-in ferrule.

2.8 MISCELLANEOUS CONDUIT FITTINGS AND PRODUCTS

A. Watertight conduit entrance seals: Steel or cast malleable iron bodies and pressure clamps with PVC sleeve, neoprene sealing grommets and PVC coated steel pressure rings. Fittings shall be supplied with neoprene sealing rings between the body and PVC sleeve.

B. Watertight cable sealing bushings: One piece, compression molded sealing ring with PVC coated steel pressure disks, stainless steel sealing screws and zinc plated cast malleable iron locking collar.

C. Expansion fittings: Multi-piece unit comprised of a hot dip galvanized malleable iron or steel body and outside pressure bussing designed to allow a maximum of 4" conduit movement (2" in either direction). Furnish with external braid tinned copper bonding jumper. Unit shall be UL listed for wet or dry locations.

D. Expansion/deflection couplings: Multi-piece unit comprised of a neoprene sleeve with internal flexible tinned copper braid attached to bronze end couplings with stainless steel bands. Coupling shall accommodate 0.75-inch deflection, expansion or contraction in any direction and allow 30-degree angular deflections. Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber jacket and stainless-steel jacket clamps. Unit shall comply with UL467 and UL514. Manufacturer shall be OZ/Gedney Type DX, Steel City Type EDF or equal.

E. Fire rated penetration seals:

1. UL building materials directory classified.

2. Conduit penetrations in fire rated separation shall be sealed with a UL classified fill, void or cavity material.

3. The fire rated sealant material shall be the product best suited for each type of penetration and may be a caulk, putty, composite sheet, or wrap/strip.

F. Standard products not herein specified:

1. Provide listing of standard electrical conduit hardware and fittings not herein specified for approval prior to use or installation, i.e. locknuts, bushings, etc.

2. Listing shall include Manufacturers name, part numbers and a written description of the item indicating type of material and construction.

3. Miscellaneous components shall be equal in quality, material and construction to similar items herein specified.

G. Hazardous area fittings: UL listed for the application.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of conduit system installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 APPLICATION

A. Galvanized rigid steel conduit (GRS) can be used in the following applications:

1. For feeders and branch circuits located indoors, concealed or exposed above suspended ceilings, in damp/wet locations, in crawl spaces, in attics, chases, furred spaces, equipment rooms, loading docks or in hazardous locations in accordance with CEC and local Codes.

2. For feeders and branch circuits concealed in concrete floors and walls when not in contact with earth.

3. For use where conduit is subject to physical damage.

4. For feeders and branch circuits installed exposed on the roof.

B. PVC insulated galvanized rigid steel conduit can be used in the following applications:

1. Use 40-mil coating for feeders and branch circuits in damp or wet locations.

2. Use 20- or 40-mil for feeders and branch circuits concealed in concrete walls or slabs in contact with earth.

3. Use 20- or 40-mil for runs beneath floor slabs on grade.

4. Use 40-mil for all below grade penetrations through floor slabs on grade or exterior walls.

C. Intermediate metal conduit (IMC): Can be used for the same application as galvanized rigid steel conduit as specified herein, except for hazardous locations prohibited by CEC or Local Codes.

D. Electrical metallic tubing (EMT): Can be used exposed or concealed for interior electrical feeders 4" and smaller, interior power and lighting branch circuits and low tension distribution system where run above suspended ceilings, in concrete slabs and walls not in contact with earth; in stud walls, furred spaces and crawl spaces. EMT shall not be installed exposed below 8 feet above the finish floor except within electrical, communication or signal rooms or closets (subject to physical damage).

E. Flexible metallic conduit (FMC): Can be used only in dry locations for connections from an adjacent outlet box or conduit to all motors, transformers, vibrating equipment or machinery, controllers, solenoid valves, float and flow switches or similar devices and to luminaires installed in suspended ceilings.

F. Liquidtight flexible metallic conduit (LFMC): Can be used in wet or damp locations for connections from adjacent outlet box or conduit to all motors, transformers, vibrating equipment or machinery, controllers, solenoid valves, float and flow switches or similar devices. These areas are typically food preparation and dishwashing areas, sump wells, loading docks, pump rooms, exterior areas, etc.

G. Fire-Resistive Systems: Refer to CEC Article 728. All devices utilized, mountings, and supports shall be listed as part of the fire-resistive system.

3.3 PREPARATION

A. Locations of conduit runs shall be planned in advance of the installation and coordinated with ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

B. Where practical, install conduits in groups in parallel vertical or horizontal runs and at elevations that avoid unnecessary offsets.

C. All conduits shall be run parallel or at right angles to the centerlines of columns and beams, whether routed exposed, concealed above suspended ceiling or in concrete slabs.

D. Conduits shall not be placed closer than 12-inches to a flue, parallel hot water, steam line or other heat producing source or three inches from such lines when crossing perpendicular to the runs.

E. Communications conduits shall not be placed closer than 12 inches to power, a flue, parallel hot water, steam line or other heat producing source or three inches from such lines when crossing perpendicular to the runs.

F. Exposed conduit installation shall not encroach into the ceiling height headroom of walkways or doorways. Where possible, install horizontal raceway runs above water and below steam piping.

G. The largest trade size conduits in concrete floor and wall slabs shall not exceed 1/3 the floor or wall thickness and conduits shall be spaced a minimum of three conduit diameters apart unless otherwise noted on the Drawings. All conduits shall be installed in the center of concrete slabs or wall and shall not be placed between reinforcing steel and the bottom of floor slabs.

H. In long runs of conduit, provide sufficient pull boxes inside buildings to facilitate pulling wires and cables, with spacing not to exceed 150-feet. Support pull boxes from structure independent of conduit supports. These pull boxes are not indicated on the Drawings.

I. Provide all reasonably inferred standard conduits fitting and products required to complete conduit installation to meet the intended application whether noted, indicated, or specified in the Contract Documents or not.

J. Connect recessed luminaires to conduit runs with maximum six feet of flexible metal conduit.

3.4 INSTALLATION

A. Install conduit in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.

B. Minimum Conduit Size: Unless otherwise noted herein or on Drawings, minimum conduit size shall be 3/4" for interior applications and 1" for exterior and underground applications.

C. Minimum Communication and Signal Conduit Size: Unless otherwise noted herein or on Drawings, minimum conduit size shall be 1" for interior applications and 2" for exterior and underground applications.

D. All conduit sizes indicated on the Drawings are sized for copper conductors with THHN/THWN insulation. If conductor type or size is changed the Contractor shall be responsible for resizing conduits upward to meet Code.

E. All communication and signal conduit sizes indicated on the Drawings are sized for 40% fill or less for category 6 or 6A cable. If cable type or size is changed the Contractor shall be responsible for resizing conduits upward to meet a maximum 40% fill.

F. In general, all conduit work shall be concealed where possible. Exceptions shall be electrical, communication and mechanical rooms, exposed ceiling areas, and parking garages.

G. Conduit connections to motors and surface cabinets shall be concealed, except for electrical, communication and mechanical rooms, or unless exposed Work is clearly called for on the Drawings.

H. Install conduits in complete runs before pulling in cables or wires.

I. Install conduit free from dented, bruises or deformations. Remove and replace any damaged conduits with new undamaged material.

J. Conduits shall be well protected and tightly covered during construction using metallic bushings and bushing "pennies" to seal open ends.

K. In making joints in rigid steel conduit, ream conduit smooth after cutting and threading. Coat all field-threaded joints with UL approved conductive type compound to ensure low resistance ground continuity through conduit and to prevent seizing and corrosion.

L. Clean any conduit in which moisture or any foreign matter has collected before pulling in conductors. Paint all field-threaded joints to prevent corrosion.

M. In all empty conduits or ducts, install a “True Tape” conduit measuring tape line to provide overall conduit length for determining length of cables/conductors for future use.

N. Conduit systems shall be mechanically and electrically continuous throughout. Install code size, insulated, copper, green-grounding conductors in all conduit runs for branch circuits and feeders. This conductor is not indicated on the Drawings. Refer to Section 260526: Grounding and Bonding.

O. Metallic conduit shall not be in contact with other dissimilar metal pipes (i.e. plumbing).

P. Make bends with standard conduit bending hand tool or machines. The use of any item not specifically designed for the bending of electrical conduit is strictly prohibited.

Q. A run of conduit between terminations at wire pulling points shall not contain more than the equivalent of four quarter bends (360-degrees, total).

R. A run of communications and signal conduit between terminations at wire pulling points shall not contain more than the equivalent of two quarter bends (180-degrees, total).

S. Emergency power raceway system: Install entirely independent of other raceway systems, except where specifically allowed by CEC Article 517.

3.5 PENETRATIONS

A. Locate penetrations and holes in advance where they are proposed in the structural sections such as footings, beams, wall, etc. Penetrations are acceptable only when the following occurs:

1. Where indicated on the Structural Drawings.

2. As approved by the Structural Engineer prior to construction and after submittal of Drawing showing location, size, and position of each penetration.

B. Cutting or holes:

1. Cut holes through concrete, masonry block or brick floors and floors of structure with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Structural Engineer as required by limited working space. Obtain the approval of the Structural Engineer prior to drilling through structural sections.

2. Provide sleeves or “can outs” for cast-in-place concrete floors and walls. Following conduit installation, seal all penetrations using non-iron bearing, chloride free, non-shrinking, dry-pack grouting compounds; or fire rated penetration-sealing materials.

3. Cut holes for conduit penetrations through non-concrete and non-masonry walls, partitions, or floors with a hole saw. The hole shall be only as large as required to accommodate the size of the conduit.

4. Provide single piece escutcheon plates around all exposed conduit penetrations in public places.

C. Sealing:

1. Non-rated penetrations: Pack opening around conduits with non-flammable insulating material and seal with gypsum wallboard taping compound.

2. Fire stop: Where conduits, wireways and other electrical raceways pass through fire rated partitions, walls, smoke partitions or floor; install a UL classified fire stop material to provide an effective barrier against the spread of fire, smoke, and gases. Completely fill and seal clearances between raceways and openings with the fire stop material.

D. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight as specified in Division 07: Sealants and Caulking.

1. Install specified watertight conduit entrance seals at all below grade wall and floor penetrations. Conduits penetrating exterior building walls and building floor slab shall be PVC coated rigid galvanized steel.

2. For roof penetrations furnish and install roof flashing, counter flashing and pitch-pockets as specified under Roofing and Sheet Metal Sections of the Specifications.

3. Provide membrane clamps and cable sealing fittings for any conduit that horizontally penetrates the waterproof membrane.

4. Conduits that horizontally penetrate a waterproof membrane shall fall away from and below the penetration on the exterior side a minimum of two times the conduit diameters.

3.6 CONCEALED IN CONCRETE

A. Install conduits approximately in the center of the slab so that there will be a minimum of 3/4-inch of concrete around the conduits.

B. Installation of conduit in structural concrete that is less than three inches thick is prohibited. Topping slabs, maintenance pads and curbs are exempted.

C. Tie conduits to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Run conduit larger than 1-inch trade size, parallel with or at right angles to the main reinforcement; where at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab.

D. Where nonmetallic conduit or tubing is used, raceways must be converted to PVC coated rigid steel conduit before rising above floor.

E. Make couplings and connections watertight.

F. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

3.7 TERMINATIONS AND JOINTS

A. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings except as otherwise indicated.

B. Raceways shall be joined using specified couplings or transition couplings where dissimilar raceway systems are joined.

C. Conduits shall be securely fastened to cabinets, boxes and gutters using two locknuts and an insulating bushing or specified insulated connectors. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors. Install grounding bushings or bonding jumpers on all conduits terminating at concentric or eccentric knockouts.

D. Conduit terminations exposed at weatherproof enclosures and cast outlet boxes shall be made watertight using specified connectors and hubs.

E. Stub-up connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this contract, install screwdriver operated threaded flush plugs with floor.

F. Install specified cable sealing bushings on all conduits originating outside the building walls and terminating in switchgear, cabinets, or gutters inside the building. Install cable sealing bushings or raceway seal for conduit terminations in all grade level or below grade exterior pull, junction, or outlet boxes.

G. Raceway seal: Inject into wire filled raceways, a pre-formulated rigid 2 lbs. density polyurethane foam which expands a minimum 35 times its original bulk. Foam shall have the physical properties of water vapor transmission of 1.2 to 3.0 perms: water absorption less than 2% by volume, fungus and bacterial resistant. Foam shall permanent seal against water, moisture, insects, and rodents. Install raceway sealing foam at the following points:

1. Where conduits pass from warm locations to cold locations to prevent passage of water vapor (such as refrigerated spaces, constant temperature rooms, air-conditioned spaces, etc.).

2. Where conduits enter buildings from below grade.

H. Install expansion couplings where any conduit crosses a building separation or expansion joint as follows:

1. Conduits three inches and larger, shall be rigidly secured to the building structure on opposite sides of a building expansion joint and provided with expansion or deflection couplings. Install the couplings in accordance with the Manufacturer's recommendations.

2. Conduits smaller than three inches shall be rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes on both sides of the joint. Connect conduits to junction boxes with 15 inches of slack flexible conduit. Flexible conduit shall have a green copper ground-bonding jumper installed. For concrete embedded conduit, use expansion and deflection couplings as specified above for three inches and larger conduits.

I. Use short length (maximum of 6ft) of the appropriate FMC or LFMC conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission. Provide liquidtight flexible metal conduit for installation in exterior locations, moisture or humidity-laden atmosphere, corrosive atmosphere, water hose or spray wash-down operations and locations subject to seepage or dripping of oil, grease, or water. Provide a green ground wire with FMC or LFMC conduit.

3.8 HAZARDOUS LOCATIONS

A. Use rigid steel conduit only.

B. Install UL approved sealing fittings that prevent passage of explosive vapors in accordance with the Manufacturers written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank coverplate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous locations.

2. At luminaires, switches, receptacles and as required by the CEC.

3.9 SUPPORTS

A. Provide supports for raceways as specified in Section 260529: Electrical Hangers and Supports.

B. All raceways systems shall be secured to building structures using specified fasteners, clamps and hangers spaced according to the CEC.

C. Support single runs of conduit using one-hole pipe straps. Where run horizontally on walls in damp or wet locations, install "clamp backs" to space conduit off the surface.

D. Multiple conduit runs shall be supported using "trapeze" hangers fabricated from specified construction channel, mounted to 3/8-inch diameter, threaded steel rods secured to building structures. Fasten conduit to construction channel with standard one-hole pipe clamps or the equivalent. Provide lateral seismic bracing for hangers.

E. Individual 1/2" and 3/4" conduits installed above suspended ceilings may be attached to the ceiling's hanger wire using spring steel support clips provided that not more than two conduits are attached to any single support wire.

F. Support exposed vertical conduit runs at each floor level, independent of cabinets or switches to which they run, by means of acceptable supports.

G. Fasteners and supports in solid masonry and concrete:

1. Use steel or malleable iron concrete inserts set in place prior to placing the concrete.

2. After concrete installation:

a. Steel expansion anchors not less than ¼ inch bolt size and not less than 1-1/8” embedment.

b. Power set fasteners not less than ¼ inch diameter with depth of penetration not less than three inches.

c. Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.

H. Hollow masonry: Toggle bolts are permitted. Bolts supported only by masonry block are not acceptable.

I. Metal structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 26 05 33 – BOXES

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Wall and ceiling outlet boxes.

2. Pull and junction boxes.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Division 08: Access doors. Wall and ceiling access doors.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.

1. American National Standards Institute (ANSI) /National Electrical Manufacturer Association (NEMA):

a. ANSI/NEMA OS-1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

b. ANSI/NEMA OS-2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

c. NEMA 250 – Enclosures for Electrical Equipment (1000 volts maximum).

2. Underwriters Laboratories (UL):

a. UL 50 – Enclosures for Electrical Equipment.

b. UL 514A – Metallic Outlet Boxes.

c. UL 1773 – Termination Boxes.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Submit Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Outlet and junction boxes:

a. Spring City Electrical Manufacturing Co.

b. Thomas & Betts Corp.

c. Raco, Inc.

2. Cast boxes:

a. Appleton Electric Co.

b. Crouse-Hinds.

3. Pullboxes:

a. Circle AW Products.

b. Hoffman Engineering Co.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 OUTLET BOXES

A. Standard outlet box:

1. Provide galvanized, one-piece die formed or drawn steel or welded, knockout type box of size and configuration best suited to the application indicated on the Drawings.

2. 4-inch square by 2-1/4-inch deep shall be minimum box size.

3. ANSI/NEMA OS 1.

B. Concrete box:

1. Provide galvanized steel, 4-inch octagon rings with mounting lugs, backplate and adapter ring as required.

2. Select height as necessary to position knockouts above concrete reinforcing steel.

3. ANSI/NEMA OS 1.

C. Tile box:

1. Provide outlet boxes for installation in tile or concrete block walls.

2. Standard outlet boxes with raised, square corners and device covers are acceptable.

3. ANSI/NEMA OS 1.

D. Cast metal outlet body:

1. Provide 4-inch round, galvanized cast iron alloy with threaded hubs and mounting lugs as required.

2. Provide boxes with cast cover plates of the same material as the box and neoprene cover gaskets.

E. Conduit outlet body: Provide malleable iron, oblong conduit outlet bodies with threaded conduit hubs and neoprene gasket, cast iron covers.

2.3 PULL AND JUNCTION BOXES

A. Sheet metal pull and junction box:

1. Provide standard outlet or concrete ring boxes wherever possible; otherwise use minimum 16-gauge galvanized sheet metal, NEMA 1 boxes, sized to Code requirements with covers secured by cadmium plated machine screws located 6 inches on centers.

2. ANSI/NEMA OS 1.

B. Flush mounted pullboxes and junction boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of box installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Install all outlet boxes flush with building walls, ceilings, and floors except where boxes are installed in mechanical and electrical rooms, in cabinetry, above accessible ceilings or where exposed Work is called for on the Drawings.

B. Locate pullboxes and junction boxes in concealed locations above removable ceilings or exposed in electrical rooms, utility rooms or storage areas.

C. Install outlet boxes at the locations and elevations indicated on the Drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.

D. Locate switch outlet boxes on the latch side of doorways unless otherwise indicated.

E. Locate outlet boxes above hung ceilings having concealed suspension systems, adjacent to openings for removable recessed luminaires.

F. Do not install outlet boxes back-to-back, separate boxes by at least 6". In fire-rated walls separate boxes by at least 24" and wall stud.

G. Adjust position of outlet boxes in finished masonry walls to suit masonry course lines. Coordinate cutting of masonry walls to achieve neat openings for boxes.

3.3 INSTALLATION

A. Install boxes in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.

B. Locate electrical boxes as indicated on Drawings and as required for splices, taps, wire pulling, equipment connections and Code compliance.

C. Install junction or pullboxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not indicated on the Drawings.

D. Install raised covers (plaster rings) on all outlet boxes in stud walls or in furred, suspended, or exposed concrete ceilings. Covers shall be of a depth to suit the wall or ceiling finish.

E. Leave no unused openings in any box. Install close-up plugs as required to seal openings.

F. Provide cast metal boxes with gasketed cast metal cover plates where boxes are exposed in damp or wet locations.

G. Welded outlet boxes shall only be used in concealed interior installations.

H. Provide precast concrete boxes in exterior planting areas, walkways, roads etc.

I. Provide an access panel in permanent ceiling or wall where boxes are installed and will be inaccessible.

J. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.

K. For outlets mounted above counters, benches or backsplashes, coordinate location and mounting heights with built-in units. Adjust mounting height to agree with required location for equipment served.

L. Use conduit outlet bodies to facilitate pulling of conductors or to make changes in conduit direction only. Do not make splices in conduit outlet bodies.

M. Add additional sheet rock as necessary to maintain original fire rating of walls where boxes are installed.

N. Install galvanized steel coverplates on boxes in unfinished areas, above accessible ceilings and on surface mounted outlets.

3.4 SUPPORTS

A. Provide boxes installed in metal stud walls with brackets designed for attaching directly to the studs or mount boxes on specified box supports.

B. Mount boxes, installed in suspended ceilings of gypsum board or lath and plaster construction, to 16-gauge metal channel bars attached to main ceiling runners.

C. Support boxes independently of conduit system.

D. Support boxes, installed in suspended ceilings supporting acoustical tiles or panels, directly from the structure above wherever pendant mounted luminaires are to be installed from the box.

E. Support boxes mounted above suspended acoustical tile ceilings, directly from the structure above.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 26 05 43 – UNDERGROUND DUCTS AND STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Underground conduits and ducts.

2. Handhole and pullboxes.

3. Excavation, trenching and backfill.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Division 03 – Cast-in-place concrete: Protective envelope for ducts.

3. Division 31 – Earthwork: General requirements for Excavation and Backfill and related items for ducts, manholes, pullboxes and handholes.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. American Concrete Institute (ACI):

a. ACI 318 – Building Code Requirements for Structural Concrete

2. ASTM International (ASTM):

a. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field

b. ASTM C39 – Test Method for Compressive Strength of Cylindrical Concrete Specimens

c. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete

d. ASTM C192 – Practice for Making and Curing Concrete Test Specimens in the Laboratory

e. ASTM C231 – Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

f. ASTM C478 – Specification for Precast Reinforced Concrete Manhole Sections

g. ASTM C805 – Test Method for Rebound Number of Hardened Concrete

h. ASTM C857 – Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

i. ASTM C858 – Specification for Underground Precast Concrete Utility Structures

j. ASTM C877 – Specification for External Sealing Bands for Concrete Pipe, Manholes and Precast Box Sections

k. ASTM C891 – Practice for Installation of Underground Precast Concrete Utility Structures

l. ASTM C990 – Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

m. ASTM C1037 – Practice for Inspection of Underground Precast Concrete Utility Structures

n. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Concrete

o. ASTM C1231 – Standard Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinder

p. ASTM C1611 – Standard Test Method for Slump Flow of Self-Consolidating Concrete

3. Underwriters Laboratories, Inc. (UL):

a. UL 651 – Schedule 40 and 80 Rigid PVC Conduit.

4. National Electrical Manufacturer Association (NEMA):

a. NEMA RN1 – PVC Externally-coated Galvanized Rigid Steel Conduit.

b. NEMA TC 2 – Electrical Plastic Tubing and Conduit.

c. NEMA TC 3 – PVC Fittings for use with Rigid PVC Conduit.

d. NEMA TC6 – PVC Plastic Utilities Duct (EB and BD Type).

1.3 DEFINITIONS

A. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground embedded in earth.

B. Duct bank: Two or more conduits or another raceway installed underground in same trench.

C. Handhole: An underground junction box in a duct or duct bank.

1.4 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Shop Drawings showing details and design calculations for precast handholes, including reinforced steel.

4. Submit Manufacturer's installation instructions.

5. Complete bill of material listing all components.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted and approved.

C. Precast concrete vaults shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete units similar to that indicated in the project specifications or drawings for at least 10 years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Underground precast concrete utility structures:

a. Oldcastle Enclosure Solutions.

b. Jensen Precast.

2. Conduits, ducts and fittings:

a. Prime Conduit.

b. JM Eagle.

c. Cantex.

d. Occidental Coating Company (OCAL).

B. Substitution: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 CONDUIT AND DUCT

A. Refer to Section 26 05 31 – Conduit.

B. Galvanized rigid steel conduit (GRS) in underground installations:

1. PVC insulated galvanized rigid steel conduit (PVC GRS):

a. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with nominal 20 or 40 mil thermoplastic vinyl coating, heat fused and bonded to the exterior of the conduit.

b. Fittings: Conduit couplings and connectors shall be steel or malleable iron as required with factory PVC coating and insulated jacket equivalent to that of the coated material.

2. Tape insulated galvanized rigid steel conduit (Tape GRS):

a. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with half lapping of PVC 10 mil tape over the exterior of the conduit. Half lap all raceways a minimum of one time and extend to 12-inches above grade.

b. Fittings: Conduit couplings and connectors shall be steel or malleable iron as required with half lapping of PVC 10 mil tape over the exterior of the fittings. Half lap shall extend to 12-inches above grade.

C. Rigid non-metallic conduit (PVC):

1. Conduit:

a. Rigid polyvinylchloride, schedule 40 or 80 conforming to NEMA TC2 and UL 651. UL listed for exposed and direct-burial applications and for 90 degrees C conductor insulation. Conduit shall include an integral bell fitting at one end.

b. Rigid polyvinylchloride, type EB or DB conforming to NEMA TC 6 and UL 651. UL listed for concrete encased burial and direct burial applications and for 90 degree C conductor insulation. Conduit shall include an integral bell fitting at one end.

2. Fittings: Couplings, adaptors, transition fittings, bell ends, etc., shall be molded PVC, slip on and solvent weld type. Schedule 40 or 80 conforming to NEMA TC 3 and type EB or DB conforming to NEMA TC 9.

D. Elbows:

1. Low voltage systems (1000 volts and less):

a. Minimum radius bends shall be 18” for conduits up to 2” diameter, 36” for conduits greater than 2” diameter, or greater if indicated on the drawings or required by the cable manufacturer.

E. Duct supports: Rigid PVC spacers selected to provide minimum duct spacing and concrete cover depths, while supporting ducts during concrete pour.

F. Duct sealing compound: Non-hardening, safe for human skin contact, not deleterious to cable insulation, workable at temperatures as low as 35 degree F, withstands temperature of 300 degrees F without slump and adheres to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, cable sheaths and jackets, etc.

2.3 PULLBOXES AND HANDHOLES

A. Construction: High densities precast reinforced concrete box, extension, base, and cover. Furnish box with end and side knockouts and non-settling shoulders. Cover shall have hold-down bolts and two lifting eyes.

B. Size: As indicated on the Drawings.

C. Cover markings: Covers shall read "ELECTRICAL", “COMMUNICATIONS”, or "SIGNAL" as appropriate.

D. Rated covers: Use cast iron lid with H20 traffic rating when subject to vehicular traffic.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of duct and manhole installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 EARTHWORK

A. Excavation and backfill: Conform to Division 31, Earthwork.

B. Excavation for underground electrical structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus, a sufficient distance to permit placing and removal of concrete formwork, installation or services, other construction and for inspection.

1. Excavate, by hand, areas within dripline of large trees. Protect the root system for damage and dry-out. Maintain moist conditions for root system and over exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.

2. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.

C. Trenching: Excavate trenches for electrical installation as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearances on both sides of raceways and equipment.

2. Excavate trenches to depth indicated or required.

3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.

D. Backfilling and filling: Place soil materials in layers to required sub-grade elevations for each area classification, using materials and methods specified in Division 31: Earthwork.

1. Under building slabs, use drainage fill materials.

3.3 CONDUIT AND DUCT INSTALLATION

A. Install duct lines in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

B. Application:

1. Direct burial ducts: Schedule 40, minimum 24-inches below finished grade.

2. Below building slab-on-grade: Schedule 40, minimum 4-inches below bottom of slab except that bends and penetrates through floor slab shall be insulated galvanized rigid steel conduit.

3. Below roads and paved surfaces:

a. Schedule 80, minimum 36-inches below finished grade.

4. Utility pole riser: Schedule 80.

5. Penetrations of building and equipment slabs: Insulated galvanized rigid steel conduit .

C. Slope duct to drain towards handholes and away from building and equipment entrances. Pitch not less than 4-inches per 100-feet.

D. Curved sections in duct lines shall consist of long sweep bends with a minimum radius of 25-feet in the horizontal and vertical directions. The use of manufactured bends is limited to building entrances and equipment stub-ups.

E. For communications and signal conduits, do not exceed a combined bend radius of greater than 180 degrees between pull points.

F. Underground conduit stub-ups to inside of building and exterior equipment shall be insulated galvanized rigid steel conduit.

G. Make joints in ducts and fittings watertight according to Manufacturer's instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.

H. Terminate duct lines at handholes with end bells spaced 10-inches on center for 5-inch ducts and varied proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10-feet from the end bell without reducing duct line slope and without forming trap in the line.

I. Separation between direct buried duct lines shall be 3-inches minimum for like systems and 12-inches minimum between power and signal ducts.

J. For direct burial installations install continuous warning strip of heavy gage plastic imprinted "electrical ducts below", approximately 12-inch wide at 12-inches above ducts.

K. Mandrel all ducts upon completion of installation and prior to pulling cables.

3.4 HANDHOLE AND PULL BOX INSTALLATION

A. Install handholes in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.

B. Handholes shall be installed flush with finished grade or surface. Install on a level 6-inch bed of well-tamped gravel or crushed stone.

C. Orientation of handholes shall be coordinated in advance with Landscape Architect and arranged to minimize connecting duct bends and deflections.

3.5 FIELD QUALITY CONTROL

A. Testing: Demonstrate capability and compliance with requirements upon completion of installation of underground duct and structures.

1. Duct integrity: Rod ducts with a mandrel 1/4-inch smaller in diameter than internal diameter of ducts. Where rodding indicates obstructions in ducts, remove the obstructions and retest.

3.6 CLEANING

A. Pull brush through full length of ducts. Use round bristle brush with a diameter 1/2-inch greater than internal diameter of duct.

B. Clean internal surfaces of handholes. Remove foreign material.

END OF SECTION

SECTION 26 05 53 – ELECTRICAL IDENIFICATION

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Electrical equipment nameplates.

2. Panelboard directories.

3. Wire and cable identification.

4. Buried electrical line warnings.

5. Junction box identification.

6. Warning and caution signs.

7. Inscribed device coverplates.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

2. Division 09: Painting.

1.2 SUBMITTALS

A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein.

2. Schedules for nameplates to be furnished.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Conduit and wire markers:

a. Thomas & Betts Corp.

b. Brady.

c. Griffolyn.

2. Inscription Tape:

a. Kroy.

b. Merlin.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work

2.2 NAMEPLATES

A. Type NP: Engraved, plastic laminated labels, signs, and instruction plates. Engrave stock melamine plastic laminate 1/16-inch minimum thickness for signs up to 20-square inches or 8-inches in length; 1/8-inch thick for larger sizes. Engraved nameplates shall have white letters and be punched for mechanical fasteners.

B. Color and letter height as specified in Part 3: Execution.

2.3 LEGEND PLATES

A. Type LP: Die-stamped metal legend plate with mounting hole and positioning key for panel mounted operator devices, i.e. motor control pilot devices, hand-off-auto switches, reset buttons, etc.

B. Stamped characters to be paint filled.

2.4 BRASS TAGS

A. Type BT: Metal tags with die-stamped legend, punched for fastener.

B. Dimensions: 2" diameter 19 gauge.

2.5 PANELBOARD DIRECTORIES (400 AMP OR LESS)

A. Directories: A 6" x 8" minimum size circuit directory frame and card with clear plastic covering shall be provided inside the inner panel door.

B. Circuit numbering: Starting at the top, odd numbered circuits in sequence down the left-hand side and even numbered circuits down the right-hand side. Multi-section panelboards shall have continuous consecutive circuit numbers, i.e. Section 1 (circuit numbers 1-42), Section 2 (circuit numbers 43-84), Section 3 (circuit numbers 85-126) for all 42-pole panelboards. For 84-pole panelboards the numbering is Section 1 (circuit numbers 1-84), Section 2 (circuit numbers (85-168), etc.

2.6 WIRE AND TERMINAL MARKERS

A. Provide self-adhering, pre-printed, machine printable or write-on, self-laminating vinyl wrap around strips.

B. Blank markers shall be inscribed using the printer or pen recommended by Manufacturer for this purpose.

2.7 CONDUCTOR PHASE MARKERS

A. Colored vinyl plastic electrical tape, 3/4" wide, for identification of phase conductors. Scotch 35 Brand Tape or equal.

2.8 UNDERGROUND CONDUIT MARKER

A. 6-inch wide, yellow polyethylene tape, with continuous black imprinting reading "Caution - Buried Electric Line Below".

2.9 INSCRIBED DEVICE COVERPLATES

A. Coverplate material shall be as specified in Section 26 27 26 – Wiring Devices.

B. Methods of inscription: (Unless otherwise noted)

1. Type-on-tape:

a. Imprinted or thermal transfer characters onto tape lettering system.

b. Tape trimmer.

c. Matte finish spray-on clear coating.

2. Engraving:

a. 1/8" high letters.

b. Paint filled letters finished in black.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of identification device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 NAMEPLATES

A. Installation:

1. Degrease and clean surfaces to receive nameplates.

2. Install nameplates parallel to equipment lines.

3. Secure nameplates to equipment fronts using machine screws.

B. Provide type 'NP' color coded nameplates that present, as applicable, the following information:

1. Equipment or device designation:

a. Equipment designations shall conform to the following:

i. Building number designation – 1.

ii. Power source:

1) Normal - __

2) Emergency – E

iii. Equipment description:

1) Main switchboard – MS

2) 277/480volt distribution board – HD

3) 277/480volt panelboard – H

4) 120/208volt distribution board – LD

5) 120/208volt panelboard – L

6) Transformer – TX

iv. Floor number where equipment is located – 03

v. Equipment designation – B

b. Example: 2EHD03A

i. Building number 2.

ii. Emergency source.

iii. 277/480volt distribution board.

iv. Floor level 03.

v. Board designation A

2. Amperage, KVA or horsepower rating, where applicable.

3. Voltage or signal system name.

4. Source of power or control.

5. Examples:

a. Boards: 2EHD03A; 1200A, 277/480volt, 3-phase, 4-wire; Served from 2EATS03A

b. Transformers: 2ETX03A; 150KVA, 480volt primary, 120/208volt, 3-phase, 4-wire secondary; Served from 2EHD03A; Load Served: 2EL03A

c. Disconnects or Individual Motor Starters: EF-1; 20HP; 480volt, 3-phase,3-wire; Served from 2EHD03A

C. Nameplates for power system distribution equipment and devices are to be black.

D. Nameplates for signal systems equipment and devices are to be black except as follows:

1. Fire alarm and life safety - Red.

E. Minimum letter height shall be as follows:

1. For panelboards, switchboards, battery panels, etc.: ½ inch letters to identify equipment designation. Use ¼ inch letters to identify voltage, phase, wires, etc.

2. For individual circuit breakers, switches and motor starters in panelboards, distribution boards, and switchboards use 3/8-inch letters to identify equipment designation. Use 1/8-inch letters to identify all other.

3. For individual mounted circuit breakers, disconnect switches, enclosed switches and motor starters use 3/8-inch letters to identify equipment designation. Use 1/8" letters to identify all other.

4. For transformers use ½-inch letters to identify equipment designation. Use ¼-inch letters to identify primary and secondary voltages, etc.

5. For equipment cabinets, terminal cabinets, control panels and other cabinet enclosed apparatus use 3/8-inch letters to identify equipment designation.

3.3 LEGEND PLATES

A. Provide panel-mounted operators devices such as pilot lights, reset buttons, “HAND-OFF-AUTO” switches, etc.

3.4 BRASS TAGS

A. Provide type BT tags for individual ground conductors to exposed ground bus indicating connection i.e. "UFER", "Cold water bond", etc.

B. Provide tags for all feeder cables in underground vaults and pull boxes.

C. Provide tags for empty conduits in underground vault, pull boxes and stubs.

3.5 PANELBOARD DIRECTORIES (400AMP OR LESS)

A. Provide typewritten directories arranged in numerical order denoting loads served by room number or area for each circuit.

B. Verify room numbers or area designation with Project Manager.

C. Mount panelboard directories in a minimum 6" x 8" metal frame under clear plastic cover inside every panelboard.

3.6 WIRE AND CABLE IDENTIFICATION

A. Provide wire markers on each conductor in panelboards, pull boxes, outlet, and junction boxes and at load connection. Identify with branch circuit or feeder number for power and lighting circuits and with control wire number as indicated on equipment Manufacturer's Shop Drawings for control wiring.

B. Provide colored phase markers for conductors as noted in Section 26 05 19 – Building Wire and Cable. Apply colored, pressure sensitive plastic tape in half-lapped turns for a distance of 3-inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Do not cover cable identification markings by taping.

3.7 UNDERGROUND CONDUIT MARKERS

A. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

3.8 JUNCTION BOX IDENTIFICATION

A. The cover of junction, pull and connection boxes for both power and signal systems, located above suspended ceilings and below ceilings in non-public areas, shall be clearly marked with a permanent ink felt pen. Identify the circuit(s) (panel designation and circuit numbers) contained in each box, unless otherwise noted or specified.

3.9 WARNING, CAUTION, AND INSTRUCTION SIGNS

A. Provide warning, caution or instruction signs where required by CEC, where indicated or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

B. Emergency Operating Signs: Install engraved laminate signs with white letters on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding or other emergency operations.

C. Elevator Machine Rooms(s): Provide warning sign for each elevator controller disconnect to read "Warning - Part of the Control Panel is not De-energized by this Switch."

D. Elevator car light and fan switch: Provide signage indicating elevator number serving and function of each switch.

3.10 INSCRIBED DEVICE COVERPLATE

A. General:

1. Lettering type: Helvetica, 12 point or 1/8" high.

2. Color of characters shall be black.

3. Locate the top of the inscription ½" below the top edge of the coverplate.

4. Inscription shall be centered and square with coverplate.

B. Application:

1. Type-on-tape inscriptions shall be provided for the following devices:

a. Receptacles.

b. Outlets in surface raceways.

c. Telecommunication outlets.

2. Engraved inscriptions shall be provided for the following devices:

a. Multi-ganged switches.

b. Special purpose switches.

3. Type-on-tape installation:

a. Tape shall be trimmed to the height of the letters.

b. Trim tape length to ¼-inch back from each edge of coverplate.

c. Contractor hands shall be clean or covered with surgical type glove prior to application of tape. Tape installations with visible fingerprints or smudges will not be acceptable.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 26 24 16 – PANELBOARDS

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Branch circuit panelboards.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.

1. National Electrical Manufacturers Association (NEMA):

a. NEMA AB 1 – Molded Case Circuit Breakers.

b. NEMA PB 1 – Panelboards.

c. NEMA PB 1.1 – General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

2. Underwriters Laboratories, Inc. (UL):

a. UL 67 – Panelboards.

b. UL 486E – Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.

c. UL 489 – Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

d. UL 870 – Wireways, Auxiliary Gutters and Associated Fittings.

1.3 SUBMITTALS

A. Submit in accordance with the requirements Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Shop Drawings: Include elevations, cabinet dimensions, gutter sizes, layout of contactors, relays, time clocks, lug sizes, bussing diagrams; make, location and capacity of installed equipment; mounting style; finish and panelboard nameplate inscription.

4. Furnish structural calculations for equipment anchorage as described in Section 26 01 00 – General Requirements of Electrical Work.

5. Submit Manufacturer's installation instructions.

6. Complete bill of material listing all components.

7. Warranty.

B. Dimensions and configurations of panelboards shall conform to the spaces allocated on the Drawings for their installation. The Contractor shall include with the submittal a layout of the electrical room if it differs from construction documents for review and approval by the Engineer prior to release of order.

1.4 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, to include the following:

1. A detailed explanation of the operation of the system.

2. Instructions for routine maintenance.

3. Pictorial parts list and parts number.

4. Telephone numbers for authorized parts and service distributors.

5. Final testing reports.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Panelboard components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.

B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with NEMA PB1.1 and Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.7 WARRANTY

A. Units and components offered under this Section shall be covered by a 1-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

1.8 EXTRA MATERIAL

A. Turn over two (2) sets of panelboard keys to the Owner at completion of Project. All panelboards shall be keyed alike.

B. Provide one spray can of matching finish paint for touching up damaged surfaces after installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Square D.

2. ABB/ General Electric.

3. Eaton.

4. Siemens.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 PANELBOARDS - GENERAL

A. Enclosure:

1. Cabinets shall be NEMA Type 1 enclosure, door, and trim of code gauge galvanized steel. Provide NEMA Type 3R enclosures for exterior mounted panelboard.

2. Panelboard covers shall be door-in-door construction such that inner door exposes the overcurrent protective devices and the outer door exposes the

complete panelboard interior (i.e. branch circuit conductors, lugs, neutral and ground bus, overcurrent protective devices, etc.). Outer door shall have full-length piano hinge and inner door shall have two-point hinges.

3. Provide combination spring catch and lock on inside edge of the inner door trims with flush fitting joint between door and trim. Locks on all panelboards shall be keyed alike. Doors 36 inches and over in height shall be provided with three-point catch and lock. Provide quarter-turn captive bolts on the outer door.

B. Bus assembly and terminations:

1. Bus shall be bolted copper with taps arranged for distributed phase connections to branch circuit devices

2. Cross connectors shall be copper, drilled and tapped for bolt-on device connections, arranged for double row placement of device and designed to permit removal or addition of overcurrent protection devices without disturbing adjacent devices or removing main bus connections.

3. Neutral bus shall be 100 percent rated of phase bus bars and shall have lugs for each outgoing branch circuit or feeder requiring a neutral connection unless otherwise noted.

4. Ground bus shall be full size with lugs for each outgoing branch circuit and feeder.

5. Refer to panelboard schedules on Drawings for bus rating. Bus rating shall match or be greater than main device or main lug rating.

6. As a minimum, bus bars shall be rated 10,000 AIC for 120/208volt .

7. Provide full sized bussing in all sections of multi-section panelboards.

8. Termination Lugs: Rated for use with aluminum/copper conductors.

9. All "SPACES" shall be ready for installation of future overcurrent protective device.

C. Miscellaneous requirements:

1. Circuit numbering: Starting at the top, indicate odd numbered circuits in sequence down the left-hand side and even numbered circuits down the right-hand side. Multi-section panelboards shall have continuous consecutive circuit numbers. Provide metal embossed circuit identification of panelboards.

2. Directories: A 6" x 8" minimum size circuit directory frame and card with clear plastic covering shall be provided inside the inner panelboard door to reflect conditions at completion of Work. Directory shall be typewritten denoting loads served by room number or area for each circuit.

3. Nameplates: Provide engraved nameplate for each panelboard. See Section 26 05 33 – Electrical Identification for requirements.

D. Refer to Panelboard Schedules for the following:

1. Mounting style; service voltage; terminal lug size, location, and quantity; bus ampacity; interrupting capacity of bus and breakers; quantity, poles and rating of overcurrent protective devices.

E. Overcurrent protective devices:

1. Refer to Division 26 sections.

2. Overcurrent protective devices shall be molded case circuit breakers.

3. Main devices shall be hard bus connected to the panelboard bus bars.

4. In all cases, panelboards fed directly from a transformer shall have a main overcurrent protective device. If not indicated on the Drawings or Panelboard Schedules, provide this device sized to provide the full capacity of the transformer rating.

5. Main devices shall be vertically mounted and shall have their operating handle in the up position when energized. Main devices that are mounted in the same manner as the branch devices are NOT acceptable, i.e. main devices shall be individually mounted at the top or bottom of the phase bus bars.

6. Panelboards overcurrent protective devices layout shall conform to the layout indicated on the panelboard schedules.

7. Provide identified handle ties for single pole circuit breakers that share a neutral conductor.

F. Surge Protective Devices: Refer to Division 26 sections.

G. Finish: Five step zinc phosphate pre-treatment, one coat of rust inhibiting dichromate primer and one coat of baked-on enamel finish, ANSI 61 (light gray).

2.3 BRANCH CIRCUIT PANELBOARDS

A. Enclosure shall be 20" wide x 5-3/4" deep, surface or flush mounted and shall comply with NEMA PB 1.

B. Flush panelboards mounted adjacent to each other shall be same physical size.

C. Where "SPACE" is indicated on panelboard schedules or Drawings, install minimum 100amp branch circuit cross connectors and mounting hardware. For future device spaces larger than 100amps, cross connectors shall match the frame size ampere rated noted.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of panelboard installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

B. Where panelboards are shown to be flush mounted in walls, the contractor shall insure that 6” deep studs are employed in wall construction to accommodate the 5-3/4” deep panelboard enclosure.

3.2 INSTALLATION

A. Install panelboards in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

B. Set panels plumb and symmetrical with building lines in conformance with PB1.1. Furnish and install all construction channel bolts, angles, etc., required to mount the equipment furnished under this Section.

C. Mounting height shall be 6 feet.

D. Panelboards shall be anchored and braced to withstand seismic forces as calculated per Section 26 01 00 – General Requirements of Electrical Work.

E. Provide mounting hardware brackets, busbar drillings and filler pieces for all unused spaces.

F. "Train" interior wiring; bundle and clamp, using specified plastic wire wraps specified under Section 26 05 19 – Building Wire and Cable.

G. Replace panel pieces, doors or trim exhibiting dents, bends, warps, or poor fit that may impede ready access, security, or integrity.

H. Conduits terminating in concentric, eccentric, or oversized knockouts at panelboards shall have ground bushings and bonding jumpers installed interconnecting all such conduits and the panelboard.

I. Check and tighten all bolts and connections with a torque wrench using Manufacturer's recommended values.

J. Provide four 3/4" spare conduits stubbed-out of flush mounted panelboards to nearest accessible ceiling space.

K. Visually inspect panelboard for rust and corrosion. If signs of rust and corrosion are present, restore or replace panelboard to new condition.

L. In damp and wet locations, mount panelboards with a minimum one inch of air space between cabinet and the wall or other support material.

M. Provide close up plugs in all unused openings in the cabinet.

N. Field install handle ties on single pole circuit breakers that share a neutral conductor.

O. Circuit breakers feeding "Fire Alarm Control Panel(s)" shall be red in color.

3.3 FIELD QUALITY CONTROLS

A. Independent testing: Contractor shall arrange and pay for the services of an independent Testing Agency to perform all quality control electrical testing, calibration and inspection required herein. Testing Agencies objectives shall be to:

1. Assure panelboard installation conforms to specified requirements and operates within specified tolerances.

2. Field test and inspect to ensure operation in accordance with Manufacturer's recommendations and Specifications.

3. Prepare final test report including results, observations, failures, adjustments, and remedies.

4. Apply label on panelboards upon satisfactory completion of tests and results.

5. Verify ratings and settings and make final adjustments.

B. At least three weeks prior to any testing, notify the Engineer so that arrangement can be made for witnessing test, if deemed necessary. All pretesting shall have been tested satisfactorily prior to the Engineer's witnessed test.

C. The Contractor shall supply a suitable and stable source of electrical power to each test site. The Testing Agency shall specify the specific power requirements.

D. Testing of overcurrent protective devices shall be done only after all devices are installed and system is energized.

E. Prefunctional testing:

1. Provide Testing Agency with Contract Documents and Manufacturer instructions for installation and testing.

2. Visual and mechanical inspection:

a. Inspect for physical damage, defects alignment and fit.

b. Perform mechanical operational tests in accordance with Manufacturer's instructions.

c. Compare nameplate information and connections to Contract Documents.

d. Check tightness of all power connections.

e. Check that all covers, barriers, and doors are secure.

3. Electrical tests:

a. Insulation resistance: 1000volt DC tests for one minute on all 600volt and lower rated equipment, components, buses, feeder and branch circuits and control circuits. Test phase-to-phase and phase-to-ground circuits showing less than 10-megohms resistance to ground shall be repaired or replaced.

b. Circuit continuity: All feeders shall be tested for continuity. All neutrals shall be tested for improper grounds.

c. Ground resistance: Test resistance to ground of system and equipment ground connection.

d. Test overcurrent protection devices per Section 26 01 00 – General Requirements of Electrical Work.

F. In the event that the system fails to function properly during the testing as a result of inadequate pretesting or preparation. The Contractor shall bear all costs incurred by the necessity for retesting including test equipment, transportation, subsistence, and the Engineer's hourly rate.

G. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances.

H. Contractor shall submit the Testing Agency's final report for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observation, deficiencies, and remedies. Test report shall be included in the operation and maintenance manuals.

3.4 CLEANING

A. Prior to energizing of panelboards, the Contractor shall thoroughly clean the interior of enclosure of all construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.

B. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of panelboards per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt, and debris.

C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

END OF SECTION

SECTION 26 27 26 – WIRING DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Wall switches.
2. Occupancy/vacancy sensors, including wallbox and ceiling mounted.
3. Receptacles.
4. Coverplates.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. Division 03: Cast-in-place concrete.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.

1. National Electrical Manufacturer's Association (NEMA):
   a. NEMA WD-1 – General-Purpose Wiring Devices.
   b. NEMA WD-2 – Semiconductor Dimmers for Incandescent Lamps.
   c. NEMA WD-5 – Specific-Purpose Wiring Devices.
   d. NEMA SSL 7A – Phase-Cut Dimming for Solid State Lighting
2. Underwriter's Laboratories (UL):
   a. UL 20 – General-Use Snap Switches.
   b. UL 231 – Power Outlets.
   c. UL 310 – Electrical Quick-Connect Terminals.
   d. UL 498 – Attachment Plugs and Receptacles.
   e. UL 514A – Metallic Outlet Boxes.

3. UL 514D – Cover Plates for Flush-Mounted Wiring Devices.

4. UL 943 – Ground-Fault Circuit-Interrupters.

5. UL 1681 – Wiring Device Configurations.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Provide color finishes for Architect to select from.

4. Submit Manufacturer's installation instructions.

B. Where inscribed device coverplates are noted on the Drawings or in the Specifications, conform to the requirements of Section 26 05 53 – Electrical Identification.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.5 WARRANTY

A. Occupancy sensors offered under this Section shall be covered by a 1-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Switches, receptacles and coverplates:

a. Pass & Seymour.

b. Hubbell.

c. Leviton.

2. Occupancy/vacancy sensors switches, time switches:

a. SensorSwitch, Inc.

b. Wattstopper

c. Cooper Controls “Greengate”

d. Leviton

e. Hubbell Building Automation, Inc.

3. Floor mounted service boxes:

a. Legrand

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 WALL SWITCHES

A. Standards: Provide general-purpose 120/277volt AC switches that conform to NEMA WD-1 Specifications.

B. Color: Device color shall be as selected by the Architect, unless otherwise noted.

C. Wall switches:

1. Provide twenty amperes, 120/277volt, Specification grade, toggle handle, quick-make slow-break, quiet type snap switch with silver cadmium alloy contacts, binding head terminal screws, back and side wired with totally enclosed case.

2. Single-pole, single-throw switches: Hubbell #1221 series, Pass & Seymour #20AC1 series or Leviton #1221 series.

3. Three-way switches: Hubbell #1223 series, Pass & Seymour #20AC3 series or Leviton #1223 series.

2.3 OCCUPANCY/VACANCY SENSOR SWITCHES

A. Occupancy sensors: automatic on, automatic off.

B. Vacancy sensors: manual on, automatic off.

C. General:

1. Occupancy sensors shall comply with the latest edition of the California Building Energy Efficiency Standards, California Building Code, Part 6 and be certified by The California Energy Commission. All sensors shall be listed in

the most current directory of Certified Occupancy Sensing Devices or be on file with the CEC.

2. Sensors shall be dual-technology type infrared/ultrasonic or infrared/microphonic or as specified herein.

3. Neutral connection required. Sensors that rely on ground leakage current for operation shall not be provided.

4. All sensors shall have an adjustable time delay off setting and a sensitivity adjustment.

5. Ceiling mounted sensors shall operate be line voltage or low voltage with separate control unit. Control unit shall contain power supply and relays for switching loads.

6. Units shall be furnished with area coverage to suit application. No allowance shall be given for providing sensors improperly sized for the square footage of the controlled area.

D. Color: Device color shall be as selected by Architect, unless otherwise noted.

E. Wallbox mounted single level control sensors:

1. Sensor shall provide minimum coverage of 900-square feet.

2. Time delay adjustment from 30-seconds to 20-minutes. Set initial time-out setting at 4-minutes, unless otherwise specified. Set sensitivity adjustment at maximum.

3. Load capacity of 0 to 1800watts at connected voltage.

4. For use in small utility closets and similar areas where dual level switching is not indicated.

F. Wallbox mounted dual level control sensors:

1. Sensor shall provide dual level switching capability and minimum coverage of 1000-square feet.

2. Operation shall be manual (in two levels) “ON” and manual (in two levels) or automatic (full) “OFF”.

3. Time delay adjustment from 30-seconds to 20-minutes. Set initial time-out setting at 20-minutes, unless otherwise specified. Set sensitivity adjustment at maximum.

4. Load capacity of 50 to 1000watts at connected voltages.

5. Integral photocell. Provide with ambient light control adjustment.

6. For use in offices and similar areas where dual level switching is indicated.

G. Wallbox mounted combination sensor and dimmer:

1. Sensor shall provide 0-10volt dimming capability for LED loads.

2. Sensor shall provide minimum coverage of 20-feet for clear line-of-sight applications.

3. Infrared only or dual-technology sensor.

4. Time delay adjustment from 3-minutes to 20-minutes. Set initial time-out setting at 15-minutes, unless otherwise specified. Set sensitivity adjustment at maximum.

5. For use in private offices and similar areas where dimming is indicated.

H. Ceiling or wall mounted single-directional sensors:

1. Sensor shall provide minimum coverage of 900-square feet.

2. Operation shall be automatic “ON” and automatic “OFF”. Provide with a manual override switch.

3. Time delay adjustment from 30-seconds to 20-minutes. Set initial time-out setting at 10-minutes. Set sensitivity adjustment at maximum.

4. Load capacity of 20amps per power or slave pack at connected voltage.

5. Power pack, if required, consisting of Class 2, 24volt output transformer and relay in single housing, capable of powering up 2 sensors and mounted inside standard 4-inch square box.

6. For use in small office, classroom, and similar areas.

I. Ceiling mounted omnidirectional sensors:

1. Sensor shall provide minimum omnidirectional coverage of 1000-square feet.

2. Operation shall be automatic “ON” and automatic “OFF”. Provide with a manual override switch.

3. Time delay adjustment from 30-seconds to 20-minutes. Set initial time-out setting at 10-minutes. Set sensitivity adjustment at maximum.

4. Load capacity of 20amps per power or slave pack at connected voltage.

5. Power pack, if required, consisting of Class 2, 24volt output transformer and relay in single housing, capable of powering up to 2 sensors and mounted inside standard 4-inch square box.

6. For use in large storage rooms and similar areas.

2.4 TIME SWITCHES

A. Wallbox mounted, line voltage type.

B. Shall be compatible with all LED lighting loads, electronic ballasts, motor loads, and inductive loads. Triac and other harmonic generating devices shall not be allowed.

C. Shall have no minimum load requirement and shall be capable of controlling up to 800watts.

D. Shall allow manual override of the preset time-out period.

E. Time switch shall be capable of operating as an “ON/OFF” switch.

F. Digital time switch:

1. Shall have the option for a beep warning that shall sound every 5-seconds once the time switch countdown reaches one minute.

2. Shall have an electroluminescent backlit Liquid Crystal Display that shows the timer’s countdown.

3. Maximum setting of 30-minutes for server aisles and 10-minutes for closets.

G. Astronomical time switch:

1. Includes integral programming function for precise Time Zone, Longitude, and Latitude input/

2. Weekly schedule format.

3. Minimum 5 programmable schedules.

2.5 RECEPTACLES

A. Standards:

1. Provide general purpose 20amp, 125/250volt AC receptacles that conform to NEMA WD-1 Specifications. Specialty receptacles shall conform to NEMA WD-5 Specifications as applicable.

2. Provide NEMA 5-20R, industrial (heavy-duty) specification grade as noted herein, 20amp, 125volt AC, 2-pole, 3-wire grounding type receptacles.

3. Receptacles shall be the standard conventional style device.

4. Receptacles shall be tamper-resistant to meet the requirements of CEC Article 406.12.

B. Color:

1. Device color shall be as selected by the Architect, unless otherwise noted.

2. Devices connected to an emergency circuit shall be red.

C. General purpose single outlets:

1. Provide self-grounding back and side wired with binding head staked terminal screw.

2. Use Hubbell #5361 series, Pass & Seymour #5361 series Leviton #5361 series.

D. General purpose duplex receptacles:

1. Provide self-grounding, back and side wired with binding head staked terminal screws and break-off strip for two-circuit wiring.

2. Use Hubbell #5362 series, Pass & Seymour #5362 series or Leviton #5362 series.

E. Ground fault circuit interrupting (GFCI) receptacles:

1. Provide 20amp, 125volt AC, receptacles consisting of NEMA 5-20R duplex device with integral solid state sensing and signaling circuitry capable of detecting and interrupting a maximum 5-milli-amp line-to-ground fault current in approximately 1/40th of a second.

2. Provide visual device with trip indication, manual reset, and test mechanisms and with point of use and multi-outlet protection.

3. Provide self-test and monitor feature with visual indicators on device face representing power status, trip condition, ground fault condition and end of life status.

4. Provide weather resistant devices at all damp and wet locations.

5. Use Pass & Seymour #2097TR series, Hubbell GFTRST20 series, Leviton #S7899 series, for Specification grade GFCI receptacles.

6. Use Pass & Seymour #2097TRWR series, Hubbell GFTWRST20 series, Leviton #WT899 series for weather resistant GFCI receptacles.

F. Special purpose receptacles: Provide Specification grade devices with the NEMA configuration, voltage and current rating, number of poles and ground provisions as noted on the Drawings.

2.6 COVERPLATES

A. General:

1. Provide all coverplates with rounded edges and corners, smooth and free of grooves, embossing or other embellishment.

2. Provide mounting screws to match the plate finish.

3. Provide gang type coverplates where two or more devices are installed at one location. Individual gangable coverplates are not acceptable.

4. Provide plates of one design, standard conventional/designer decora style, throughout the Project unless otherwise specified.

B. Color: Coverplate color shall be ivory/white/black/grayas specified by the Architect, unless otherwise noted.

C. Plastic coverplates:

1. Provide smooth, high impact, self-extinguishing thermoplastic coverplates and 0.100 inches thick with rounded edges and corners.

2. Provide openings to accommodate the devices indicated on the Drawings and in the Specifications.

D. Metal coverplates:

1. Provide smooth, type 430 stainless steel coverplates, 0.035" thick with rounded edges and corners.

2. Provide openings to accommodate the devices indicated on the Drawings and in the Specifications.

3. Provide removable plastic film to protect coverplates during installation. Remove film at time of final acceptance.

E. Weatherproof coverplates:

1. Non-public areas:

a. Provide horizontal mounted, weatherproof in-use coverplate for one duplex or one GFCI receptacle. Provide gasketed, spring loaded, vertically self-closing covers suitable for use in damp and wet locations as described in UL 514 and CEC 406. Covers shall allow the use of the device with the cover closed.

b. Furnish base plates, covers, hinge pins, spring, and screws of corrosion resistant type 302 stainless steel.

2. Public area receptacles:

a. Provide horizontal mounted weatherproof in-use coverplate for one duplex or one GFCI receptacle. Provide gasketed, spring loaded, lockable, vertically self-closing covers suitable for use in damp and wet locations as described in UL 514 and CEC 406. Covers shall allow the use of the device with the cover closed.

b. Furnish base plates, covers, hinge pins, spring and screws of corrosion resistant type 302 stainless steel.

c. Provide two (2) keys for each locking type coverplate.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of wiring device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Coordinate device heights in vending, kitchen and utility areas with benches and counters.

B. Coordinate switch mounting location with Architectural details. Unless otherwise noted, locate switches on latch side of door.

3.3 INSTALLATION

A. Install wiring devices in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

B. Install devices with the vertical centerline plumb and with all edges of the device flush against the adjacent wall surfaces.

C. Mount switches at 42 inches to center above finished floor unless otherwise noted.

D. Mount receptacles vertically with the centerline 18-inches above finished floor and with grounding slot at bottom.

E. Mount receptacles vertically/horizontally when mounting above counters, mount with grounding slot to the left.

F. Mount GFCI receptacles in the following locations, whether indicated as GFCI type or not on the drawings:

1. In bathrooms.

2. Where receptacles are installed within 6’0” from edge of sinks.

3. In kitchens above counters.

4. On rooftops.

5. Outdoors.

6. Where serving vending machines.

7. Where serving electric drinking fountains.

G. Derate ganged dimmer switches as instructed by Manufacturer. Do not use common neutrals in dimmer circuits.

H. Install red receptacles where connected to an emergency circuit.

I. Provide coverplates for all outlet boxes, switches, receptacles, etc.

J. Install blank coverplates on all outlet boxes in which no device is required or installed.

K. Provide coverplates that completely cover wall opening and seat against wall.

L. Provide stainless steel coverplates for all devices in kitchen/food service equipment areas.

3.4 OCCUPANCY/VACANCY WALLBOX SENSORS

A. All occupancy/vacancy sensors shall have a sensitivity appropriate for the space. Contractor shall be responsible for testing the sensitivity of the sensor in the space and adjusting as needed.

B. Where no direction is provided in a sequence of operation or by the owner set the occupancy sensor timeout to values as indicated in Part 2 above.

C. Install wall mounted devices with the vertical centerline plumb and alleges of device flush against adjacent wall surfaces. Mount devices at 42-inches to center above finished floor unless otherwise noted.

3.5 FIELD QUALITY CONTROL

A. Electrical testing:

1. Test proper polarity of all receptacles.

2. Test ground continuity of all wiring devices.

3. Test ground fault interrupting device operation.

B. Visual and mechanical inspection:

1. Check proper operation of all switches.

2. Check indicating lights on all SPD receptacles.

3. Visually inspect and replace damaged or defective devices.

3.6 CLEANING

A. Clean interior of all boxes from dirt and paint prior to installation of devices.

B. Clean wiring devices and coverplates from dirt and paint over spray.

END OF SECTION

SECTION 26 28 19 – DISCONNECT SWITCHES

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Disconnect Switches.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated on specified:

1. National Electrical Manufacturer Association (NEMA):

2. NEMA KS 1 – Enclosed Switches.

3. Underwriters Laboratories, Inc. (UL):

4. UL 512 – Fuseholders.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. As a minimum the following characteristics shall be indicated:

a. NEMA types.

b. Current rating.

c. Number of poles.

d. Fuse provisions.

e. Enclosure dimensions.

f. Voltage.

g. Horsepower rating (if applicable).

h. Short circuit rating.

3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

4. Submit Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Square D.

2. ABB/ General Electric.

3. Eaton.

4. Siemens.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 DISCONNECT SWITCHES

A. Description: Provide NEMA heavy-duty type switches with dead front construction and padlock provisions for up to three locks in the “OFF” position.

B. Switch interior: Provide switch with switchblades that are fully visible in the “OFF” position when the door is open. Provide UL listed lugs for copper conductors, lugs to be front removable. Provide plated current carrying part.

C. Switch mechanism: Provide switches with a quick-make, quick-break, position indicating, operating handle and mechanism and a dual cover interlock to prevent unauthorized opening of the switch door in the “ON” position or closing of the switch mechanism with the door open. Furnish an electrical interlock to de-energize control wiring when the disconnect switch is opened.

D. Enclosures: Provide switches with hinged cover in NEMA 1 general purpose, sheet steel enclosure for dry locations and NEMA 3R weatherproof galvanized enclosures for exterior, damp, or wet locations, unless otherwise noted on the Drawings. Provide an enclosure treated with a rust-inhibiting phosphate primer and finished in gray baked enamel.

E. Ratings: Provide switches that are horsepower rated for 240 VAC or 600volt AC as required for the circuit involved and that meet “I-SQUARED-T” requirements. Fusible switches to have provisions for the types of fuses specified in Section 262816: Overcurrent Protective Devices. UL listed short circuit rating, when equipped with fuses to be 200,000amps RMS symmetrical. Furnish with provisions for RK-1 fuses for switches up to 600amps. 800amp switches and larger to have provisions for Class L fuses.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of disconnects switch installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Coordinate locations of switches and equipment in the field to provide code required clearances in front of switches and to ensure that switches are insight of the controller as described in CEC Article 430.

3.3 INSTALLATION

A. Install disconnect switches where indicated on the Drawings.

B. Install fuses in fusible disconnect switches.

C. Include construction channel and mounting hardware as required to support disconnect switch.

3.4 IDENTIFICATION

A. Provide engraved, machine screw retained type 'NP' nameplate on each disconnect switch. See Section 26 05 53 – Electrical Identification.

3.5 CLEANING

A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of enclosure of all construction debris, scrap wire, paint splatters, dirt, etc.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

SECTION 26 50 00 – LIGHTING

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Interior luminaires (lighting fixtures.)
2. Exterior luminaires.
3. Light-emitting diode (LED) assemblies.
4. Drivers and transformers.
5. Optical components; including diffusers, refractors, reflectors, and louvers.
6. Unit battery equipment.

B. Related Work: Consult all other Sections, determine the extent and character of related Work, and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. Division 03: Concrete; for cast-in place bases for lighting poles and bollards.
3. Division 05: Metals; for fittings, brackets, backing supports, rods, etc. as required for support and bracing of luminaires.
4. Division 09: Finishes; for ceilings, wall assemblies, acoustical treatment, and field painting of luminaires.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and Standards except as otherwise indicated or specified:

1. American National Standards Institute (ANSI):
   a. ANSI/IEC 60529 – American National Standard for Degrees of Protection Provided by Enclosures (IP Code)
   b. C137.0 Lighting System Terms and Definitions.
   c. C137.1 0-10V Dimming Interface for LED Drivers and Controls
2. Underwriters Laboratories, Inc. (UL):

a. UL 66 – Fixture Wire.

b. UL 102.3 – Standard Method of Fire Test of Light Diffusers and Lenses.

c. UL 844 – Luminaires for Use in Hazardous (Classified) Locations.

d. UL 924 – Emergency Lighting and Power Equipment.

e. UL924a – Auxiliary Power Supplies (for generator-backed systems.)

f. UL 1574 – Track Lighting Systems.

g. UL 1598 – Luminaires.

h. UL 1598C – Light-Emitting Diode Retrofit Luminaire Conversion Kits.

i. UL 1838 – Low Voltage Landscape Lighting Systems.

j. UL 1993 – Self-Ballasted Lamps and Lamp Adapters.

k. UL 2007A – Shatter Containment of Lamps for Use in Regulated Food Establishments.

l. UL 2108 – Low Voltage Lighting Systems.

m. UL 2592 – Low Voltage LED Wire.

n. UL 5085-3 – Low Voltage Transformers: Class 2.

o. UL 8750 – Light Emitting Diode (LED) Equipment for Use in Lighting Products.

p. UL 8753 – Field-Replaceable Light Emitting Diode (LED) Light Engines.

q. UL 8754 – Holders, Bases, and Connectors for Solid-State (LED) Light Engines and Arrays.

3. National Electrical Manufacturers Associations (NEMA):

a. SSL-1 – Electronic Drivers for LED Devices, Arrays or Systems.

b. SSL-4 – Retrofit Lamps—Minimum Performance Requirements.

c. 77 – Temporal Light Artifacts: Test Methods and Guidance for Acceptance Criteria.

d. LE-4 – Recessed Luminaires, Ceiling Compatibility

e. 100 – Wire Insulation Colors for Lighting Systems

4. Illuminating Engineering Society of North America (IESNA):

   a. TM-15 – Luminaire Classification System for Outdoor Luminaires.

   b. TM-21 – Projecting Long Term Lumen Maintenance of LED Light Sources.

   c. TM-30 – Method for Evaluating Light Source Color Rendition.

   d. TM-30-Annex E – Recommendations for Specifying Light Source Color Rendition

   e. LM-79 – Electrical and Photometric Measurements of Solid-State Lighting Products.

   f. LM-80 – Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.

   g. LM-84 – Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires.

   h. LM-86 – Measuring Luminous Flux and Color Maintenance of Remote Phosphor Components

5. Restriction of Hazardous Substances (RoHS):

   a. RoHS 3 – Directive 2015/863 - Cat 5. Lighting: lamps, luminaires, light bulbs.

1.3 SYSTEM DESCRIPTION

A. Provide and install a fully functional and operating lighting system as indicated, complete with light engines, lamps, wiring, and securely attached to support system to meet all seismic code requirements.

B. Where catalog number and narrative or pictorial descriptions are provided, the written description shall take precedence and prevail.

1.4 SUBSTITUTIONS

A. Refer to Section 26 01 00 – General Requirements of Electrical Work for specific Equipment requirements.

B. Items specified under this Section and Luminaire Schedule are subject to the requirements, with the following qualifications:

1. Items solely specified by Manufacturer name and catalog number, without qualifiers: Provide as specified – No Substitutions.

2. Items specified by multiple Manufacturers, without qualifiers: Provide any listed manufacturer – No Substitutions.

3. Items specified by sole or multiple Manufacturers, followed by “Or Approved Equal” or “Or Approved Equivalent”: Conform to substitution requirements outlined for Equipment.

4. Items specified by sole or multiple Manufacturers, followed by “Or Equal” or “Or Equivalent”: Products that meet the salient requirements are acceptable to provide.

   a. Equivalency is at the sole judgement of the Architect and Engineer.

   b. Should a submitted, unspecified product fail to meet the requirements of Equivalency, provide specified products at no additional cost to the Owner.

C. Equivalency shall be determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on any characteristic shall constitute justification for rejection of the submittal or substitution.

1. Performance:

   a. Distribution.

   b. Utilization.

   c. Luminance distribution (Average brightness / maximum brightness.)

   d. Spacing to mounting height ratio.

   e. Overall luminaire efficiency.

2. Construction:

   a. Engineering.

   b. Workmanship.

   c. Rigidity.

   d. Permanence of materials and finishes.

3. Installation Ease:

   a. Captive parts and captive hardware.

   b. Provision for leveling.

   c. Through-wiring ease.

4. Maintenance:

   a. Ease of relamping / replacement of LED array.

   b. Ease of replacement of driver/ballast and lamp sockets.

5. Appearance:

   a. Architectural integration.

   b. Light tightness.

   c. Styling.

   d. Conformance with design intent.

   e. When requested, furnish a working sample complete with housing, trim, 8' cord and plug, and specified lamp.

1.5 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, the following items:

1. Complete bill of material listing (index) of all luminaires. Index shall be organized in the same sequence as the Luminaire Schedule (alphabetical.) Include in the index:

   a. Type per the Luminaire Schedule.

   b. Manufacturer.

   c. Complete catalog number, including all accessories and appurtenances required for the installation.

   d. Voltage.

   e. Poles, arms, and brackets, if applicable.

   f. Lamping, if applicable.

2. Manufacturer's data sheets/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

   a. Identify luminaire type on each sheet.

   b. Clearly mark on each data sheet the specific item(s) being submitted. Obfuscate or otherwise delete options on data sheets that are not provided.

3. Driver or transformer and/or lamp data sheets as applicable to submitted item.

4. Manufacturer's installation instructions.

5. Warranty.

6. U.L. labeling information.

7. Photometric Reports consisting of:

   a. Independent Testing Laboratories, Inc. or equal, photometric test report for each luminaire listed on the Luminaire Schedule. Test reports shall be based on Illuminating Engineering Society published test procedures and shall contain candlepower distribution curves in five lateral planes for luminaires with asymmetric distributions and luminance data for vertical angles above 45 degrees from nadir.

   b. Coefficient of utilization table.

   c. Zonal lumen summary including overall luminaire efficiency.

8. Shop Drawings:

   a. Where noted in the Luminaire Schedule, submit Shop Drawings from Manufacturer detailing modified or custom luminaires indicating dimensions, weights, methods of field assembly, components, features, accessories, methods of support, etc.

9. Mock-ups: Provide mock-up luminaire samples where “MOCK-UP” is indicated in the Luminaire Schedule. Refer to Part 3 – Execution for requirements.

1.6 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals in accordance with the requirements of Section 26 01 00 – General Requirements of Electrical Work, to include the following:

1. An updated index per 1.5.A.

2. One complete set of final submittals of actual product installed, including product data and shop drawings.

3. Instructions for routine maintenance.

4. Pictorial parts list and parts number.

5. Telephone numbers for authorized parts and service distributors.

1.7 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and currently under production.

B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Luminaires shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable.

Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.

B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.9 WARRANTY

A. Units and components offered under this Section shall be covered by a 1-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Luminaires, Poles, and Exit Signs: as listed in the Luminaire Schedule.

2. Light-Emitting Diode (LED) Arrays:

a. Cree.

b. Nichia.

c. Citizen.

d. Lumileds.

e. Samsung.

f. Lumenetix Araya.

g. Xicato.

h. Bridgelux.

i. LEDs provided by Luminaire Manufacturer listed in the Luminaire Schedule: meeting the technical and warranty requirements of this Section.

3. LED replacement and integral-driver lamps:

a. General Electric.

b. Osram.

c. Cree.

d. Maxlite.

e. Green Creative.

f. Soraa.

4. LED drivers (DC output):

a. eldoLED.

b. Lutron.

c. Signify Advance.

d. Osram.

e. Q-Tran.

f. Universal Lighting Technologies.

g. Drivers provided by Luminaire Manufacturer listed in the Luminaire Schedule: meeting the technical and warranty requirements of this Section.

5. Transformers for LED systems (AC output):

a. Q-Tran.

b. Hatch.

c. Semper Fi.

d. Transformers provided by Luminaire Manufacturer listed in the Luminaire Schedule: meeting the technical and warranty requirements of this Section.

6. Unit battery equipment:

a. Philips Bodine.

b. Myers/Iota.

c. Unit battery equipment provided by Luminaire Manufacturers listed in the Luminaire Schedule: meeting the technical and warranty requirements of this Section.

B. Substitutions: Under provisions of Section 26 01 00 – General Requirements of Electrical Work.

2.2 GENERAL

A. Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.

B. Luminaire assemblies U.L. listed appropriate to mounting conditions and application. All labels affixed to the luminaire shall be in a location not visible from normal viewing angles.

C. Each luminaire family type (downlights, etc.) supplied by only one manufacturer.

D. Recessed luminaires installed in fire rated ceilings and using a fire rated protective cover shall be thermally protected for this application and shall carry a fire rated listing.

E. Luminaires installed under canopies, roofs or open areas and similar damp or wet locations shall be UL listed and labeled as suitable for damp or wet locations.

F. Luminaires shall bear the IP rating appropriate for the application.

G. Luminaires shall be free of light leaks and shall be designed to provide sufficient ventilation of light engines, including ventilation holes where required.

2.3 LUMINAIRE CONSTRUCTION

A. All sheet metal Work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. 20-gauge (0.7-mm or 0.027-inch) minimum.

1. Finish: Baked white dry polyester powder, unless otherwise specified, with a minimum average reflectance of 85% on all exposed and light reflecting surfaces. Steel components shall be prepared for finishing with a 5-step zinc phosphating process prior to painting.

2. Luminaire (including all painted component parts) shall be painted after fabrication unless specifically noted in the Luminaire Schedule.

B. Extruded Aluminum Housings: One-piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1-foot to 24-foot with the cross sectional dimensions as indicated in the Luminaire Schedule.

C. Die-Cast Aluminum Housings:

1. Single-piece casting to ensure water tightness.

2. Low copper (<0.7% Cu) aluminum alloy.

3. Minimum Class 4 Consumer Grade per NADCA Standards.

D. All surfaces shall be cleaned and dressed to eliminate all exposed sharp edges or burrs.

E. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly.

F. End Plates: Die cast end plates shall be mechanically attached without exposed fasteners. End caps shall be minimum 0.125" thick.

G. All mitered corners or joints shall be accurately aligned with abutting intersecting members. Sheet metal Work shall be properly fabricated so that planes will not deform (i.e. become concave or convex) due to normal expected ambient and operating conditions.

H. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked enamel process to prevent corrosion and discoloration of adjacent materials.

I. Fasteners shall be manufactured of galvanized steel.

J. Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.

K. Recessed luminaires: Equip with through-wire junction box. Box, driver, and replaceable components shall be accessible from the ceiling opening of the luminaire.

L. Finish:

1. All exposed aluminum surfaces shall be treated with an acid wash and clear water rinse prior to painting. The luminaire shall then be electrostatically painted, or powder coated, and oven baked in the color indicated in the Luminaire Schedule.

2. All exposed steel surfaces shall be treated with an acid wash and clear water rinse, then prime coated. The luminaire shall then be electrostatically painted, or powder coated, and oven baked in the color indicated in the Luminaire Schedule.

M. Door Frames for lensed luminaires: White painted, flat aluminum with mitered corners.

2.4 SUSPENSION

A. Suspension Devices, type as specified in the Luminaire Schedule:

1. Aircraft Cable: Stainless steel type - 3/32” nominal diameter, stranded, with positive pressure, field adjustable clamp at luminaire connection.

2. Rigid Pendant: ½” nominal diameter or as specifically shown on drawings. Supplied by luminaire manufacturer when available as standard product. At luminaire end of stems, provide earthquake type swivel fitting to permit 45-degree swing in any direction away from vertical.

3. Chain hangers: Length to suit mounting height if shown or as field conditions dictate. Use two heavy duty chains with "S" hooks at each suspension point. Length to suit mounting height as shown on Drawings.

B. Suspension system must permit ±13-mm (1/2") minimum vertical adjustment after installation.

C. Supports:

1. Provide internal safety cable from luminaire body to stud in outlet box.

2. Carry luminaire weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.

D. Feed Point:

1. Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.

2. At the electrified connection provide straight cord feed.

3. Power cord: white multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).

4. Where emergency feed is required, a separate feed point shall be provided.

E. Non-feed Points:

1. 13-mm (½") O.D. polished chrome end sleeve, inside threaded ¼"-20, with 50-mm (2") diameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.

2. Contractor to provide support above ceiling as required.

F. Suspension method shall allow adjustment to be made in hanging length to allow for variance in ceiling height.

G. All exposed paintable suspension components shall have the same finish and color as the luminaire housing.

2.5 LAMPHOLDERS

A. Of configuration and design to accept standard lamp bases.

B. Wiring channels and lampholder mountings shall be rigid and accurately constructed.

C. Integral-driver LED:

1. Medium screw base: Unglazed porcelain body or thermoplastic (PET GF) with copper-alloy screw shell. 660watt, 250volt rated.

2. Bi-Pin base: Ceramic casing with mica cover plate, copper allow contact surfaces. Pin distance designed for lamp provided.

2.6 LED ARRAYS

A. Minimum lumen maintenance per LM-80 measurements and TM-21 calculations: L90 at 60,000 hours.

B. Maximum burnout: B90 at 200,000-hours.

C. Free of mercury and toxic materials; RoHS compliant.

D. Linear LED boards: LED pitch shall be consistent throughout the luminaire and shall remain consistent from the end of one board to the start of the next. LED pitch shall be the same from the endcap of the luminaire to the last LED on the board as the LED pitch throughout the luminaire. Luminaire shall have a continuous luminous appearance – bright or dark spots are not acceptable.

E. White LEDs:

1. Interior

a. Correlated Color Temperature (CCT): 4000K

b. Minimum efficacy: 75 lumens per watt.

c. L70 lifetime: minimum 80,000-hours (extrapolated.)

d. Correlated Color Temperature (CCT); as specified in Luminaire Schedule. Maximum 3-step MacAdam ellipse variation throughout listed life (L70).

e. Color Rendering Index (CRI); minimum 80 Ra.

f. R9 value; minimum 30.

g. TM30 values; Rf >75, 92>Rg>110.

2. Exterior

a. Correlated Color Temperature (CCT): 4000K

b. Minimum efficacy: 100 lumens per watt.

c. L70 lifetime: minimum 100,000-hours (extrapolated.)

d. Correlated Color Temperature (CCT); as specified in Luminaire Schedule. Maximum 4-step MacAdam ellipse variation throughout listed life (L70).

e. Color Rendering Index (CRI); minimum 70 Ra.

f. R9 value; minimum 20.

g. TM30 values; Rf >70, 80>Rg>120.

2.7 LED DRIVERS:

A. LED drivers shall be integral to luminaire housing or remotely located, when specified, within 15 feet of diode assembly.

1. Luminaires shall be provided with the UL listed or equivalent driver and low voltage power supply as recommended by Manufacturer to insure proper and consistent lamp and luminaire performance. The number of LEDs per luminaire per power supply shall not be exceeded, and LEDs shall not be wired to a high capacity driver unless recommended by Manufacturer.

2. Light Emitting Diode (LED) control gears shall operate with sustained variations of +/- 10% in voltage and frequency without damage to the driver and have a power factor not less than 90%. Regulations: +/-5% across the listed load range.

3. Driver input current shall have Total Harmonic Distortion (THD) of less than 20%. The Driver shall have a Class A sound rating unless otherwise specified.

4. Control gear shall be rated for 50-degree C ambient temperature.

5. All control gear shall facilitate smooth, flicker-free dimming from 100% to 10%, 1% or 0.1% as noted on the Luminaire Schedule.

2.8 LENSES

A. Acrylic:

1. Lenses shall be extruded or injection molded crystal clear 100% virgin acrylic (except as indicated otherwise). For lenses with male pattern of pyramids or cones, specified minimum thickness refers to distance from flat surface to base of pyramids (cones) or thickness of undisturbed material. For lenses with female pattern, specified minimum thickness refers to overall thickness of material.

2. Lenses shall fully eliminate lamp images when viewed from all directions within 45 to 90-degree angles from vertical, where the ratio of lamp spacing to the distance from lamp underside to top of lens does not exceed 1.50. Within the viewing angle from 0 to 45-degrees the ratio of maximum brightness (under a lamp) to minimum brightness (between lamps) shall not exceed 3 to 1.

3. Finishes (i.e. sandblasting, etching, polishing) shall be performed as described in the Luminaire Schedule.

4. Plastic electrical light diffusers must meet the requirements of Section 2-5209, CAC, Flame Spread Rating.

5. Prismatic Acrylic:

a. Extruded of clear virgin acrylic plastic, 0.125" minimum overall thickness, 0.100” nominal unpenetrated thickness, Pattern 12 with flat sided female prisms running at 45 degrees off panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.

6. Opal acrylic:

a. Extruded or injection molded of virgin acrylic plastic, 0.080" minimum overall thickness.

2.9 REFLECTOR CONES

A. Reflector cones shall be manufactured of uniform gauge, not less than 0.032” thick, high purity aluminum, Alcoa 3002 alloy, free of spin marks or other defects or blemishes caused during manufacturing.

B. The finish on the inner surface of the reflector shall be as described in the Luminaire Schedule and as produced by the Alzak process. The reflector shall have an anodic coating of not less than four mils thick. The reflector inner surface shall be free of water spotting and shall maintain a reflectivity ratio of not less than 83% on clear specular finishes. The reflectors shall have a low iridescence finish.

C. All luminaires using Alzak reflector cones shall be supplied by the same manufacturer unless directed otherwise in Luminaire Schedule.

D. Provide 45-degree lamp and lamp imaging cut-off unless otherwise specified in the Luminaire Schedule. Where upper reflector is separated from cone, cut-off shall be 45-degrees unless otherwise noted.

E. Plastic materials shall not be used for reflector cones or aperture plate materials.

F. Luminaires in which reflector cones are riveted or welded to the housing or where removal of the cone requires pressure to be applied to the finished surface of the reflector shall not be acceptable.

G. Cone flange shall be formed as an integral part of the cone and shall have identical color and finish as the cone, except when specified otherwise in the Luminaire Schedule. The flange major surface shall be perpendicular to the cone axis. The width of the flange shall adequately cover the ceiling opening without light leaks. No luminaire parts (housing, mounting frame, etc.) shall be visible between the ceiling surface and the edge of the cone flange.

H. Reflector cone retention devices shall not deform the cone in any manner.

2.10 UNIT BATTERY EQUIPMENT

A. LED Emergency Power Supplies

1. Standard Features:

a. Safety compliance to UL 924; CAN/CSAC22.2 No.141-10 and NFPA requirements for 90-minute egress

b. Open circuit / short circuit protection

c. Operating temperature: 32-degree F/0-degree C to 122-degree F/50-degree C

2. Test switch / charging indicator light

3. Emergency reaction time < 1-sec

4. Powder coat steel, stainless or galvan-nealed case

5. Field-replaceable NiCd battery pack (x2) with quick connect

6. Min. lead wire length: 6in UL 1452 solid / #18 AWG 1000volt / 90-degree C

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of luminaire installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Architectural Plans shall govern exact ceiling construction and mounting conditions for all luminaires. Locate as shown on the architectural elevations and reflected ceiling plan.

B. Consult Architectural Drawings for details of ceiling construction, finish, and other applicable details.

C. Contractor shall be responsible for coordination of luminaire mounting and compatibility with ceiling construction.

D. Luminaires in areas where exposed or concealed pipe and ductwork prevents direct access to the structural ceiling shall be provided with appropriate support system to install luminaire below obstructions to avoid conflicts with same.

3.3 ARCHITECTURAL COORDINATION

A. Where luminaires are mounted in architectural coves, soffits, valances, or cabinets and are given an overall length, the Contractor shall verify all lengths in the field prior to releasing order.

B. Where luminaires are surface mounted or suspended to match the length of walls or other architectural elements, the Contractor shall verify all lengths in the field prior to releasing order.

C. Mounting heights specified on drawings:

1. Wall mounted luminaires: shall be to centerline of luminaire.

2. Pendant mounted luminaires: shall be to bottom of luminaire unless specifically identified in the Luminaire Schedule or on drawings.

3.4 INSTALLATION

A. Install luminaires in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

B. Contractor shall be responsible for all supports, hangers, and hardware necessary for a complete installation.

C. Luminaires shall be plumb, level, square, in straight lines and without distortion.

D. Remedy light leaks that may develop after installation of recessed or enclosed luminaires.

E. Adjustable luminaires shall be installed with “dead” zone of rotation away from intended aiming point.

3.5 LUMINAIRE SUPPORTS

A. Physical (gravity) supports:

1. Recessed luminaires in wood framed ceilings shall be supported by 2" x 4" hangers fastened to adjacent ceiling joists.

2. Recessed downlights in wood frame ceilings shall be supported with Manufacturers supplied bar hangers and shall be installed according to the Manufacturer’s instructions.

3. Surface mounted luminaires solely supported by recessed boxes in a gypsum board ceiling shall have a 1-1/8" steel bar screwed or welded to the back of the box. This steel bar must be long enough to span two ceiling support channels and shall be attached to the channels by twisting wire around the bar and the support channel. For luminaires weighing over 50-pounds, provide studs in recessed box.

4. Support surface mounted luminaires more than 18" wide at or near each corner or edge, in addition to support from outlet box.

5. Support recessed downlights manufactured with built-in brackets by twisting wire around the bracket and two adjacent ceiling support channel runners on either side of the luminaire.

6. Support outlet boxes as specified in Section 26 05 33: Boxes. Provide all boxes with grounding pigtail.

7. On concrete ceilings, use one of the following for supporting luminaires other than by outlet box:

a. Preset concrete inserts, provided inserts are completely covered by the luminaire after installation.

b. 1/4-20 threaded appropriate length wedge type anchor.

B. Seismic supports:

1. Recessed luminaires in suspended ceilings shall be supported by connecting two support wires to the luminaire at diagonal opposite corners for luminaires weighing 56 pounds or less. Connect four wires, one at each corner for luminaires weighing more than 56 pounds.

2. Surface mounted luminaires on suspended ceilings shall be attached to the main ceiling runner with at least two positive clamping devices and shall have an additional support wire attached to each clamping device and to the structure above.

3. Recessed downlight luminaires in suspended ceilings shall be supported by connecting one support wire to the luminaire housing.

4. All suspended luminaires shall be able to swing 45-degrees from vertical in any direction without obstruction.

a. Furnish suspended rigid pendant luminaires with universal joint type hanger canopy and longitudinal sway adapter at each stem, to permit 45-degree swivel on 360-degree circle at canopy and 45-degree longitudinal movement at sway adapter.

b. Submit Drawings of hanger assembly for review prior to ordering.

c. If suspended luminaire is not free to swing 45-degrees in any direction, without obstructions, provide seismic restraint to prevent contact in conformance with California Uniform Building Code, Section 2330, Seismic Design.

5. All recessed modular luminaires shall be furnished with earthquake clips where installed in tee bar ceiling.

3.6 ATTIC STOCK

A. Spare Parts: Provide spare parts totaling 5 percent of the quantity specified, or two total, whichever is greater, of the following:

1. Luminaires:

2. Lenses:

3. LED Drivers:

4. LED Modules:

3.7 IDENTIFICATION SYSTEM

A. All concealed junction box cover plates for the lighting branch circuit system shall be clearly marked with a permanent black ink felt pen identifying the branch circuit (both panel designation and circuit number) contained in the box.

3.8 FIELD QUALITY CONTROL

A. Visual and mechanical inspection:

1. Inspect for physical damage, defects, alignment and fit.

2. Perform operational test of each luminaire after installed, circuited, and energized.

3. Perform emergency operational test of all luminaires connected to emergency circuiting by simulating normal power source failure.

B. Contractor shall replace at no cost to the Owner all equipment which is found defective or do not operate within factory specified tolerances.

3.9 MOCK-UPS

A. The purpose of the mock-up is to study the general appearance and performance of and to make comparisons between the various lighting systems. At that time, certain minimal test variations may be requested as to lamp location, lamp type, reflector shape, color, etc. Final modifications, if any, shall be considered a part of these Specifications and shall be accomplished with no additional cost to the Owner.

B. Where noted in the Luminaire Schedule, the Contractor shall provide sample(s) for use in full-size field mockup of specific luminaires.

C. The Contractor shall allow time in the bid and be responsible for procuring and installing a sample luminaire on the Project for review, prior to acceptance and final installation.

D. This mock-up will be required to be coordinated and reviewed with the Owner's Representative and the Architect or Engineer.

E. The Contractor shall be responsible for providing the labor and materials for the field mock-up including, but not limited to, special rigging or scaffolding and adjustments in the field, as directed by the Architect or Engineer.

F. The mock-up installation shall closely conform to the conditions of the actual final installation as to height, distance from adjacent surfaces, number and type of lamps, material, color, etc.

G. The Contractor shall submit a written description of each proposed mock-up with Drawings in order to obtain Architect’s approval prior to commencement of each mock-up.

H. Exterior mockups will occur at night, starting 2-hours after local sunset. Dates to be coordinated with design team to suit schedules. Contractor to propose multiple dates at least 4 weeks in advance.

I. Allow two, 6-hour mockup sessions per luminaire. The second mockup, if required, will occur after additional or alternate equipment is available.

J. Contractor to provide all required security, sidewalk closures, lifts, walkie-talkies (4 minimum) and manpower to make changes to color and intensity of the temporary luminaires.

K. Mockup luminaire shall not be used for final permanent installation unless approved by the design team.

3.10 ADJUSTING AND AIMING

A. Aiming will occur at night under the direction of the Owner's Representative and the Architect or Engineer. The Contractor shall be responsible for providing the labor and materials for field aiming. This shall include, but not limited to, special rigging or scaffolding, adjusting luminaires in field, testing of various lenses or louvers, as directed by the Architect or Engineer.

B. Aim all directional luminaires, including but not limited to luminaires described in the Contract Documents or by the luminaire manufacturer as "aimable," "adjustable," or "asymmetric" as follows:

1. To provide the lighting pattern for which the luminaire is designed.

2. To provide the lighting pattern as shown on the drawings.

3. To predetermined aiming points as shown on the drawings.

4. Where aiming cannot be determined, request, in writing, clarification from the Specifier, indicating luminaires needing clarification.

C. Re-aim luminaires as determined by Architect during final project walkthrough.

3.11 CLEANING

A. Clean luminaires prior to Project closeout in accordance with Manufacturer's recommended materials and methods.

B. Remove all debris, fingerprints, and packaging remnants.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 46 00 – Fire Detection Alarm

PAGE INTENTIONALLY LEFT BLANK.

SECTION 28 46 00 – FIRE DETECTION ALARM

PART 1 – GENERAL

1.1 SUMMARY

A. This section specifies equipment, accessories, wire, materials, installation, configuration and testing requirements for an addition to existing complete and operable Fire Detection and Alarm system. The system shall provide fire alarm detection, notification, monitoring, command, and control and be connected to the District's existing UL listed monitoring station.

1.2 SCOPE

A. The installed Fire Alarm system shall comply with all requirements of currently adopted version of NFPA 72.

B. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship. Contractors unfamiliar with the District's standards shall familiarize themselves with the District's standards and requirements prior to beginning work.

C. For new building construction on an existing campus – provide and install all components and accessories as outlined in the design documents for a complete and operable system that extends and seamlessly integrates into the existing campus' Fire Alarm system.

D. not used.

E. Labor and Materials: The Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation, and completion of the Work

F. Contractor shall furnish and install all new conduit/raceway and wire as indicated on the project drawings and/or as required to provide a turn-key system to the District.

G. The Contractor shall be responsible for programing of all Fire Alarm Control Panel(s) (FACP) site wide.

H. With one-week notice the Contractor shall coordinate with the District staff for monitoring connectivity.

I. Prior to final programming the contractor shall review the proposed final system programming, functionality and expectations with the District project manager, and/or Designer/Engineer. If the system is programmed without approval, all subsequent requested programming changes by the District will be at the Contractor's expense.

J. After completion of the installation and 100% pretest of the system, a satisfactory final test (compliant with NFPA 72 requirements) of the entire system shall be made in the presence of the inspector of record (IOR) and District or the District's representative.

K. Provide District an electronic copy of final test results.

L. Existing system shall remain operable until new system is accepted and approved by the IOR and the District or its representative.

M. The Contractor is responsible for user/operator training (2 hours).

N. The Contractor shall complete all required project closeout documentation in a timely fashion.

1.3 RELATED REQUIREMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Division 26 – Electrical

1.4 CODES AND STANDARDS

A. The installed system shall conform to all California State Codes:

1. 2022 California Building Code (CBC)
2. 2022 California Electrical Code (CEC)
3. 2022 California Fire Code (CFC)
4. All equipment shall have California State Fire Marshall listing(s)
5. DSA IR 9-1 Emergency Voice/Alarm Communication Systems
6. DSA IR 9-2 Carbon Monoxide Detection Requirements for Group E Classrooms and Group I-4 Occupancies

B. National Fire Protection Association (NFPA) – USA:

1. 2020 NFPA 70 – National Electric Code (NEC)
2. 2022 NFPA 72 – National Fire Alarm Code (NFPA 72)
3. 2021 NFPA 101 – Life Safety Code (NFPA 101)
4. Americans with Disabilities Act (ADA)

C. Local building codes

D. All requirements of the Authority Having Jurisdiction (AHJ)

1.5 UNDERWRITERS LABORATORY (UL) LISTING

A. All equipment shall be UL listed for its intended purpose.

B. Any modification that voids the equipment's UL listing is strictly prohibited (i.e. relocated or oversize knock-outs).

C. Any modified new equipment that voids the UL listing shall be replaced by the Contactor (parts and labor) at their expense.

1.6 QUALIFICATIONS

A. The Contractor shall possess a California C10 license.

B. The installing Contractor or Subcontractor shall be FACP manufacturer authorized to provide and install equipment with 5 years of documented experience.

C. The programming technician shall possess a valid manufacturer's programming certification.

D. The Contractor shall have at least one NICET certified in Fire Alarm Technology, level II (or greater) personnel as the on-site supervising technician who is always on site when Fire Alarm activities are taking place.

E. The installing company and its subcontractors shall have an office located within 50 miles of the project site.

1.7 NOT USED

1.8 SYSTEM REQUIREMENTS

A. Site Compatibility: Any new installations or modifications to an existing system shall seamlessly integrate into the site's existing Fire Alarm system.

1.9 CONTRACTOR "SHOP DRAWINGS" DESIGN REQUIREMENTS

A. A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:

1. Control panel wiring and interconnection schematics.

2. Complete point-to-point wiring diagrams.

3. Riser diagrams.

4. Complete floor plan drawing locating all system devices and 1/4" = 1'-0" scale plan and elevation of all equipment in the Fire Command Station. Including showing the placement of each individual item of fire alarm, security, and access control equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.

5. Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.

6. Complete system bill of material.

7. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET certification in fire protection engineering technology, subfield of fire alarm systems.

1.10 SUBMITTALS

A. Project:

1. The contractor shall purchase no equipment for the system specified herein

until the owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The contractor shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order.

2. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the contract documents. In addition the Contractor shall provide specific notation on each shop drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.

3. All drawings and diagrams shall include the contractor's title block, complete with drawing title, contractor's name, and address, date including revisions, and preparer and reviewer's initials.

B. Product Data:

1. Data sheets with the printed logo or trademark of the manufacturer for all equipment. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Architect/Engineer.

2. Provide copies of certificates listed in QUALIFICATIONS section above.

1.11 WARRANTY

A. Refer to Division 01 Warranty section.

B. After the satisfactory completion letter has been received, a continuous and fault free thirty (30) day “burn-in” period shall begin. Any fault shall reset the “burn-in” period to zero (0). Warranty shall commence at day 31 of a successful and continuous “burn-in” period.

PART 2 – PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL

A. Existing fire alarm control panel is Fire-Lite

B. All products shall be new and unused and shall be of manufacturer's current and standard production.

C. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

D. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support

the operation specified. Contractor shall provide all components needed for complete and satisfactory system operation.

E. Product availability:

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.

2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

2.2 CONDUIT AND RACEWAY

A. See Division 26 sections.

2.3 WIRE AND CABLE

A. Provide all new wire and cable required to install systems as indicated on design documents or approved shop drawings.

B. Approved wire and cable manufacturer is West Penn, substitutions require prior approval.

C. All cable shall be jacketed, and jacket color shall be red (OSP cable excluded). No THHN/THWN allowed.

D. All cables shall be specifically designed for their intended use and install requirements (FPL, plenum, direct burial, aerial, etc.).

E. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG solid for initiating device circuits and signaling line circuits, 12 AWG stranded for notification appliance circuits and 14 AWG stranded for emergency voice communication circuits. (Coordinate with wire schedule)

2.4 BATTERIES

A. Shall be new 12-volt, sealed lead-acid type.

B. Battery shall be sized according to calculations on design drawings.

C. Approved battery manufacturer: Powersonic or approved equal

2.5 EXTRA STOCK

A. For projects with less than 10 new Fire Alarm devices – no extra stock required.

B. For projects with 11 – 50 new Fire Alarm devices – provide extra stock of 1 (ea.) Smoke detector (current model), 1 (ea.) Heat detector (current model) and 1 (ea.) Pull station (current model)

C. For projects over 50 new Fire Alarm devices – provide extra stock of 2 (ea.) Smoke detector (current model), 1 (ea.) CO detector (current model), 1 (ea.) Wall speaker/strobe (current model) and 1 (ea.) Ceiling speaker strobe (current model) per 100 Fire Alarm device increments.

D. For projects over 300 new Fire Alarm devices – provide devices listed in sections C (above) plus 1 (ea.) Power Booster (current model)

PART 3 – EXECUTION

3.1 INSTALLATION

A. The installing company shall employ a minimum of one National Institute for the Certification in Engineering Technologies (NICET) Fire Alarm Systems, level II technician. To ensure system integrity, the NICET level II technician shall be on site during all fire system related work to guide the installation of conduit, back-boxes, device placement, device installation, programming, pre-testing, and final testing of the system.

B. The District, Inspector of Record (IOR), Construction Manager or an agent of the District shall have the authority to stop work until the certified personnel requirement is met. The Contractor shall be held accountable for meeting completion dates.

C. Installation shall be in accordance with the CBC, CEC, CFC, NFPA 72, local and national codes.

D. Fire Alarm cables shall not be installed in decking flutes used as pathway. Any conduit that needs to be ran in decking flutes needs to be rigid.

E. All Fire Alarm cables shall be run unexposed (not observable from occupiable space) throughout the entire cable path – either in conduit, on ladder racking, on j-hooks above ceilings or below flooring.

F. All fire devices and panels shall be mounted at the height as indicated on the design plans and shall comply with local, CBC, CEC, CFC, and NFPA 72 codes and standards. Any discrepancies shall be brought to the Designer/Engineer and Project Manager's attention.

G. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place with fasteners and supports in accordance with drawings and specifications.

H. Signal line circuits (SLC) for initiating devices shall be wired Class B.

I. Notification appliance circuits (NAC) shall be wired Class B.

J. CO detection to initiate a building wide evacuation in accordance with DSA IR 9-2.

K. Smoke detectors shall remain covered until operational. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and/or physical damage and may require additional testing and/or replacement.

L. All addressable smoke or heat devices shall have trim skirts.

M. All modules with indicator lights (i.e. SIGA-CT1 & etc.) shall be mounted where the indicator lights are observable from the occupiable space.

N. Smoke relief hatches are to have door contacts installed and monitored with a monitoring module. Opening of the hatch shall produce a Supervisory event notification. Monitoring module height is to be 10’ AFF or less.

O. Fire alarm circuits shall have a red breaker lock on device per NFPA 72 requirements.

P. All modification to electrical power shall be made by a licensed electrician.

Q. Headend FACP and associated equipment layout per design documents. If no layout exists Contractor to notify and receive guidance from District or District’s representative prior to install.

R. All Duct Smoke Detector / Fire Smoke Damper shutdown to be coordinated with Div 23.

3.2 LABELING

A. All labels are to be machine generated black letters on white adhesive label stock that is appropriate for the installation environment (interior/exterior).

B. Device ID Labels are to be 1/4” lettering for mounting heights 10’ AFF or less, 1/2" black lettering on white labels for mounting heights greater than 10’ AFF.

C. All panels and power supplies shall be labeled indicating AC electrical power panel and circuit breaker number and panel location.

D. All panels and power supplies shall be identified per design plans.

E. All smoke and heat detectors shall be labeled with Point ID affixed to the trim skirt. Labels are to be visible when approaching the device from the room entry.

F. All modules are to be labeled with Point ID and function and/or associated equipment (i.e. FAN SHUTDOWN, HVAC UNIT XX, ATTIC HEAT, etc.)

G. All notification devices shall be labeled with NAC Point ID.

H. All cables in cabinets shall be labeled with function and circuit ID.

I. All end-of-line devices shall have a “EOL” label.

3.3 PANEL PROGRAMMING/SOFTWARE MODIFICATION

A. The contractor shall review the proposed system programming, functionality, expectations with the District or its representative 10 days prior to final programming.

B. Contractor shall provide the services of a factory trained, and authorized technician to perform all system software modifications, upgrades, or changes on site. No

remote programming is allowed.

C. Contractor shall provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system.

D. Programming syntax shall be consistent with the with the existing site for label text and numbering scheme.

3.4 PRE-TESTING

A. The entire system shall be checked and pre-tested by the Contractor and shall test free of all faults prior to calling for a final test.

B. Before energizing the cables and wires, check for correct connections and test for open circuits, short circuits, ground faults, continuity, and any physical damage to the cable/wire insulation that may have occurred during installation.

3.5 TESTING AND GUARANTEE

A. Upon completion of the installation of the system, a test consisting of 100% of all newly installed and 10% of existing relevant system components shall be performed to confirm operation and function. This test shall be made in the presence of the Inspector of Record (IOR) and the District or its representative.

B. Provide the Project Manager with 7 days in advance written notice of system readiness for Final Testing and Inspection. System shall be 100% pre-tested and fully operable with no trouble conditions prior to final test.

C. Provide the service of a NICET level II technician to supervise and participate during all of the adjustments and tests of the system.

D. Testing and adjustments:

1. Verify that all devices operate per Design documents matrix (matrices.)

2. Verify the Point IDs and descriptions as indicated on the updated (redlined) Design Documents Floor Plan.

3. Verify the candela settings of all NAC devices with strobes.

4. Verify and document that sound levels at all EVAC notification appliance speakers meets or exceeds the minimum sound levels as indicated in the design drawings for expected average ambient or maximum sound levels. Testing to be conducted using dBA setting, 5’ above finished floor and 10’ from speaker with a stand-alone meter (Galaxy Check Mate series or equal).

5. Contractor to adjust horn settings as required to meet sound levels required after testing.

6. Verify that an open circuit on the initiating device circuit activates a trouble signal locally for all circuits.

7. Verify that an open or a short circuit on the signaling line circuit activates a

trouble signal locally for all circuits.

8. Verify that an open or short circuit on the notification appliance circuit activates trouble signal locally for all circuits.

9. Verify that a ground condition on an initiating device circuit activates trouble signals locally for all circuits.

10. Verify that a ground condition on a signaling line circuits activates a trouble signals locally for all circuits.

11. Verify that a ground condition on a notification appliance circuit activates a trouble signal locally for all circuits.

3.6 DEMOLITION

A. See Divisions 2 and 26.

3.7 FINAL DOCUMENT SUBMITTALS

A. See Division 26, for additional requirements

B. Submit completed NFPA certification forms as found in NFPA 72. Forms shall be submitted in typewritten format.

C. Provide District an electronic copy of final test results.

D. Contractor “red-line as-built” drawings shall also include the following: The drawings shall depict, at a minimum, the following conditions:

1. The device exact installed location.

2. Device updated labeling ID(s), which shall match the physical label at the device.

3. Revised risers to match record set point to point installation and

4. Updated battery calculation with quantity of device changes.

5. New pathways, conduit, ground boxes, junction boxes, raceway, power-poles and floor-monuments.

6. Any other new conditions.

E. The Contractor shall submit “red-line as-built” drawings as indicated on project schedule.

F. Warranty:

1. Refer to Division 01 Warranty section.

2. After the satisfactory completion letter has been received, a continuous and fault free thirty (30) day “burn-in” period shall begin. Any fault shall reset the

"burn-in" period to zero (0). Warranty shall commence at day 31 of a successful and continuous "burn-in" period.

APPENDIX A – Pre-Approved Materials

DESCRIPTION	MFG	PART NUMBER
Fire Alarm Control Panel	Fire-Lite	existing
Smoke Detector	Fire-Lite	SD255
Heat Detector (Rate of Rise)	Fire-Lite	H355R
Monitor Module	Fire-Lite	MMF-300
Monitor Module (Mini)	Fire-Lite	MMF-301
Booster Power Supply	Fire-Lite	FCPS-24FS6
Horn/Strobe (Wall)	System Sensor	P2RL
Horn/Strobe (Ceiling)	System Sensor	PC2RL
Horn (Outdoor)	System Sensor	HRK
Terminal/Barrier Strip	Ideal Industries	89-608
Dry Contact Input Relay	Functional Devices, Inc.	RIB01BDC

END OF SECTION

DIVISION 31 – EARTHWORK

31 00 00 – Earthwork
31 23 33 – Trenching and Backfilling

PAGE INTENTIONALLY LEFT BLANK.

SECTION 31 00 00 – EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes earthwork.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 01 50 00 – Construction Facilities and Temporary Controls.

C. Section 01 57 13 – Erosion Control

D. Section 31 23 33 – Trenching and Backfilling.

E. Section 32 12 00 – Asphalt Concrete Paving.

F. Section 32 16 00 – Site Concrete.

G. Section 33 40 00 – Site Drainage.

1.3 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.4 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

C. The representatives of the Owner’s testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner’s testing lab representatives nor the testing by the Owner’s testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting of inadequate compaction or moisture content is the sole responsibility of the contractor.

D. Tests (See Part 3 for Compaction Testing).

E. Contractor shall be solely responsible for all subgrades built. Failures resulting from inadequate compaction or moisture content are the responsibility of the contractor.

Contractor shall be solely responsible for any and all repairs.

1.5 WARRANTY

A. Refer to General Conditions and Section 01 78 36.

1.6 REFERENCES AND STANDARDS

A. General: Site survey, included in the drawings, was prepared Warren Consulting Engineers, Inc., dated November 11, 2022, and is the basis for data regarding current conditions. While the survey is deemed generally accurate, there exists discrepancies and variations due to elapsed time, weather, etc. Existing dirt grades may vary 0.2 ft. from that shown.

B. Geotechnical Engineering Report was prepared by Terracon. Report is entitled Sequoia Elementary School, dated March 6, 2023 and is on file with Architect. Recommendations of the Geotechnical report were used to develop the contract plans and specifications. The Geotechnical report shall be used as a reference for the soil condition of the project site. The design information contained in the contract plans and specifications shall govern over the recommendation of the Geotechnical report

C. Site Visitation: All bidders interfacing with existing conditions shall visit the site prior to bid to verify general conditions of improvements. Discrepancies must be reported prior to the bid for clarification.

D. ANSI/ASTM D698-e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

E. ANSI/ASTM D1556-e1 - Test Method for Density of Soil in Place by the Sand-Cone Method.

F. ANSI/ASTM 698-12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

G. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

H. ANSI/ASTM D 4318-10e1 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

I. CALTRANS Standard Specifications Section 17.

J. CAL-OSHA, Title 8, Section 1590 (e).

K. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

1.7 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.8 PROJECT CONDITIONS

A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

B. Excavation dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for excavation dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

1.9 EXISTING SITE CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

1.10 ON SITE UTILITY VERIFICATION AND REPAIR PROCEDURES

A. Ground-breaking requirements:

1. All underground work performed by a Contractor must be authorized by the District's Construction Manager or the Low Voltage Consultant prior to start of construction.

2. The Contractor is to obtain and keep the original School's construction utility site plans on site during all excavation operations. Contractor can contact the District's Construction Manager, Facilities Manager, or the Low Voltage Consultant to procure the drawings.

B. Underground Utility Locating:

1. The contractor shall hire an Underground Utility Locating Service to locate existing underground utility pathways in areas affected by the scope of work for excavation.

2. Contractor must use an underground utility locator service with a minimum of 3 years' experience. The equipment operator must have demonstrated experience.

3. The Underground Utility Locator Service must have the use of equipment with the ability to locate by means of inductive clamping, induction, inductive metal detection, conductive coupling, or TransOnde (Radio detection) to generate signals, passive locating (free scoping) for "hot" electric, and metal detector.

4. The Underground Utility Locator Service must be able to locate existing

utilities at a depth of at least 72".

5. The Underground Utility Locator Service must be able to locate but are not limited to locating the following types of utility pathways:

6. All conduit pathways containing 110 volt or greater 50-60Hz electrical wire.

7. All conduit pathways containing an active cable TV system.

8. All conduit pathways containing wire or conductor in which a signal can be attached and generated without damaging or triggering the existing systems.

9. All empty conduit pathways or pipe in which a signal probe or sonde (miniature transmitter) can be inserted.

10. All conduit pathways containing non-conductive cables or wires in which a signal probe or sonde (miniature transmitter) can be inserted.

11. All plastic and other nonconductive water lines in which a TransOnde Radio detection) or other "transmitter" can be applied to create a low frequency pressure waive (signal) without damaging or triggering the existing systems.

12. All copper or steel waterlines and plastic or steel gas lines

13. All markings made by the Underground Utility Locator Service or other shall be clear and visible.

14. The contractor shall maintain all markings made by Underground Utility Locator Service or other throughout the entire length of the project.

15. The Underground Utility Locator Service shall provide the contractor with two sets of maps showing the location of utilities and average depth. They will be referenced to permanent buildings. Contractor will deliver one copy to the district at no additional charge.

16. Contractor is responsible to contact Underground Service Alert (U.S.A. 800/227-2600) and receive clearance prior to any excavation operations.

17. Contractor shall inform the (District's Construction Manager) (Architect) (Owner) no later than five (5) days prior to the date scheduled for the utility locator service to be on site.

1.11 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including

safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

1.12 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

B. Excessively wet fill material shall be bladed and aerated per section 3.8, B.

1.13 TESTING

A. General: Refer to Section 01 45 00 – Quality Requirements.

B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and back charged to Contractor.

1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Sub Base, Aggregate Base, Rock, Crushed Rock or sand the cost of all testing of this material shall be paid for by the Contractor.

2. Testing of import fill for compliance with Department of Toxic Substance Control (DTSC) shall be paid for by the Contractor.

1.14 ARCHEOLOGICAL AND CULTURAL RESOURCES

A. If archeological or cultural resources are discovered during the Work, the Contractor must cease all construction operations in the vicinity of the discovery until a qualified archeologist can assess the value of these resources and make recommendations to the State Historic Preservation Officer. Archeological and cultural resources include artifacts, large amounts of bone, shell, or flaked stone, and other evidence of human activity. If the State Historic Preservation Officer or the Owner directs that work be

temporarily ceased at the location of an archeological or cultural find, the Contractor must temporarily suspend work at the location.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Engineered Fill Materials: All fill shall be of approved local materials supplemented by imported fill if necessary. "Approved" local materials are defined as local soils tested and approved by Geotechnical Engineer free from debris, and concentrations of clay and organics; and contain rocks no larger than 6-inches in greatest dimension. The soil and rock should be thoroughly blended so that all rock is surrounded by soil. This may require mixing of the soil and rock with a dozer prior to placement and compaction. Clods, rocks, hard lumps or cobbles exceeding 3-inches in final size shall not be allowed in the upper 18 inches of any fill. Native clay or clayey soils will not be permitted within the upper 18 inches of building pad areas or paved areas.

B. Imported Engineered Fill Material: Imported fill may be required to complete work. Proposed import fill material shall meet the above requirements; shall be similar to the native soils. Import fill shall meet the above requirements; shall have plasticity index of 10 or less; an Expansion Index of less than 20; be free of particles greater than 3-inches in largest dimension; be free of contaminants and have corrosion characteristics within the acceptable limits. All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site. Proposed fill material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

1. DTSC TESTING: Site work contractor is to coordinate testing with an analytical lab, hired by the owner, licensed by the State of California for the DTSC testing. The costs associated with the testing will be paid by the contractor.

2. DTSC testing shall include documentation as to the previous land use, location, and history. Soils shall be analyzed for all compounds of concern to ensure the imported soil is uncontaminated and acceptable. Testing shall be performed per the recommendations included in DTSC Imported Fill Advisory http://www.dtsc.ca.gov/Schools/upload/SMP FS Cleanfill-Schools.pdf). Soils shall be tested prior to import to the project site.

   a. Lab shall determine geographically which tests and analysis comparison will be appropriate for the testing. (CAM 17 / Title 22); (RWQCB) Regional Water Quality Control Board; or (OEHHA) Office of Environmental Health Hazard Assessment.

3. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

Fill Material Sampling Schedule

Area of Individual Borrow Area	Sampling Requirements
2 Acres or less	Minimum of 4 samples
2 to 4 Acres	Minimum of 1 sample every ½ Acre
4 to 10 Acres	Minimum of 8 Samples
Greater than 10 Acres	Minimum of 8 locations with 4 subsamples per location
Volume of Borrow Area Stockpile	
Up to 1,000 Cubic Yards	1 sample per 250 cubic yards
1,000 to 5,000 Cubic Yards	4 samples for the first 1000 cubic Yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 Cubic Yards	12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

4. Reports/ Documentation: Results of the testing analysis shall be sent to the Owner; Architect; Project Inspector, Project Civil Engineer, DTSC, and DSA. Letter shall reference DSA file and application numbers.

C. Landscape Backfill Material:

a. The top 12" of native topsoil stripped from the site may be used for landscape backfill material provided it meets the requirements as specified in Landscape plans.

b. Imported Topsoil may be required to complete work. Proposed Topsoil material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

D. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

E. Aggregate Base: Provide Class 2 3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26-1.02A.

PART 3 – EXECUTION

3.1 INSPECTION LAYOUT AND PREPARATION

A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence

B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a

licensed Land Surveyor or Professional Civil Engineer.

C. Verify that specified items may be installed in accordance with the approved design.

D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.2 PERFORMANCE – GENERAL

A. General: Do all grading, excavating and cutting necessary to conform finish grade and contours as shown. All cuts shall be made to true surface of subgrade.

B. Archaeological Artifacts: Should any artifacts of possible historic interest be encountered during earthwork operations, halt all work in area of discovery and immediately contact the Architect for notification of appropriate authorities.

C. Degree of Compaction: Percentage of maximum density, hereinafter specified as degree of compaction required, means density equivalent to that percentage of maximum dry density determined by ASTM D1557 Compaction Test method, and such expressed percentage thereof will be minimum acceptable compaction for specified work.

D. Moisture Content: Moisture content shall be as noted below and as called for on the plans. Moisture content shall be maintained until subgrade is covered by surfacing materials.

3.3 DEMOLITION, DISPOSAL AND DISPOSITION OF UNDESIRABLE MAN-MADE FEATURES

A. All other obstructions, such as abandoned utility lines, septic tanks, concrete foundations, and the like shall be removed from site. Excavations resulting from these removal activities shall be cleaned of all loose materials, dish shaped, and widened as necessary to permit access for compaction equipment. Areas exposed by any required over-excavation should be scarified to a depth of 18", moisture-conditioned to 2% above optimum moisture content, and recompacted to at least 90% of the maximum dry density.

3.4 TESTING AND OBSERVATION

A. All grading and earthwork operations shall be observed by the Geotechnical Engineer or his representative, serving as the representative of the Owner.

B. Field compaction tests shall be made by the Geotechnical Engineer or his representative. If moisture content and/or compaction are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified moisture or compaction. Notify Geotechnical Engineer at least 48 hours in advance of any filling operation.

C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer or his representative. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.

D. If the Contractor should fail to meet the compaction or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer or Architect/Engineer.

E. After each rain event Geotechnical Engineer shall test fill material for optimum moisture. Do not place any fill material until desired moisture is achieved.

3.5 CLEARING AND GRUBBING

A. Prior to grading, remove all debris off-site. Remove trees and brush including the root systems. Holes resulting from tree and brush removal should be prepared and backfilled in accordance with paragraphs 3.07, 3.08, 3.09, and 3.10. This may require deepening and/or widening the holes to adequately remove disturbed soil and provide room for compaction equipment. Strip the surface of all organics. Stripping's meeting the requirements of Section 32 90 00 may be used in landscape areas only.

3.6 CUTTING

A. Do all cutting necessary to bring finish grade to elevations shown on Drawings.

B. When excavation through roots is necessary, cut roots by hand.

C. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

3.7 STRUCTURAL EXCAVATION

A. General: Excavate to bear on firm material at contract depth shown on Structural Drawings.

B. Footings: All footing excavations shall be of sufficient width for installation of formwork, unless earth will retain its position during concreting. All portions of footings above grade must be formed.

C. Unsuitable Ground: Any errors in structural excavation, soft ground, or clay soils found when excavating shall be reported to Architect. In no case shall work be built on any such soft or clayey unsuitable surface without direction from the Architect. Restore excavations to proper elevation with engineered fill material compacted to 90% of dry density.

3.8 SUBGRADE PREPARATION

A. Grade compact and finish all subgrades within a tolerance of 0.10' of grades as indicated on Drawings and so as not to pool water. Subgrade within building pads and concrete walks shall be within 0.05' of grades indicated.

B. After clearing, grubbing and cutting, subsurface shall be plowed or scarified to a depth of at least 18", until surface is free from ruts, hummocks or other uneven features and uniform and free from large clods. Moisture condition to 2% above optimum moisture content and recompact to at least 90% of the maximum dry density as determined by ASTM Test Method D1557. If the existing soils are at a

water content higher than specified, the contractor shall provide multiple daily aerations by ripping, blading, and/or disking to dry the soils to a moisture content where the specified degree of compaction can be achieved. After seven consecutive working days of daily aerations, and the moisture content of the soil remains higher than specified, the contractor shall notify the architect. If the existing soils have a moisture content lower than specified, the contractor shall scarify, rip, water and blade existing soil to achieve specified moisture content. The contractor shall make proper allowance in schedule and methods to complete this work.

C. Subgrade in areas to receive landscaping shall be compacted to 90%.

D. Where Contractor over-excavates building pads through error, resulting excavation shall be recompacted as engineered fill at Contractor's expense.

3.9 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN BUILDING PAD AND PAVEMENT AREAS

A. Selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in compacted thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity in moisture content.

B. Selected fill material shall be moisture-conditioned to specified moisture content. Selected fill material shall be unfrozen. When moisture content of fill material is below that specified, add water until proper moisture content is achieved. When moisture content is above that specified, aerate by blading or other methods mentioned in 3.08 B until moisture content is satisfactory.

C. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of 90% as determined by the ASTM D1557 Compaction Test. Compact each layer over its entire area until desired density has been obtained.

D. Recompaction of Fill in Trenches and Compaction of Fill Adjacent to Walls: Where trenches must be excavated, backfill with material excavated. Place in lifts that when compacted do not exceed 6”, moisture conditioned to 2% above optimum moisture content, and compact to a minimum of 90% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.

E. Jetting of fill materials will not be allowed.

3.10 FINAL SUBGRADE COMPACTION

A. Building Pads: Subgrade soils beneath proposed floor slab shall be removed to a depth of 18” beneath finish pad grade. Scarify to a depth of 18” and moisture condition to 2% above optimum moisture content and compact to 90% relative compaction. Upper 18" of all final building pad subgrades (including future buildings) shall be structural fill uniformly compacted at specified moisture content to at least 95% of maximum dry density, as determined by ASTM D1557 Compaction Test, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.

B. Paved Areas: Upper 12" of all final subgrades supporting pavement sections and all

other flatwork shall be brought to specified moisture content and shall be uniformly compacted to not less than 95% of maximum dry density, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.

C. Other Fill and Backfill: Upper 12” of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.

D. Gravel Fill: Do not place compacted gravel fill until after underground work and foundations are in place. Compact gravel fill with vibratory plate or similar equipment to preclude settlement.

3.11 PLACING, SPREADING, AND COMPACTION OF LANDSCAPE BACKFILL MATERIALS

A. All landscaped areas shall receive topsoil. After subgrade under landscape area has been scarified and brought to 90% maximum dry density, top soil shall be placed evenly to depth of 12" at 85% of maximum dry density.

B. Project Inspector must verify that materials are uniformly spread to minimum depth specified.

3.12 SLOPE CONSTRUCTION

A. Cut slopes shall be constructed to no steeper than 2:1 (horizontal:vertical). Fill slopes shall be constructed to no steeper than 2:1 (horizontal:vertical).

3.13 FINISH GRADING

A. At completion of project, site shall be finished graded, as indicated on Drawings. Finish grades shall be “flat graded” to grades shown on the drawing. Mounding of finish grades will not be allowed unless otherwise directed on the landscape drawings. Tolerances for finish grades in drainage swales shall be +-0.05’. Tie in new and existing finish grades. Leave all landscaped areas in finish condition for lawn seeding. Landscaped planters shall be graded uniformly from edge of planter to inlets. If sod is used for turf areas the finish grade on which it is placed shall be lowered to allow for sod thickness.

B. All landscape areas shall be left free of rock or foreign material as specified in Landscape drawings.

C. All landscape areas shall be approved by Architect prior to any planting.

3.14 SURPLUS MATERIAL

A. Excavated material not required for grading or backfill shall be removed from site at contractor’s expense.

3.15 CLEANING

A. Refer to Section 01 77 00.

B. Remove from fill all vegetation, wood, form lumber, casual lumber, and shavings, in

contact with ground; buried wood will not be permitted in any fill.

END OF SECTION

SECTION 31 23 33 – TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes trenching and backfilling.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 01 50 00 – Construction Facilities and Temporary Controls.

C. Section 01 57 13 – Erosion Control

D. Section 31 00 00 – Earthwork.

E. Section 32 12 00 – Asphalt Concrete Paving.

F. Section 32 16 00 – Site Concrete.

G. Section 33 40 00 – Site Drainage.

1.3 REFERENCES AND STANDARDS

A. California Building Code current edition.

B. California Plumbing Code current edition.

1.4 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

C. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

1.5 SUBMITTALS

A. Refer to Section 01 33 00.

B. Submit Manufacturers data and shop drawings.

1.6 WARRANTY

A. Submit fully executed warranty for work and materials in this section per 01 78 36.

1.7 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.8 PROJECT CONDITIONS

A. Contractor shall acquaint himself with all existing site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

C. Trench dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for trench dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

1.9 PROTECTION

A. Adequate protection measures shall be provided to protect workers and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations. Repair all trenches in grass areas with new sod (seeding not permitted) and "stake-off" for protection.

B. Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Architect or Owner is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. Keep all excavations free from water during entire progress of work, regardless of cause, source or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

H. Trees: Carefully protect existing trees which are to remain.

1.10 TRENCH SAFETY PROVISIONS

A. General Contractor shall be solely responsible for safety design, construction and coordination with agencies having jurisdiction. If such plan varies from shoring system standards established by Construction Safety Orders, plan shall be prepared by registered civil or structural engineer.

B. Nothing herein shall be deemed to allow use of shoring, sloping or protective system less effective than that required by Construction Safety Orders of California State Division of Industrial Safety.

C. When trenching through paved surface, provide steel trench plates to cover open trenches daily until trenches are backfilled.

1.11 SEASONAL LIMITS

A. No backfill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, full operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

B. Material above optimum moisture shall be processed per Section 31 00 00, 3.8.B.

1.12 TESTING

A. General: Refer to Section 01 45 00 – Quality Requirements.

1.13 WARRANTY

A. Submit fully executed warranty for work and materials in this Section per 01 78 36.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Backfill materials: Pipeline and conduit trench backfill as shown on the plans and as specified below.

1. 3/4 inch crush rock.

2. Native Materials: Soil native to Project Site, free of wood, organics, and other deleterious substances. Rocks shall not be greater than 3-inches.

3. Sand: Fine granular material, free of organic matter, mica, loam or clay.

4. Lean Mix Concrete/Controlled Density Backfill: 2 sacks cement slurry.

5. Class 2 aggregate base, 3/4" rock, per Caltrans section 26-1.02B

B. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

C. Provide other bedding and backfill materials as described and specified in Section 31 00 00, Section 33 40 00 and Divisions 22, 23, and 26.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.

2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

3.2 COORDINATION

A. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 INSTALLATION

A. Perform work in accordance with pipe manufacturer's recommendations, as herein specified and in accordance with drawings.

3.4 TRENCHING

A. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of trench around installed item as required for caulking, joining, backfilling and compacting; not less than 12 inches wider than pipe or conduit diameter, unless otherwise noted.

B. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

C. Trench straight and true to line and grade with bottom smooth and free of edges or rock points.

D. Where depths are not shown on the plans, trench to sufficient depth to give minimum fill above top of installed item measured from finish grade above the utility as follows:

1.	Sewer pipe:	depth to vary
2.	Storm drain pipe:	depth to vary
3.	Water pipe - Fire Supply:	36 inches
4.	Water pipe – Domestic Supply:	30 inches

E. Where trench through existing pavement saw cut existing pavement in straight lines. Grind existing asphalt on each side of trench 3" wide x ½ the depth of the section. Apply tact coat to vertical surfaces before installing new asphalt. Replace asphalt

and concrete pavement sections to matched existing conditions. In concrete pavement provide expansion and control joints to match existing joint layout.

3.5 BACKFILL

A. Pipe Trench Backfill is divided into three zones:

1. Bedding: Layer of material directly under the pipe upon which the pipe is laid.

2. Pipe Zone: Backfill from the top of the bedding to 6 inches (compacted) over the top of the pipe.

3. Upper Zone: Backfill between top of Pipe Zone and to surface of subgrade.

B. Bedding: Type of material and degree of compaction for bedding backfill shall be as defined in the Details and Specifications.

C. Pipe Zone and Upper Zone Backfill:

1. Type of material and degree of compaction Pipe Zone and Upper Zone Backfill shall be as required by Drawings, Details, & Specifications.

2. Upper Zone Backfill shall not be placed until conformance of Bedding and Pipe Zone Backfill with specified compaction test requirements has been confirmed.

3. Backfill shall be brought up at substantially the same rate on both sides of the pipe and care shall be taken so that the pipe is not floated or displaced. Material shall not be dropped directly on pipe.

D. Backfill Compaction:

1. Backfill shall be placed in layers which, when compacted shall not exceed 6 inches in thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity. Do not backfill over, wet, frozen or soft subgrade surfaces. Employ a placement method that does not disturb or damage foundation walls, perimeter drainage, foundation damp-proofing, waterproofing or protective cover.

2. When moisture content of fill material is below that required to achieve specified density, add water until proper moisture content is achieved. When moisture content is above that required, aerate by blading or other methods until specified moisture content is met, see Section 310000, 3.8.B.

3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to 90% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.

4. The top 12 inches of subgrade compaction under pavement or top 18 inches of subgrade compaction under building shall be per Earthwork section 31 00 00.

5. Compaction: All backfill operations shall be observed by the Inspector of Record and/or Geotechnical Engineer. Field density tests shall be made to check compaction of fill material. If densities are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified densities. Notify Inspector and Architect at least 24 hours in advance of any operation.

E. Backfill in Areas Previously Lime or Cement Treated: If trenching is necessary in areas that have been previously lime treated the contractor shall backfill the trench with class 2 aggregate base, with minimum section equal to the lime treated section and compacted to 95%.

3.6 TRENCH AND SITE RESTORATION

A. Finished surface of trenches shall be restored to a condition equal to, or better than the condition as existed prior to excavation work.

3.7 PROTECTION

A. Protect existing surfaces, structures, and utilities from damage. Protect work by others from damage. In the event of damage, immediately repair or replace to satisfaction of Owner.

B. Repair existing landscaped areas to as new condition. Replant trees, shrubs or groundcover with existing materials if not damaged or with new materials if required. Replace damaged lawn areas with sod, no seeding will be permitted.

C. Replace damaged pavement with new compatible matching materials. Concrete walks to be removed to nearest expansion joint and entire panel replaced. Asphalt to be cute neatly and replaced with new materials.

D. Any existing materials removed or damaged due to trenching to be returned to new condition.

3.8 SURPLUS MATERIAL

A. Remove excess excavated material, unused materials, damaged or unsuitable materials from site.

3.9 CLEANING

A. Refer to Section 01 77 00.

B. Contractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others throughout the project and at the completion of work.

C. After completion of work in this section, remove all equipment, materials, and debris. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 12 00 – Asphalt Concrete Paving
32 16 00 – Site Concrete
32 31 19 – Decorative Metal Fencing and Gates

PAGE INTENTIONALLY LEFT BLANK.

SECTION 32 12 00 – ASPHALT CONCRETE PAVING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt paving mix designs.
2. Aggregate Base Course.
3. Asphalt Overlay.
4. Seal Coat and Striping.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 01 50 00 – Construction Facilities and Temporary Controls.

C. Section 31 00 00 – Earthwork.

1.3 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.

D. Contractor shall provide verification that asphalt mix temperature meets the requirements of this specification at time of application.

E. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.

F. Sieve analysis from testing laboratories identifying rock/sand percentages within the asphalt mix shall have a testing date within 90 days of contract signing.

G. Sieve analysis from a testing laboratory identifying rock/sand percentages within the class 2 aggregate base rock shall have a testing date within 90 days of contract signing.

1.4 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.5 WARRANTY

A. Refer to General Conditions and Section 01 78 36.

1.6 REFERENCES AND STANDARDS

A. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

B. ANSI/ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ANSI/ASTM D3017 – Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

E. ANSI/ASTM D4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

F. CALTRANS Standard Specifications.

G. CAL-OSHA, Title 8, Section 1590 (e).

H. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

1.7 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:

1. Base Course: Do not lay base course on muddy subgrade, during wet weather, or when atmospheric temperature is below 40 degrees F.

2. Asphalt Surfacing: Do not apply asphaltic surfacing on wet base, during wet

weather, or when atmospheric temperature is below 50 degrees F.

B. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

C. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

D. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

E. Any construction review of the Contractor's performance conducted by the owner's representative is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

F. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

G. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

H. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

I. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.9 TESTING

A. General: Refer to Section 01 40 00 – Quality Requirements.

B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Sterilant: Soil sterilizer shall be CIBA GEIGY's Pramatol 25-E or Thompson-Hayward Casoron.

1. Soil sterilizer shall be applied in strict accordance with manufacturer's instructions.

B. Base Course Aggregate: State Specifications, Section 26, Class 2 aggregate base (3/4" max.).

C. Asphalt Binder: Steam-refined paving asphalt conforming to State Specifications, Section 92, viscosity grade PG 64-10. Asphalt binder additives for HMA per Caltrans approved list of manufacturer's.

D. Liquid Asphalt Tack Coat: Per CALTRANS section 94.

E. Surface Course Aggregate: Mineral aggregates for Type "B" asphalt concrete, conforming to State Specifications 39-2.02, Type B, ½" maximum, medium grading. 3/8" maximum grading at Playcourt.

F. Seal Coat: shall be a pre-mixed asphalt emulsion blended with select fillers and fibers such as:

1. "Park-Top No. 302", Western Colloid Products.

2. "OverKote", Reed and Gram.

3. "Drivewalk", Conoco Oil.

G. Wood Headers and Stakes: Pressure treated.

H. Pavement Marking: Colors as directed by Architect. Colors of painted traffic stripes and pavement markings must comply with ASTM D6628.

1. Waterborne traffic line - colors white, yellow and red, State specification PTWB-01R3.

2. Waterborne traffic line for the international symbol of accessibility and other curb markings – blue, red and green, Federal specification TT-P-1952F.

I. Precast Concrete Bumpers: 3000 psi at 28 day minimum strength; 48" length unless otherwise indicated; provide with steel dowel anchors and concrete epoxy.

J. Pavement Epoxy; K-Lite; Ktepx-590; Ennis Epoxy HPS2 or an approved equal.

K. Crack Filler;

1. Cracks up to ½": QPR model CAR08, 10oz asphalt crack filler; Star STA-FLEX Trowel Grade crack filler or approved equal.

2. Cracks ¼" – 1": "Docal 1100 Viscolastic, distributed by Conoco, Inc., Elk Grove, CA, (916) 685-9253, or approved equal.

3. Cracks greater than 1": Hot Mix, Topeka.

L. Reclaimed Asphalt Paugment (RAP): HMA Type A or Type B may be produced using RAP providing it does not exceed 15% of the aggregate blend.

2.2 MIXES

A. General: Plant mixed conforming to State Specifications, Section 39, Type B, ½" maximum, medium grading. 3/8" maximum grading shall be used at hardcourt.

B. Temperature of Hot Mix Asphalt: Not less than 275 degrees F nor more than 325 degrees F when added to aggregate.

C. Temperature of Hot Mix Aggregate: Not less than 250 degrees F nor more than 325 degrees F when asphalt is added.

D. Temperature of Hot Mix Asphalt Concrete: Asphalt shall be not less than 285 degrees at time of application, nor more than 350 degrees. Asphalt not meeting the required temperature shall not be used.

Temperature of Warm Mix Asphalt: Mixing and placement; Per the approved manufactures heat range recommendations for mixing and placement.

PART 3 – EXECUTION

3.1 EXAMINATION OF CONDITIONS

A. Conditions of Work in Place: Subsurfaces which are to receive materials specified under this Section shall be carefully examined before beginning work hereunder, and any defects therein shall be reported, in writing, to the Architect. Work shall not be started until such defects have been corrected. Starting of work shall imply acceptance of conditions as they exist.

3.2 PREPARATION

A. Sub-Grade: Clean, shape and compact to hard surface free from elevations or depressions exceeding 0.05' in 10' from true plan. Compact per Section 31 00 00. Compaction and moisture content shall be verified immediately prior to placement of aggregate base. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

B. Cleaning: Existing surfaces and new surface shall be clean of all dirt, sand, oil or grease. All cracks shall be cleaned and free of all debris and vegetation. Hose down entire area with a strong jet of water to remove all debris.

3.3 INSTALLATION

A. Headers:

1. General: Install as edging to asphalt paving, except where adjoining existing pavement, concrete curbs, walks or building.

2. Existing Headers: Remove existing headers where new paving will join existing. Saw cut existing asphalt to provide clean edge.

3. Lines and Levels: Install true to line and grade. Cut off tops of stakes 2-inches below top of header so they will not be visible on completion of job.

B. Asphalt Paving:

1. Base Course: Install in accord with State Specifications, Section 26. Compact to relative compaction of not less than 95%, ASTM D1557. The material shall be deposited on the subgrade in such a manner as to provide a uniform section of material within five percent tolerance of the predetermined required depth. Deposition will be by spreader box or bottom dump truck to prevent segregation of the material. The material so deposited on the subgrade shall have sufficient moisture which, in the opinion of the Architect is adequate to prevent excessive segregation. It shall then be immediately spread to its planned grade and cross section. Undue segregation of material, excessive drifting or spotting of material will not be permitted. If in the opinion of the site geotechnical engineer, the material is unsuitably segregated, it shall be removed or completely reworked to provide the desired uniformity of the material.

   a. Moisture content and compaction of base material shall be tested immediately prior to placement of asphalt paving.

2. Sterilant: Apply specified material at manufacturer's recommended rate. Applicator of sterilant material shall be responsible for determining location of all planter areas. Apply specified material over entire base course area just prior to application of asphalt. Follow manufacturer's printed directions.

3. Liquid Asphalt Tack Coat: Apply as "tack coat" to all vertical surfaces of existing paving, curbs, walks, and construction joints in surfacing against which paving is to be placed.

4. Asphalt Concrete Surface Course: Comply with State Specifications, 39-6 except as modified below.

   a. Final gradation shall be smooth, uniform and free of ruts, humps, depressions or irregularities, with a minimum density of 91% of the theoretical maximum specific gravity determined by California Test Method #309. Maximum variation 1/8 inch in 10' when measured with steel straightedge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. In no case shall accessible parking spaces or loading and unloading areas exceed 2% slope in any direction.

   b. Asphalt material shall be delivered to the project site in a covered condition to maintain acceptable temperature. Onsite inspector shall verify temperature of asphalt upon truck arrival to the site.

5. Placement and adjustment of Frames, Covers, Boxes and Grates: The Contractor shall set and adjust to finish grade all proposed and existing frames, covers, boxes, and grates of all manholes, drop inlets, drain boxes, valves, cleanouts, electrical boxes and other appurtenant structures prior to placement of asphaltic concrete.

6. Water Testing: All paved areas shall be water tested, to check drainage, in the presence of the project inspector prior to placement of seal coat. The surface of asphalt paving shall not vary more than 1/8 inch above or below the grade established on the plans. If variations in grade are present, they will be corrected by overlaying paving and/or pavement removal and replacement as directed by the Architect.

7. Patching: Cut existing paving square and plumb at all edges to be joined by new paving. In trenches; grind existing asphalt on each side of trench 3" wide x ½ the depth of the section. Apply tact coat to vertical surfaces before installing new work. Warp carefully to flush surface, with seal over joints, and feather edge. Sawcut, remove and patch existing paving where cutting is necessary for installation of piping or conduits under Divisions 2, 22, 23, and 26.

C. Seal Coat:

1. Seal coat shall be applied no sooner than 30 days from time of asphalt placement, no exceptions.

2. Surface Preparation: surface and cracks shall be clean of all dirt, sand, oil or grease. All cracks shall be filled to a level condition after curing. Make multiple fill applications until a level condition is achieved. Failure to do so will be the reason for rejection. Hose down entire area with a strong jet of water to remove all debris. Remove soft, loose, or otherwise damaged areas of asphalt concrete to full depth of damage and replace with compacted hot mix asphalt concrete as specified herein. Minor holes and imperfections may be patched using hot mix asphalt or mastic using sand/SS-1-H. Use wire brush for removal of oil and grease; prime with shellac or synthetic resin as recommended by manufacturer of pavement sealer material.

3. Seal Coat Seal Application: Thoroughly mix materials and apply in the presence of the onsite inspector. Failure to do so will be cause for rejection. Apply in accordance with manufacturer's written instructions.

   a. The minimum application rate for each applied coat shall be 30gals per 1000 sq. ft. Two coats of sealcoat will be required.

   b. Clean-Up and Precautions: As recommended by pavement sealer material manufacturer.

D. Asphalt Concrete Overlay Paving:

1. Comply with State Specifications, 39-6 except as modified below.

2. Grind or remove existing asphalt concrete paving at limits of overlay paving to provide a minimum 1 1/2" overlay thickness. Limits of grinding or removal shall be field verified to insure that finished paving surface will have a one percent minimum slope.

3. Thoroughly clean surface to remove vegetation, dirt, sand, gravel and water from surface and from cracks. Vegetation shall be treated 7 days prior to removal with an herbicide.

4. Cracks greater than 1 inch shall be filled with hot mix asphalt and rolled and compacted. Cracks less than one inch shall be filled with crack filler. Potholes shall be filled with hot-mix rolled and compacted. Contractor shall have Engineer approve crack and pothole repair prior to overlay. Provide leveling courses of hot mix asphalt as required to achieve finish grades shown on the drawings.

    a. Cracks less than one inch in width shall be level after curing. Contractor shall make multiple filling applications as necessary to achieve a level condition.

5. Place overlay when ambient air temperature is 40 degrees F. and rising, and when pavement is dry.

6. An asphalt tack coat shall be applied to existing surface area at a rate of 0.20 gallons per square yard. Application width shall be width of fabric plus 2 to 6 inches.

7. Place, spread and compact asphalt overlay to provide a minimum density of 95% of maximum theoretical unit weight as determined by California Test Method #304. Maximum variation 1/8" in 10' when measured with steel straight edge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. Minimum compacted overlay thickness 1 1/2 inches.

E. Pavement Marking: pavement markings shall be done only after the seal coat has thoroughly dried. Existing surfaces to be striped with traffic paint shall be cleaned of dust, dirt, grime, oil, rust or other contaminants which will impair the quality of work or interfere with proper bond of paint coats. Surfaces shall be thoroughly cleaned by whatever means necessary that will satisfactorily accomplish the purpose without damage to asphalt concrete. Provide measured layouts, temporary markings, templates, and other means necessary to provide required marking. Prepare and apply paint in accordance with manufacturer's instructions; paint shall be applied by spray and shall achieve complete coverage free from voids and thin spots. Where indicated on the Drawings, paint parking stall strips, lettering, arrows, accessible symbols, playfield markings, etc. on asphalt concrete paving. Paint strips shall be 4 inches wide (except otherwise indicated) and applied with two (2) coats of herein specified Traffic Line Paint; white (except as otherwise specified or indicated).

1. Paints shall be delivered to the site in unopened containers.

    a. Paint shall not be diluted, or watered down.

    b. Paint shall be applied in 10-12 wet mil thickness (4-6 mil dried). Each coat thickness shall be verified by the project inspector.

2. International Accessible Symbol: Symbol shall be white figures on a blue background. Blue shall be equal to PMS 293C. Lines and symbols shall be accurately formed and true to line and form; lines shall be straight and uniform in width. Painted edges shall be clean cut and free from raggedness, and corners shall be cut sharp and square. Tolerances: Apply striping within a tolerance 1/2 inch in 50 feet. Apply markings and striping to widths

indicated with a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.

F. Colors: As directed by Architect

G. Precast Concrete Bumpers: Install in location where shown, using steel rebar dowels, and epoxy.

3.4 DEFECTIVE ASPHALT

A. Defective asphalt is as described below.

1. Exposed rock pockets on the finished surface that lack the # 8- #200 fines that is required per the sieve analysis.

2. Asphalt not placed to the design grades.

3. Asphalt that ponds water.

4. Asphalt that was compacted below the minimum required temperature and is cracked.

5. Asphalt that fails to meet the minimum compaction requirements.

6. Asphalt that lacks the minimum thickness required per plan.

7. New asphalt contaminated by a petroleum product, or spilled paint.

8. Asphalt that has depressions, cracks, scored divits from dumpster wheels, heavy equipment use, heavy construction products,

9. Asphalt placed on pumping, unstable sub-grades.

3.5 CLEANING

A. Refer to Section 01 77 00.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

C. Clean excess material from surface of all concrete walks and utility structures.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 32 16 00 – SITE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Section describes the requirements for providing portland cement concrete paving, including accessibility ramps, sidewalks, accessible routes of travel, vehicular travel, drain structures, sewer structures, thrust blocks and for other non-structural or non-vehicular applications.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 01 50 00 – Construction Facilities and Temporary Controls.

C. Section 31 00 00 – Earthwork.

1.3 REFERENCES AND STANDARDS

A. California Building Code, latest edition.

B. ACI Standards, ACI 211.1, ACI 318-14, ACI 302, IR-04, ACI 301-16, ACI 305R-10, ACI 306R-16, ACI 308-16.

C. ASTM C94, Specification for Ready-Mixed Concrete.

D. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).

E. ASTM – ASTM International.

1.4 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Materials list: Submit to the Architect a complete list of all materials proposed to be used in this portion of the work. Submitted items should include but are not limited to sand, gravel, admixtures, surface treatments, coloring agents, sealers, fibers, cast-in-place accessories, forming and curing products and concrete mix designs.

D. With concrete submittal, provide documented history of mix design performance.

1.5 QUALITY ASSURANCE

A. Use only new materials and products.

B. Use materials and products of one manufacturer whenever possible.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

D. Sieve analysis from testing laboratories identifying rock/sand percentages within the concrete mix; or class 2 aggregate base shall have the current project name and project location identified on the report. Outdated analytical reports greater than 90 days old will not be accepted

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

E. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.

F. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregate. Use only one supply source for each aggregate stock pile.

1.7 WARRANTY

A. Refer to General Conditions and Section 01 78 36.

1.8 TESTING

A. General: Refer to Section 01 40 00 – Quality Requirements.

B. Cement and Reinforcing shall be tested in accordance with CBC Section 1910A. Testing of reinforcing may be waived in accordance with Section 1910A.2 when approved by the Structural Engineer and DSA.

1.9 ADEQUACY AND INSPECTION

A. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical and lateral loads that might be applied until such loads can be carried by concrete.

B. Notify Inspector, Architect and DSA at least 48 hours prior to placing of concrete.

1.10 PROTECTION

A. Finish surfaces shall be protected at all times from concrete pour. Inspect forming against such work and establish tight leak-proof seal before concrete is poured. Finish work damaged, defaced or vandalized during the course of construction shall be replaced by contractor at contractor expense.

1.11 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting, slopes and completion of work. Report discrepancies to Architect before proceeding.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cement: Portland cement, ASTM C150, Type II, per ACI 318-14 Section 26.4.

B. Concrete Aggregates: Normal weight aggregates shall conform to ASTM C33, except as modified by this section. Combined grading shall meet limits of ASTM C33. Lightweight aggregate shall conform to ASTM C330, suitably processed, washed and screened, and shall consist of durable particles without adherent coatings.

C. Water: Clean and free from deleterious amounts of acids, alkalis, scale, or organic materials and per ACI 318-14 Section 26.4.1.3.1.

D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted). Not more than 15% (by mass) may be substituted for portland cement.

E. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio, and ultimate shrinkage may be used. Provide WRDA 64 by Grace Construction Products or approved equal. Admixture shall conform to ASTM C494 and ACI 318-14 Section 26.4.1.4.19(a). Such admixture must receive prior approval by the Architect, Structural Engineer, and the Testing Lab, and shall be included in original design mix.

F. Air-entraining Admixture: Daravair 1000 by Grace Construction Products or approved equal. Admixture must conform to ASTM C260 and ACI 318-14, section 26.4.1.4.

G. Surface Retarder (for exposed aggregate finishes): Rugasol-S by Sika Corporation or approved equal.

H. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.

I. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615 or ASTM A706; Grade 60. Dowels for installation through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or shall be sleeved on one end for slippage.

J. Reinforcing supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3'-0" O.C.E.W. Staggered and each support securely fastened to steel reinforcement in place. Bottom bars in footings may be supported with 3" concrete blocks with embedded wire ties. Concrete supports without wire ties will not be allowed.

K. Truncated Domes: Vitrified Polymer Composite (VPC), Cast-In-Place Detectable/Tactile Warning Surface Tiles; "Armor-Tile", "Access Tile Tactile Systems", or approved equal. Tiles shall comply with Americans with Disabilities Act and the California Code of Regulations (CCR) Title 24, Part 2, Chapter 11B (dome spacing shall be 2.35"). Install tiles as recommended by manufacturer. Color, federal yellow (FS 33538).

L. Curing Compound (for exterior slabs only): Burke Aqua Resin Cure by Burke by Edoco, 1100 Clear by W.R. Meadows or accepted equal. Water based membrane-forming concrete curing compound meeting ASTM C 309 and C1315.

M. Concrete Bonding Agent: Weld-Crete by Larson Products Corp., Daraweld C by Grace Construction Products or accepted equal.

N. Patching Mortar: Meadow-Crete GPS, one-component, trowel applied, polymer enhanced, shrinkage-compensated, fiber reinforced, cementitious repair mortar for horizontal, vertical and overhead applications as manufactured by W.R. Meadows or accepted equal.

O. Non-shrink Grout: Masterflow 713 Plus by Master Builders or approved equal. Premixed,non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621, Corps of Engineers Specification and ASTM C 1107, Grades B and C.

P. Aggregate Base: Class 2 AB per Caltrans specification section 26-1.02A.

Q. Expansion Joint Material: Preformed 3/8" fiber material, full depth of concrete section, with bituminous binder manufactured for use as concrete expansion joint material, as accepted by the Architect.

R. Joint sealant for expansion joints: Single component silicone sealant, Type S, ASTM D5893.

1. Reference Standard: ASTM C920, Grade P, Class 25, Use T.

2. Dow Corning 890-SL (self-leveling) Silicone, or accepted equal.

3. Dow Corning 888-NS (non-sagging) Silicone, at slopes exceeding 5%. May not be used at asphalt surfaces.

4. Color: Custom color as selected by Architect.

S. Pre- Formed plastic Expansion Joint; W.R. Meadows 3/8" "Snap Cap", Tex-Trude expansion joint cap, or an approved equal.

T. Adhesive Anchoring (Epoxy): Hilty HIT-HY 200 Safe Set, or approved equal.

2.2 CONCRETE DESIGN AND CLASS

A. Class "B": Concrete shall have 1" max. size aggregate, shall have 3000 psi min. at 28 day strength with a maximum water to cementitious ratio no greater than 0.50. Use for exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb & gutter and other concrete of like nature.

B. Slump Limits: Provide concrete, at point of final discharge, of proper consistency determined by Test Method ASTM C143 with a slumps of 4" plus or minus 1".

C. Mix Design: All concrete used in this work will be designed for strength in accordance with provisions of ASI 318-14 Section 26.4. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review. Fly ash may be used in concrete to improve workability in amounts up to 15% of the total cementitious weight.

D. Air Entrainment; Per the Local Jurisdiction minimum requirements, or 3% minimum.

2.3 MIXING OF CONCRETE

A. Conform to requirements of CBC, Chapter 19A.

B. All concrete shall be mixed until there is uniform distribution of material and mass is uniform and homogenous; mixer must be discharged completely before the mixer is recharged.

C. Concrete shall be Ready-mixed Concrete: Mix and deliver in accordance with the requirements set forth in ASTM C94 and ACI 301. Batch Plant inspection may be waived in accordance with CBC Section 1705A.3.3.1, when approved by Structural Engineer and DSA.

1. Approved Testing Laboratory shall check the first batching at the start of the work and furnish mix proportions to the Licensed Weighmaster.

2. Licensed Weighmaster to positively identify materials as to quantity and to certify to each load by ticket.

3. Ticket shall be transmitted to Project Inspector by truck driver with load identified thereon. Project Inspector will not accept load without load ticket identifying mix and will keep daily record of pours, identifying each truck, its load and time of receipt and will transmit two copies of record to DSA.

4. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished conforms in every particular and to proportions established by mix designs.

5. Placement of concrete shall occur as rapidly as possible after batching and in a manner which will assure that the required quality of the concrete is maintained. In no case may concrete be placed more than 90 minutes from batch time.

6. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. In no case shall more than 10 gallons of water shall be added to a full 9 yard load, or 1 gal. per yard on remaining concrete within the drum providing load tag indicates at time of mixing at plant will allow for additional water.

2.4 MATERIALS TESTING

A. Materials testing of concrete and continuous batch plant inspection may be waived in accordance CBC Sections 1704A.4.4 when approved by Structural Engineer and DSA.

B. Testing of concrete shall be performed per article 3.12 of this specification.

2.5 EQUIPMENT

A. Handling and mixing of concrete: Project Inspector may order removal of any equipment which in his opinion is insufficient or in any way unsuitable.

PART 3 – EXECUTION

3.1 APPROVAL OF FORMS AND REINFORCEMENTS

A. Forms and reinforcements are subject to approval by the Project Inspector, and notice of readiness to place first pour shall be given to DSA, Architect and Structural Engineer 48 hours prior to placement of concrete. Before placing concrete, clean tools, equipment and remove all debris from areas to receive concrete. Clean all reinforcing and other embedded items off all coatings oil, and mud that may impair bond with concrete.

B. All reinforcing steel shall be adequately supported by approved devices on centers close enough to prevent any sagging.

C. All reinforcing bar lap splices shall be staggered a minimum of 5 ft.

D. Additional reinforcing steel shall be placed around all utility boxes, valve boxes, manhole frames and covers that are located within the concrete placements.

1. The bars shall be placed so that there will be a minimum of 1 ½" clearance and a maximum of 3" clearance. The reinforcing steel shall be placed mid-depth of concrete slab.

E. At all right angles or intersections of concrete walks, additional 2'x2' #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2" from concrete forms and supports at mid-depth of slab.

3.2 PROTECTION

A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

B. In the event of damage, make all repairs and replacements necessary to the

approval of the Architect at no additional cost to the Owner.

C. Sub-Grade in vehicular concrete paved areas: Subgrade shall be clean, shaped and compact to hard surface free from elevations or depressions exceeding 0.05' in 10' from true plan. Compact per Section 31 00 00. Compaction and moisture content shall be verified immediately prior to placement of concrete. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

3.3 CLEANING

A. Reinforcement and all other embedded items at time of placing concrete to be free of rust, dirt oil or any other coatings that would impair bond to concrete.

B. Remove all wood chips, sawdust, dirt, loose concrete and other debris just before concrete is to be poured. Use compressed air for inaccessible areas. Remove all standing water from excavations.

3.4 FORMING

A. Form material shall be straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Materials which have warped or delaminated, or require more than minor patching of contact surfaces, shall not be reused.

B. Build forms to shapes, lines, grades and dimensions indicated. Construct form work to maintain tolerances required by ACI 301. Forms shall be substantial, tight to prevent leakage of concrete, and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves and recesses to neat, straight lines. Construct forms for easy removal without hammering, wedging or prying against concrete.

C. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.

D. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.

E. Build in securely braced temporary bulkheads, keyed as required, at planned locations of construction joints.

F. Slope tie-wires downward to outside of wall.

G. Brace, anchor and support all cast-in items to prevent displacement or distortion.

H. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.

I. <u>Concrete paving, Curbs, Curb and Gutters, Ramps</u>:

1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20' for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant where required. Expansion joints shall not exceed ¼

inch depth measured from finish surface to top of felt or sealant, and ½ inch width.

2. Curbs, Valley Gutter, and Curb & Gutter: Install expansion joints at 60' on center, except when placing adjacent to concrete walks, the expansion joints shall align with the expansion joints shown for the concrete walks. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant will be required.

3. Isolation Joints: 3/8" felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, unless specifically noted otherwise on plans.

4. Exterior Concrete Paving: Install expansion joints at 20' on center maximum, both directions, unless shown otherwise on plans.

5. Ramps; whether shown or not all ramps shall have control joints and expansion joints.

J. Control joints on ramps shall be aligned and be placed in between with the vertical posts for the handrails. The curbs, if required shall have control joints that align with the handrail posts.

K. Expansion joints shall be placed at the upper, intermediate, and bottom landings.

3.5 FORM COATING

A. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.

B. Before re-using form material, inspect, clean thoroughly and recoat.

C. Seal all cut edges.

3.6 INSTALLATION

A. General: Reinforcement shall be accurately placed at locations indicated on the drawings within required tolerances and providing required clearances. Reinforcement shall be secured prior to placement of concrete such that tolerances and clearances are maintained. Coverage shall be in accordance with Section 1907A.7 of the CBC. Keep a person on the job to maintain position of reinforcing as concrete is placed. Reinforcement must be in place before concreting is begun. Install dowels as shown on drawings. Give notice whenever pipes, conduits, sleeves, and other construction interferes with placement; obtain method of procedure to resolve interferences. All expansion and construction joints in concrete shall have dowels of size and spacing as shown, or as approved by Architect.

B. Placing Tolerances:

1. Per ACI 301 or CRSI/WCRSI Recommended Practice for Placing Reinforcing Bars, unless otherwise shown.

2. Clear distance between parallel bars in a layer shall be no less than 1", the maximum bar diameter not 1 ½ times the maximum size of coarse aggregate.

C. Splices:

1. General: Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports and stagger splices at adjacent splices 5 foot minimum. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:

2. Lap splices in concrete: Lap splice lengths shall not be less than 62 bar diameter for No. 5 bar, 56" minimum for No. 6 bars. No. 4 bar shall have a minimum of 24" splice. 93 bar diameters for No. 7 bars and larger.

3. All splices shall be staggered at 5 feet minimum.

3.7 INSPECTION

A. Approval of reinforcing steel, after installation, must be received from Inspector. Architect, Structural Engineer and DSA must be notified 48 hrs. in advance of beginning of concrete placement operations.

B. Slope of concrete forms and finish condition shall be checked with a two foot (2') digital level.

3.8 PLACING OF CONCRETE

A. Adjacent finish surfaces shall be protected at all times during the concrete pour and finishing. Verify that all formwork is tight and leak-proof before concrete is poured. Finish work defaced during the concrete pour and finishing shall be replaced at no extra cost to the owner.

B. Transport concrete from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients. Deposit as close as practicable in final position to avoid re-handling or flowing. Partially hardened concrete must not be deposited in work. Concrete shall not be wheeled directly on top of reinforcing steel.

C. Placing: Once started, continue concrete pour continuously until section is complete between predetermined construction joints. Prevent splashing of concrete onto adjacent forms or reinforcement and remove such accumulation of hardened or partially hardened concrete from forms or reinforcement before work proceeds in that area. Free fall of concrete shall not to exceed 4'-0" in height. If necessary, provide lower openings in forms to inject concrete and to reduce fall height.

D. Remove form spreaders as placing of concrete progresses.

E. Place footings as monolithic and in one continuous pour.

F. Keep excavations free of standing water, but moisture condition sub-grade before concrete placement.

G. Compacting: All concrete shall be compacted by mechanical vibrators. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Vibrating shall not be applied to concrete which has already begun to initially set nor shall it be continued so long as to cause segregation of materials.

H. Concrete Flatwork:

1. All flatwork shall be formed and finished to required line and grades. Flatwork shall be true and flat with a maximum tolerance of 1/8" in 10' for flatness. Flatwork which is not flat and are outside of the maximum specified tolerances shall be made level by the Contractor at no additional expense to the Owner.

2. Thoroughly water and soak the flatwork subgrade as required to achieve required moisture content prior to the concrete pour. Provide damming as required to keep water within the formed area and to allow for proper saturation of the subgrade.

3. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.

I. Placing in hot weather: Comply with ACI 305R-10. Concrete shall not exceed 85 degrees F at time of placement. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.

J. Placing in cold weather: Comply with ACI 306R-16. Protect from frost or freezing. No antifreeze admixtures are permitted. When deposited concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F. Concrete shall be maintained at temperature of at least 50 degrees F for not less than 72 hours after placing or until it has thoroughly hardened. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.

K. Horizontal construction joint: Keep exposed concrete face of construction joints continuously moist from time of initial set until placing of concrete; thoroughly clean contact surface by chipping entire surface not earlier than 5 days after initial pour to expose clean hard aggregate solidly embedded, or by approved method that will assure equal bond, such as green cutting. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

3.9 CONCRETE FINISHES

A. Concrete Slab Finishing: Finish slab as required by ACI 302.1R. Use manual screeds, vibrating screeds to place concrete level and smooth. Use "jitterbugs" or other special tools designed for the purpose of forcing the course aggregate below the surface leaving a thick layer of mortar 1 inch in thickness. Surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8" in 10'. Provide final finish as follows:

1. Flatwork, medium broom finish: Typical finish to be used at all exterior walks

and stairs.

2. Ramps, heavy broom finish: Concrete surfaces with slope greater than 5% including all ramps. Brooming direction shall run perpendicular to slope to form non-slip surface

3. Under no circumstances can water be added to the top surface of freshly placed concrete.

B. Curb Finishing: Steel trowel.

C. Joints and Edges: Mark-off exposed joints, where indicated, with ¼" radius x 1" deep jointer or edging tool. Joints to be clean, cut straight, parallel or square with respect to concrete walk edge. Tool all edges of exposed expansion and contraction joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces.

1. The expansion joints shall be full depth as shown in the plan details. Failure to do so will result in non-compliance and shall be immediately machine cut by the contractor at his expense.

D. Exposed Concrete Surface Finishing (not including top surface of flatwork): Remove fins and rough spots immediately following removal of forms from concrete which is to be left exposed. Damaged and irregular surfaces and holes left by form clamps and sleeves shall be patched with grout. Tie wires are to be removed to below exposed surface and holes pointed up with neat cement paste similar to procedure noted under "Patching" below. Removal of tie wires shall extend to distance of 2" below established grade lines. Ends of tie wires shall be cut off flush at all other, unexposed locations. Care shall be taken to match adjacent finishes of exposed concrete surface. After patching, all concrete that is to remain exposed, shall be sacked with a grout mixture of 1-part cement, 1 1/2- parts fine sand and sufficient water to produce a consistency of thick paint. After first wetting the concrete surface, apply mixture with a brush and immediately float entire surface vigorously using a wood float. Keep damp during periods of hot weather. When set, excess grout shall be scraped from wall with edge of steel trowel, allowed to set for a time, then wiped or rubbed with dry burlap. Entire finishing operation of any area shall be completed on the same day. This treatment shall be carried to 4" below grade, and all patching and sacking shall be done immediately upon removal of the forms.

E. Stair Treads and Risers: Tool exterior stair tread nosing per ADA requirements and as detailed. Paint or stain tooled area at every stair tread nosing or as detailed. Stair tread nosing shall contain no pockets, voids or spalls. Patching is not allowed. Damaged nosing shall be replaced.

3.10 CURING

A. Cured Concrete in Forms: Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.

B. Flatwork/Variable Height Curbs, Curb and gutter, Valley Gutter: Cure utilizing Curing Compound. If applicable, the Contractor shall verify that the approved Curing Compound is compatible with the approved colorant system. Upon completion of job, wash clean per manufacturer's recommendations.

1. Curing compound shall be applied in a wet puddling application. Spotty applications shall be reason for rejection and possibly concrete removal and replacement at the contractor's expense with no compensation from the owner.

C. No Curing Compound shall be applied to areas scheduled to receive resilient track surface including, curbs, ramps, run ways, etc.

3.11 DEFECTIVE CONCRETE

A. Determination of defective concrete shall be made by the Architect or Engineer. His opinion shall be final in identifying areas to be replaced, repaired or patched.

B. The Owner reserves the right to survey the flatwork, if it is determined to be outside of the maximum tolerance for flatness. If the flatwork is found to be out of tolerance, then the Contractor will be required to replace concrete. The Contractor will be responsible for reimbursing the Owner for any surveying costs incurred. Determination of flatwork flatness, surveying and any remedial work must be completed far enough in advance so that the project schedule is maintained, delays are avoided and the new flatwork or flatwork repairs are properly cured.

C. As directed by Architect, cut out and replace defective concrete. All defective concrete shall be removed from the site. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.

D. Permission to patch any area shall not be considered waiver of right, by the Owner, to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.

E. Defective concrete is:

1. Concrete that does not match the approved mix design for the given installation type.

2. Concrete not meeting specified 28-day strength.

3. Concrete which contains rock pockets, voids, spalls, transverse cracks, exposed reinforcing, or other such defects which adversely affect strength, durability or appearance.

4. Concrete which is incorrectly formed, out of alignment or not plumb or level.

5. Concrete containing embedded wood or debris.

6. Concrete having large or excessive patched voids which were not completed under Architect's direction.

7. Concrete not containing required embedded items.

8. Excessive Shrinkage, Traverse cracking, Crazing, Curling; or Defective

Finish. Remove and replace if repair to an acceptable condition is not feasible.

9. Concrete that is unsuitable for placement or has set in truck drum for longer than 90 minutes from the time it was batched.

10. Expansion joint felt that is not isolating the full depth of the concrete section, and recessed as required for backer rod and sealant where required.

11. Concrete that is excessively wet or excessively dry and will not meet the minimum or maximum slump required per mix design.

12. Finished concrete with oil stains from equipment use, and or rust spots that cannot be removed.

13. Control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.

~~F.~~ Patching: Install specified Patching Mortar per manufacturer's recommendations. REPAIRS TO DEFECTIVE CONCRETE WHICH AFFECT THE STRENGTH OF ANY STRUCTURAL CONCRETE MEMBER OR COMPONENT ARE SUBJECT TO APPROVAL BY THE ARCHITECT AND DSA.

3.12 CONCRETE TESTING

A. Comply with CBC Section 1903A, 1905A.1.16, 1910A and 1705A.3 and as specified in B. below. Costs of tests will be borne by the Owner.

B. Four identical cylinder samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs or walls. In addition, samples for strength tests for each class of concrete shall be taken for seven-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.

C. Strength tests will be conducted by the Testing Lab on one cylinder at seven (7) days and two cylinders at twenty-eight (28) days. The fourth remaining cylinder will be available for testing at fifty-six (56) days if the 28-day cylinder test results do not meet the required design strength.

D. On a given project, if the total volume of concrete is such that the frequency of testing required by paragraph B. above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

E. Cost of retests and coring due to low strength or defective concrete will be paid by Owner and back-charged to the Contractor.

F. Each truck shall be tested for slump before concrete is placed.

3.13 REMOVAL OF FORMS

A. Remove without damage to concrete surfaces.

B. Sequence and timing of form removal shall insure complete safety of concrete structure.

C. Forms shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60 degrees F and above.

1. Vertical forms of foundations, walls and all other forms not covered below: 5 days.

2. Slab edge screeds or forms: 7 days.

3. Concrete columns and beam soffits: 28 days.

D. Concrete shall not be subjected to superimposed loads (structure or construction equipment) until it has attained its full design strength and not for a period of at least 21 days after placing. Concrete systems shall not be subjected to construction loads in excess of design loads.

3.14 CLEANING

A. Refer to Section 01 77 00.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

C. Clean excess material from surface of all concrete walks and utility structures.

D. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION

SECTION 32 31 13 – CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fence framework, fabric, and accessories.

2. Excavation for post bases; concrete foundation for posts.

3. Manual gates and related hardware.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 08 71 00 – Door Hardware.

C. Section 32 16 00 – Site Concrete.

D. Section 32 31 19 – Decorative Metal Fencing and Gates.

1.3 REFERENCES

A. ANSI/ASTM A123 – Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

B. ANSI/ASTM F567 – Installation of Chain link Fence.

C. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM C94 – Ready-mixed Concrete.

E. Chain link Fence Manufacturers' Institute (CLFMI) – Product Manual.

1.4 SYSTEM DESCRIPTION

A. Fence Height: 6'-0" unless otherwise noted.

B. Line Post Spacing: At intervals not exceeding 10 feet.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Submit samples of Vinyl Slats for color selection by Owner / Architect.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Installer: Company specializing in installations of chain-link fencing with a minimum of five years of experience. If any welding is required provide welders' certificates, verifying AWS qualification within the previous 12 months.

1.7 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on shop drawings.

1.8 WARRANTY

A. Manufacture of slats to provide a 25 year warranty against color fading and breakage of slats.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Fabric: Refer to plans for locations.

1. Type A – Non-Slatted Fabric: Standard Industrial grade, 1-3/4 inch mesh, 9 gauge hot-dipped galvanized steel wire, top selvage, knuckle end closed, bottom selvage, knuckled end closed.

2. Type B – Non-Slatted Fabric: Black vinyl coated tight weave, 1" mesh, 9-gauge zinc coated steel wire coated with black vinyl, top selvage knuckled tight, bottom selvage knuckled end closed. Posts to be powder coated where vinyl coated fabric occurs. Finish: ASTM F668 Class 2b, 7mil (0.18 mm) thickness thermally fused over zinc-coated wire. Color shall be: BLACK, GREEN, BROWN, BEIGE (to be chosen by Owner's Representative).

3. Type C – Non-Slatted Fabric: Black vinyl coated tight weave: 2" mesh, 9-gauge zinc coated steel wire coated with black vinyl, top selvage knuckled tight, bottom selvage knuckled end closed. Posts to be powder coated where vinyl coated fabric occurs. Finish: ASTM F668 Class 2b, 7mil (0.18 mm) thickness thermally fused over zinc-coated wire. Color shall be: BLACK, GREEN, BROWN, BEIGE (to be chosen by Owner's Representative).

4. Type D – Privacy Slatted Fabric: Industrial grade. 3-1/2-inch x 5" diamond mesh interwoven wire with factory installed 2.310" wide PDS "IDS" slats full height or approved equal. Secure slats with monel-clinch-lock staples. 9-gauge zinc coated steel wire, top selvage knuckled tight, bottom selvage knuckled end closed. Color as selected by Owner from Manufacturer's Standard range of colors. Slats to be fabricated of extruded high-density virgin polyethylene, containing color pigmentation and U.V. inhibitors.

B. Line Posts: ASTM F1083 SCH 40 galvanized, round, 2.875 inch diameter.

C. Terminal and Corner Posts: ASTM F1083 SCH 40 galvanized, round, 4.000 inch diameter.

D. Gate Posts: ASTM F1083 SCH 40 galvanized, round, 4.0 inch diameter.

E. Gate Frame: 1-7/8 inch SCH 40 galvanized diameter, for fittings and truss rod fabrication.

F. Top Rail, Middle Brace Rail and Bottom Rail: ASTM F1083 SCH 40 galvanized, round, 1.66 inch diameter, plain end, sleeve coupled at top.

G. Tie Wires: 9 gauge galvanized steel wire.

H. Concrete: ASTM C94; Portland Cement, 2,500 p.s.i. strength at 28 days, 3 inch slump; one inch maximum sized coarse aggregate.

I. Kickplate: 12 ga. Steel hot dipped galvanized.

J. Cane Bolt Receiver: 1-1/4" x 8" galvanized pipe.

2.2 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel galvanized.

C. Gate Hardware: Fork latch with gravity drop mechanical keepers; three 180 degrees gate hinges per leaf and hardware for padlock. Padlock to be provided by District.

D. ADA Accessible Gate Latch, Lockable; Paddle type lever that opens gate without full rotation.

2.3 FINISHES

A. Components and Fabric: Galvanized to ANSI/ASTM A123; 1.2 oz./sq. ft.

B. Hardware: Galvanized to ASTM A153, 1.2 oz./sq. ft. coating.

C. Accessories: Same finish as framing.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F567-93 and manufacturer's instructions.

B. Drill caissons to diameter and depth as shown in the drawings, and or details. Clean holes and remove all loose dirt to a hard undisturbed bottom.

1. When placing fence posts in existing asphalt, the existing asphalt shall be cored drilled with a diamond core hole saw 3' larger than the caisson diameter. Under no circumstances shall an auger dirt bit be used to drill through the asphalt.

C. When placing fence posts where the new surrounding finish surface will be asphalt, the fence posts shall be placed first before the asphalt is laid. Top of post caisson

shall be at the top of aggregate base.

D. Set intermediate, terminal and gate posts plumb in concrete caisson. Slope top of concrete for water runoff. Use concrete vibrator in each caisson during concrete placement to settle and seat concrete.

E. Line, Terminal, and Gate Post Footing Depth Below Finish Grade: 42 inches and 12 inches diameter.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, on bay from end and gate post.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center and bottom rails all around enclosure.

I. Stretch fabric between terminal posts.

J. Position bottom of fabric 1 inch above finished grade.

K. Fasten fabric to top, center and bottom rail and line posts with tie wire at maximum 12 inches on centers.

L. Attach fabric to end, corner and gate posts with tension bars and tension bar clips at 12 inches on center.

M. Install gate with fabric to match fence. Install three hinges per leaf, Install latches, catches, retainers and locking clamp.

N. Provide kickplate at all accessible gate accesses. Weld to gate frame with 3/16" x 1" welds at 4" o.c. Weld all 4 corners. Grind all welds and edges smooth. Treat all welds with galvanizing zinc “Hot Stick.”

O. All field welding to be performed by certified welder and all welds are to be ground down smooth and treated.

P. All areas of welds are to be thoroughly cleaned, fluxed, and treated with galvanizing zinc “Hot Stick”. Do not over heat pipe when treating.

Q. At double swing gates, install cane bolt receiver in concrete measuring 8" diameter, 12" deep.

3.2 ERECTION TOLERANCES

A. Maximum variation from plum: 1/8 inch.

B. Maximum offset from true position: 3/8 inch.

C. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 32 31 19 – DECORATIVE METAL FENCES AND GATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Ornamental picket fencing, posts, panels, gates, hardware, and accessories.

2. Contractor shall provide all labor, materials and appurtenances necessary for installation of the fence and gate system defined herein.

1.3 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 08 71 00 – Door Hardware (except hinges which are specified herein).

C. Section 32 16 00 – Site Concrete.

1.4 REFERENCES

A. 2022 California Building Code (CBC), with Amendments.

B. ASTM International (ASTM):

1. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

2. ASTM A513 – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

3. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

4. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Shop Drawings: Layout of all fences and gates with dimensions, details and finishes of component accessories and post foundations.

C. Product Data: Manufacturer's catalogue cuts indicating material compliance and specified options including steel tube sizes.

D. Samples: Color selections for polyester powder coat finish.

1.6 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.7 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Products from other qualified manufacturers having a minimum of 5 years of experience manufacturing ornamental picket fencing will be acceptable by the architect as equal if they meet the following specifications for design, size, gauge of metal parts and fabrication (or equal).

B. Ornamental Picket Fence and Swing Gates:

1. Basis of Design Style:

a. Monumental Iron Works, Estate L 3 rail 3/4" picket, or approved equal.

b. Ameristar Fencing, Montage II® Welded and Rackable (ATF – All Terrain Flexibility) Ornamental Steel, Genesis profile, or approved equal.

2. Heights: 6'-0" or as otherwise indicated on the Drawings.

C. Approved Manufacturers:

1. Monumental Iron Works, Phone (888) MH-Fence, (888) 643-3623

2. Ameristar, Phone (888) 333-3422

3. Merchant Metals, Phone (770) 741-0300

4. LOCINOX USA, Phone (877) 562-4669

2.2 ORNAMENTAL PICKET FENCE

A. Pickets: Square tubular members, ASTM A513, hot-rolled structural quality steel. 50,000 psi (310 Mps) tensile strength, 60,000 psi (372 Mpa) yield strength. Minimum size pickets 3/4" square x 16 ga. Space pickets 3-15/16" maximum (100mm) face to face. Minimum gauge wall thickness solid gauge.

1. For Monument Iron Works: Attach each picket to each rail with 1/4" (6mm) industrial drive rivets. Size #4.

B. Rails: “U” channels formed from hot-rolled structural steel having no pockets or shelves to hold water or moisture, 1-3/8" (35 mm) wide x 1-1/2" (38 mm) deep, 11-gauge 0.120" (3.05 mm) wall thickness. Steel for rail produced under ASTM A653. Provide top rail below pickets, bottom rail, and third rail 6" below top rail.

1. For Monument Iron Works: Punch rails to receive pickets and rivets and attach rails to rail brackets with two (2) each, 1/4" (6 mm) industrial drive rivets. Size #4.

2. For Ameristar Montage Genesis: Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar’s proprietary fusion welding process, thus completing the rigid panel assembly

C. Posts: Square tubular members, ASTM A500, hot-rolled structural quality steel, 50,000 psi (310 Mpa) Tensile strength, 60,000 psi (372 Mpa) yield strength, with ASTM A653 hot-dipped galvanized G90 coating. Minimum post size 4" sq., having minimum 12-gauge wall thickness. Post size at gates as required to support specified gate leaf size.

D. Accessories: Post caps.

E. Finish: After all steel components have been galvanized, clean and prepare the surface of all components to assure complete adhesion of finish coat. Apply 2.5 mil (0.0635) thickness of polyester resin-based powder coating by electrostatic spray process. Bake finish for 20 minutes at 450°F (232°C) metal temperature. Color as selected by Architect from manufacturer’s full range of standard colors.

F. Security Mesh: At pedestrian gate with panic hardware, provide powder-coated 16 ga. x 1-1/2" x 1-1/2" flattened expanded metal mesh attached to tube steel at 12" on center, with self tapping screws, on fencing shown on plans. Screw heads to have matching black powder-coated finish. Provide welded closure channels at vertical edges. Mesh shall extend to adjacent fencing full width of panel, or as noted on plans. Mesh size / pattern to match existing on campus at existing metal fences and gates.

2.3 GATES

A. Ornamental picket swing gates in same style configuration and height as specified

fencing.

B. Gate posts shall be of extra heavy-duty construction and size to adequately support each specified gate leaf size without sag.

C. Provide panic hardware at non-vehicular gates.

D. Gate Hardware:

1. See drawings for gate elevations and hardware groups.

2. Lever Hardware Kit: LOCINOX USA – LAKQ U2 chain link lock kit. For use at required accessible passage type gates not requiring panic devices.

3. Self-Closing Hinge System: LOCINOX USA – Mammoth-HD 180 Degree Closer and Hinge Kit for gates up to 440 lbs. Opening force shall be less than 5 lbs. For use at all accessible required gates along path of travel or along egress route with panic devices. Provide manufacturer's optional mounting hardware for thicker gate post material.

4. Heavy Duty Hinges: Provide heavy-duty weld hinges of size capable of supporting specified leaf width without sag or failure. Gorilla hinge or equal. For all maintenance type swing gates.

2.4 ACCESSORIES

A. Rail Attachment Brackets: Monumental Iron Works Pro-Arc swivel bracket with up to 30 degree swivel (up/down/left/right) or approved equal). Bracket to fully encapsulate rail end for complete security that is aesthetically pleasing. Note to Bidder: District has standardized on this specific bracket and requires it to be used regardless of which fence panel manufacture is submitted on. Bid accordingly.

B. Industrial Drive Rivets: Of sufficient length to attach items in a secure non-rattling position. Rivet to have a minimum of 1100 lbs. (4894 N) holding power and a shear strength of 1500 lbs. (6674 N).

C. Ornamental Picket Fence Accessories: Provide indicated items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM B695 and finish to match framing.

D. Post Caps: Formed steel, cast of malleable iron or aluminum alloy, weathertight closure cap. Provide one flat style post cap for each post.

E. Picket Tops: Flat top with polymer plug.

F. Hardware:

1. General:

a. Operable parts of hardware shall be between 34" and 44" AFF or ground, per CBC 11B-404.2.7.

b. Gate closers shall be adjusted so that from an open position of 90

degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum (CBC 11B-404.2.8.1). Spring hinges shall be adjusted so that from the open position of 70 degrees, the door or gate shall move to the closed position in 1.5 seconds minimum (CBC 11B-404.2.8.2).

c. Gate opening force shall be 5 pounds maximum (CBC 11B-404.2.9)

d. Gate surfaces within 10" of finish floor or ground shall have a smooth surface of the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped (CBC 11B-404.2.10).

2. Hinges: Provide heavy-duty weld hinges of size capable of supporting specified leaf width without sag or failure. Gorilla hinge or equal.

3. Locking Clasps: Provide heavy-duty hardware to receive padlock at location where gate leaves meet each other or strike post.

4. Padlocks: Padlocks are provided by District. Contractor to provide necessary padlock quantity to District. Once provided by Owner, Contractor shall re-key to match specific site keying.

5. Cane Bolt: Provide heavy-duty cane bolt at all 2-leaf gate configurations. Provide at each leaf to secure each leaf into pavement below. Cane bolt shall be capable of being raised and locked in the retracted position when not in use. Provide 12 inch galvanized sleeve receivers encased with 12 inch round concrete in the close and open position. Cane bolts to freely drop and lift in the closed and open position.

6. Panic (Exit) Devices: Refer to Section 08 71 00.

7. Kickplates: Kickplates to be fabricated, as shown on plans, and shall be similar or equal to Ives Model 8400. See plans for sizing and mounting heights / locations.

8. Knox Box: Model 3200 series, black. Fully weld to gate frame. Prime and paint affected finish. Location and quantity as shown on drawings. Boxes located at frontage of school shall have a reflective red adhesive sticker on front of lock body. Boxes located at other locations not on main school frontage shall have a reflective green adhesive sticker on front of lock body.

9. Knox Locks: Model 3700 series, stainless steel, exterior use. Provide at all maintenance gates and fire apparatus gates along fire lane. All locks shall have a reflective green adhesive sticker around lock body.

2.5 SETTING MATERIAL

A. Concrete: Minimum 28-day compressive strength of 3,000 psi.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify areas to receive fencing are completed to final grades and elevations.

B. Ensure property lines and legal boundaries of work are clearly established.

3.2 INSTALLATION

A. Install fence in accordance with manufacturer's instructions.

B. Space posts uniformly not to exceed a full panel width. Face of post to closest picket not to exceed 3-7/8 inch spacing.

C. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

D. Concrete Fence Set Posts: 24" min. Ø x36" min. deep or as otherwise indicated on drawings.

E. Concrete Footings for Gate Swing Posts: Provide reinforced concrete footings as indicated on the Drawings.

F. Check each post for vertical and top alignment and maintain in position during placement and finishing operation.

G. Align fence panels between posts. Firmly attach rail brackets to posts with 1/4" (6 mm) bolt and lock nut, ensuring panels and posts remain plumb.

H. Position bottom of picket 2 inches above existing/new finished grade. Distance from picket on each end of panel to the support post shall not be greater than 4".

I. Where touch up paint is necessary, paint shall match powder coated finish. Unacceptable finishes will require re-powder coating.

J. Cutting of manufacturer's brackets will not be accepted.

K. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.

L. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to a crown to shed water.

3.3 GATE INSTALLATION

A. Install gates plumb, level and secure for full opening without interference.

B. Attach hardware by means, which will prevent unauthorized removal.

C. Adjust hardware for smooth operation.

D. All gates with panic hardware to be third-party shop fabricated in a certified shop along with adjacent posts and header. Galvanized and powder coated finishes.

E. At gates with LOCINOX closer, Install hinge and closer per manufacturer's recommendations. Provide required backing inside steel gate and post. Install using only manufacturer's provided hardware.

F. Welding: All welds shall be shop fabricated prior to galvanizing unless otherwise acceptable to Owner's representative. And all field welds shall be completed by a Certified Structural Welder and shall be "spray-galvanized" or otherwise treated subject to the discretion of the Owner's Representative.

1. All field welding to be performed by a certified welder and all welds are to be ground down smooth.

2. All areas of welds are to be thoroughly cleaned and treated with two coats of cold galvanized spray.

3. All hinges shall be welded to the gate post.

3.4 ACCESSORIES

A. Install post caps and other accessories to complete fence. Post caps shall be riveted to post with two rivets on opposite sides of post.

3.5 CLEANING

A. Clean up debris and unused material and remove from site.

3.6 ADDITIONAL SUPPLIED ITEMS

A. Provide a bag of rivets to District.

B. Provide (4) additional 10 feet long 4 inch square tubing posts.

C. Provide twenty additional brackets to District.

END OF SECTION.

PAGE INTENTIONALLY LEFT BLANK.

DIVISION 33 – UTILITIES

33 00 00 – Site Utilities
33 40 00 – Storm Drainage

PAGE INTENTIONALLY LEFT BLANK.

SECTION 33 00 00 – SITE UTILITIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Domestic water piping system.
2. Fire protection piping systems.
3. Sewer piping system.
4. Other water and sewer items that may be specified or shown on the drawings.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 01 50 00 – Construction Facilities and Temporary Controls.

C. Section 31 00 00 – Earthwork.

D. Section 31 23 33 – Trenching and Backfilling.

E. Section 32 16 00 – Site Concrete.

1.3 REFERENCES AND STANDARDS

A. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

B. ANSI/ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ANSI/ASTM D3017 – Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

E. ANSI/ASTM D4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

F. CALTRANS Standard Specifications.

G. CAL-OSHA, Title 8, Section 1590 (e).

H. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

I. NFPA 13, 24 and 25, latest editions.

J. California State Health and Safety Code Section 116875, Lead Free Public Water Systems.

K. California Plumbing Code, latest edition.

1.4 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Provide sieve analysis from accredited testing lab on pipe bedding material. Analysis shall have a current date not older than project contract signing date.

D. Substitution: Provide all data of proposed material being submitted as a substitution. Provide comparison with specified product data and identify all differences. Failure to provide comparison will be reason for rejection.

1.5 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the drawings to be salvaged and re-used.

1. Sun damaged or discolored PVC pipe will be rejected.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

C. The representatives of the Owner’s testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner’s testing lab representatives nor the testing by the Owner’s testing lab shall excuse the contractors or subcontractors for defects or deficiencies discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.

D. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction or incorrect grades will be the responsibility of the contractor.

E. Per 2016 NFPA 13 provide Contractor's material and test certificate to the Owner, Architect, Project Inspector and Local Fire Authority.

1.6 FEES, PERMITS, AND UTILITY SERVICES

A. Obtain and pay for permits and service charges required for installation of Work. Arrange for required inspections and secure written approvals from authorities having

jurisdiction.

B. Upon completion of work within right-of-way, provide copies of written final approval to the Architect.

1.7 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.8 PROJECT CONDITIONS

A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

B. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

1.9 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

1.10 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.11 RECORD DRAWINGS

A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.

B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.

C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.

D. Properly identify on as-builts and provide dimensions for all stubs for future connections. Provide concrete markers 6” dia. 12” deep, flush with finish grade at the ends of all stubbed pipes.

1.12 WARRANTY

A. Refer to General Conditions and Section 01 78 36.

PART 2 – PRODUCTS

2.1 MATERIALS – GENERAL

A. Provide each item listed herein or shown on drawings of quality noted or approved equal. All material shall be new, full weight, standard in all respects and in first-class condition. Insofar as possible, all materials used shall be of same brand or manufacture throughout for each class of material or equipment. Materials shall be of domestic manufacture and shall be tested within Continental United States.

B. Grade or quality of materials desired is indicated by trade names or catalog numbers stated herein.

C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.

D. All materials in this section used for any public water system or domestic water for human consumption shall be lead free.

1. For the purposes of this section, “lead free” means not more than 0.2 percent lead when used with respect to solder and flux and not more than 8 percent when used with respect to pipes and pipe fittings.

2. All pipe, pipe or plumbing fitting or fixtures, solder, or flux shall be certified by an independent American National Standards Institute (ANSI) accredited third party, including, but not limited to, NSF International, as being in compliance with this section.

E. All materials used for fire system piping shall be UL and FM approved.

2.2 VALVE BOXES

A. Provide at each valve or cock in ground a Christy, Brooks, or equal to Christy G05CT, concrete valve box with cover marked for service, domestic water shall be marked “Water” and fire supply shall be marked “Fire”. Furnish extension handles for each size square nut valve, and provide “fork” handle for each size of “wheel handle” valve as required. Do not locate valve boxes in walk, or covered passages, curbs, or curb & gutters, unless necessary. If valve location is within concrete or asphalt paved surface valve box shall be as detailed on plans for such condition. Provide valve box extensions as required to set bottom of valve box to bottom of piping in which valve is installed. Provide Owner with set of special wrenches and/or tools as required for operation of valves.

2.3 PIPES AND FITTINGS

A. Sanitary Sewer: PVC sewer pipe and fittings with Ring-Tite joints, ASTM D3034 SDR35.

B. Domestic water Lines 3 1/2” and smaller: Type K copper tubing, hard temper, with wrought copper fittings.

C. Water lines 4” and larger: AWWA C-900 Class 150/DR18 with rubber gasket joints.

D. Solder: Lead Free. 95/5; 95% Tin / 5% Antimony.

E. Mechanical Fitting Bolts: Bolts and nuts shall be carbon steel with a minimum 60,000 psi tensile strength conforming to ASTM A307, Grade A. Bolts shall be standard ANSI B1.1 Class 2A course threads. Nuts shall conform to ASTM A563 and be standard ANSI B1.1, Class 2A course thread. All bolts and nuts shall be zinc coated.

F. Pipe Insulation: Pipe exposed to atmospheric conditions ½” thru 4” NPT; Johns Manville rigid fiberglass insulation, Micro Lok HP; Owens Corning Fiberglas SSL II; Conforming to ASTM C612, Type 1A or type 1B.

G. Aluminum field applied pipe insulation jacket; comply with ASTM B209, ASTM C1729, ASTM C1371 Manufacturers; Childers Metals; ITW Insulation Systems Aluminum Jacketing; or an approved equal.

H. Finish shall be flat mill finish

I. Factory Fabricated Fitting Covers; 45 and 90 degree elbows, tee's, valve covers, end caps, unions, shall be of the same thickness and finish of jacket.

J. The fittings shall be composed of 2-pieces

K. Adhesives; per the manufacturers requirements

L. Joint Sealant; shall be silicone, and shall be aluminum in color.

2.4 CLEANOUTS

A. Cleanouts of same diameter as pipe up to 8" in size shall be installed in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18" from building so as to provide sufficient space for rodding. No horizontal run over 100 feet shall be without cleanout whether shown on drawings or not.

B. All cleanout boxes shall be traffic rated with labeled lid, Christy G05CT or approved equal. Lid shall be vandal proof with stainless steel screws

2.5 UNIONS

A. Furnish and install one union at each threaded or soldered connection to equipment and 2 unions, one on each side of valves on pipes ½" to 3".

B. Locate unions so that piping can be easily disconnected for removal of equipment or valve. Provide type specified in following schedule:

1. Type of Pipe Union

a. Steel Pipe: 150 lb. Screwed malleable ground joint, brass, brass-to-iron seat, black or galvanized to match pipe.

b. Copper tubing: Brass ground joint with sweat connections.

c. PVC Sch 80 pipe: PVC union, FIPT X FIPT

2.6 VALVES

A. Provide valves as shown and other valves necessary to segregate branches or units. Furnish valves suitable for service intended. Valves shall be properly packed and lubricated. Valves shall be non-rising stem. Place unions adjacent to each threaded or sweat fitting valve. Install valves with bonnets vertical. All valves shall be lead free.

B. Valves ½" thru 2"; shall be made of bronze, full size of pipe and lead free. Nibco S-113-FL Series; American G-300 Series; Matco 511 FL Series; Apollo 102T-FL Series. Brass valves of brass parts within valves will not be accepted.

C. Valves, 2 ½" thru 3" shall be class 150; Shall be made of bronze, full size of pipe; Jenkins Fig. 2310 J; Lunkinheimer Fig. 2153; Crane Fig. 437; Stockham Fig. B-128.

D. Valves, Flanged; 4" thru 12" Ductile Iron Resilient Wedge Gate Valve; Nibco F 609 RW; American 2500 Series; Kennedy 8561; Mueller 2360 Series.

2.7 TRACER WIRE

A. No. 10 THW solid copper wire. Solder all joints

PART 3 – EXECUTION

3.1 DRAWINGS AND COORDINATION

A. General arrangement and location of piping, etc., are shown on Drawings or herein specified. Install work in accord therewith, except for minor changes that may be necessary on account of other work or existing conditions. Before excavation, carefully examine other work that may conflict with this work. Install this work in harmony with other craft and at proper time to avoid delay of work.

B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.

C. In advance of construction, work out minor changes if conflicts occur with electrical or mechanical. Relocate services to suit actual conditions and work of other trades to avoid conflict therewith. Any adjustments or additional fittings to make adjustments shall not be cause for additional costs to the owner.

D. Execute any work or apparatus shown on drawings and not mentioned in specifications, or vice versa. Omission from Drawings or Specifications of any minor details of construction, installation, materials, or essential specialties does not relieve Contractor of furnishing same in place complete.

E. Graded pipes shall take precedence. If conflict should occur while placing the domestic water and fire service piping, the contractor shall provide any and all fittings necessary to route the water lines over or under such conflicting pipes at no additional costs to the owner.

3.2 ACCESS

A. Continuously check for clearance and accessibility of equipment or materials specified herein to be placed. No allowance of any kind shall be made for negligence on part of Contractor to foresee means of installing his equipment or materials into proper position.

3.3 EXCAVATING AND BACKFILLING

A. Excavation and Bedding:

1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width to be a minimum of 12" wider than outside diameter of pipe. Follow manufacturer's recommendations for use of each kind and type of pipe.

2. Bedding: Provide a bedding as noted on drawing details for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, which ever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.

3. If the trenches for the site utilities falls within areas to be lime treated, the piping shall be installed prior to any lime treatment operations, providing the elevation of the piping is below the treatment section.

4. If trenching is necessary in areas that have been previously lime treated the contractor shall backfill the trench with class 2 aggregate base, with minimum section equal to the lime treated section and compacted to 95%.

B. Laying of Pipe:

1. General: Inspect pipe prior to placing. Sun damaged pipe will be rejected. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe bell upgrade, true to line and grade.

2. 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 any case of discrepancy, work shall be stopped and the discrepancy immediately reported to the Owner’s Representatives. In addition, when requested by the Owner's Representative, a string line shall be used in the bottom of the trench to insure a straight alignment of the sewer pipe between manholes. The maximum deviation from grade shall not be in excess of 1/4 inch. In returning the pipe to grade, no more than ¼” depression shall result.

3. The Contractor shall expose the end of existing pipe to be extended, for verification of alignment and elevation, prior to trenching for any pipe which may be affected. All costs of such excavation and backfill shall be included in the price paid for the various items of work.

4. A temporary plug, mechanical type shall be installed on sewer pipe at the point of connection to existing facilities. If connecting to a public facility the plug shall conform to the requirements of the local jurisdiction. This plug shall remain in place until the completion of the balling and flushing operation.

5. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.

C. Backfilling:

1. General: Do not start backfill operations until required testing has been accomplished.

2. Compaction and Grading: Remainder of backfill shall be in accordance with Section 31 23 33 – Trenching and Backfilling.

3. If trenching in area previously lime or cement treated backfill top of trench section, same depth as lime or cement treatment with Class 2 Aggregate Base compacted to 95% minimum relative compaction.

3.4 INSTALLATION OF WATER PIPING

A. The contractor shall be responsible for determining the installed depth of all water piping, based on surfaces grades and minimum required depth of cover.

B. Immediately cap or plug ends of, and opening in, pipe and fittings to exclude dirt until final connections made. Use reducing fittings where any change in pipe size occurs. Bushings shall not be used.

C. General: Should existing conditions or other work prevent the running of pipes or the setting of equipment at the points indicated by drawings, changes as authorized by the Architect shall be made without additional cost to the Owner.

D. All bolts used on mechanical fittings shall be thoroughly coated with an asphaltic bituminous coating conforming to 2019 NFPA 24, 10.4.1.1.

E. All buried metal shall be incased with 8 mil polyethylene wrap so that no soil is in contact with metal. Ends of polyethylene wrap shall be taped to provide seal with pipe.

F. Do not install water lines in same trench with non-metallic sewer lines unless bottom of water pipe at all points is at least 12" above top of sewer line and water line is placed on solid shelf excavated at one side of common trench with a minimum of 12 inch horizontal separation.

G. Under no circumstance shall a fitting be located directly under a structural footing without prior approval from the Architect.

H. In locations where existing domestic pipe is rerouted, the new pipe shall be assembled using restrained fittings at all joints including factory pipe joints. Tapped restrained blind flanges shall be temporarily installed at each end of the assembled pipes until testing and chlorination is completed and approved.

3.5 CLOSING IN OF UNINSPECTED WORK

A. Do not allow or cause work installed to be covered up or enclosed before it has been inspected, tested, and approved. Should work be enclosed or covered up before it has been approved, uncover work at own expense. After it has been inspected, tested and approved, make repairs necessary to restore work of other contractors to

condition in which it was found at time of cutting.

3.6 CARE AND CLEANING

A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in new condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures and trim that are installed as part of this work. Leave systems and equipment in satisfactory new operating condition.

B. Drain and flush piping to remove grease and foreign matter.

C. Sewer piping shall be balled and flushed.

D. Clean out and remove surplus materials and debris resulting from the work, including surplus excavated material.

E. Flush fire service piping in the presence of the project inspector. Flushing shall be continued for a sufficient time as necessary to ensure all foreign material has been removed. Flow rate shall be equal to site fire flow requirements.

3.7 SEWER INTERNAL INSPECTIONS

A. 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 resulted from the new installation, shall also be removed. Pipes shall be cleaned by the controlled balling and flushing 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.

3.8 TEST OF PIPING

A. Pressure Test piping at completion of roughing-in, in accord with following schedule, and show no loss in pressure or visible leaks after minimum duration or four (4) hours at test pressures indicated.

B. Chlorination tests shall be performed after all fixtures and any required mechanical devices are installed and the entire system is complete and closed up.

C. In cases where new domestic water piping is assembled for re-routing of existing domestic water pipe , the contractor shall perform the following testing prior to connecting the new water pipe to the existing system.

1. The pipe shall be pressure tested and per the test schedule.

2. The pipe shall be pressure tested down within the trench.

3. The contractor shall dig a temporary ditch below the existing pipe to drain to a sump that is lower than the bottom of the trench and to the side of the trench. The sump shall be 30% larger than the total volume of water within the testing pipe assembly.

4. After pressure testing and chlorination has taken place and accepted, the contractor shall drain the pipe into the sump and pump the sump out as it is filling.

5. The temporary test fittings at each end of the pipe assembly shall be removed and the final restrained couplings installed.

6. The existing piping shall be cut and the water within the pipe shall drain below the pipe to the temporary sump. Pump the sump as it is being filled up. Take extreme caution not to contaminate the existing pipe with any contaminates within the trench.

7. Before making the final coupling connections, the restrained couplings at each end of the new pipe shall be thoroughly swabbed inside the fitting with a solution of chlorine mixed with water at a rate of 1part chlorine to 4 parts potable water.

8. After final connections are made, a visual inspection shall be made after fittings are wiped off. If after 1 hr, no noticeable drips are noted the pipe can be backfilled.

9. The contractor shall flush all water piping affected by chlorination until it is within acceptable levels approved by certified testing lab.

TEST SCHEDULE

System Tested	Test Pressure PSIG Test With
Public water mains	Per local jurisdiction requirements.
Private domestic water piping and fire mains serving fire hydrants:	150 Lbs. Water 4 hrs.
Fire Protection Piping from PIV to fire riser:	200 Lbs. Water pressure, 4 hours duration with no pressure loss.
Sanitary Sewer Piping:	Sewer system shall be tested for leakage per local jurisdiction requirements.

D. Testing equipment, materials, and labor shall be furnished by contractor.

3.9 WATER SYSTEM STERILIZATION

A. Public Water Mains: Shall be flushed and disinfected per the local jurisdiction requirements.

B. Clean and disinfect all site water systems connected to the domestic water systems in accordance with AWWA Standard C651 and as required by the local Building and Health Department Codes, and EPA.

1. Clean and disinfect industrial water system in addition to the domestic water system.

2. Disinfect existing piping systems as required to provide continuous disinfection upstream to existing valves. At Contractors option, valves may be provided to isolate the existing piping system from the new piping system.

C. Domestic water sterilization shall be performed by a licensed "qualified applicator" as required by CAL-EPA Pesticide Enforcement Branch for disinfecting and sterilizing drinking water.

D. Disinfecting Agent: Chlorine product that is a registered product with Cal-EPA for use in California potable water lines, such as Bacticide, CAL-EPA Registration No. 37982-20001.

E. Contractor to provide a 1" service valve connected to the system at a point within 2'-0" of its junction with the water supply line. After sterilization is complete Contractor to provide cap at valve.

F. Sterilization Procedure to be as follows:

1. Flush pipe system by opening all outlets and letting water flow through the system until clear water flows from all outlets.

2. Inject disinfecting agent to provide a minimum chlorine residual concentration of at least 50 parts per million (ppm) of free chlorine at each outlet.

3. Provide sign at all outlets which reads "Water Sterilization in Progress – Do not operate". Remove signs at conclusion of test.

4. Close all outlets and valves, including valve connecting to water supply line and 1" service valve. Retain treated water in pipe for a minimum of twenty-four hours. Should chlorine residual at pipe extremities be less than 50 PPM at this time, pipe shall be re-chlorinated. As an option, the water systems may be filled with a water-chlorine solution containing a minimum of 200 PPM of chlorine and allowed to stand for three hours.

5. After chlorination, flush lines of chlorinated water and refill from domestic supply. Continue flushing until residual chlorine is less than or equal to 0.2 ppm, or a residual the same as that of the test water.

G. Chemical and bacteriological tests shall be conducted by a state-certified laboratory and approved by the local authorities having jurisdiction.

H. Submit written report to Health Department as required by State Regulations. Provide a copy of report to Architect prior to completion of project.

I. The costs of sterilization and laboratory testing shall be paid for by the contractor.

3.10 CLEANING

A. Refer to Section 01 77 00.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.

SECTION 33 40 00 – SITE DRAINAGE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Storm Drain piping, fittings, structures.

1.2 RELATED SECTIONS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

B. Section 01 50 00 – Construction Facilities and Temporary Controls.

C. Section 31 00 00 – Earthwork.

D. Section 31 23 33 – Trenching and Backfilling.

E. Section 32 16 00 – Site Concrete.

1.3 REFERENCES AND STANDARDS

A. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

B. ANSI/ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ANSI/ASTM D3017 – Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

E. ANSI/ASTM D4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

F. CALTRANS Standard Specifications.

G. CAL-OSHA, Title 8, Section 1590 (e).

H. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

I. NFPA 13, 24 and 25, latest editions.

J. California State Health and Safety Code Section 116875, Lead Free Public Water Systems.

K. California Plumbing Code, latest edition.

1.4 SUBMITTALS

A. Refer to Section 01 33 00.

B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

C. Provide sieve analysis from accredited testing lab on pipe bedding material. Analysis shall have a current date not older than project contract signing date.

D. Substitution: Provide all data of proposed material being submitted as a substitution. Provide comparison with specified product data and identify all differences. Failure to provide comparison will be reason for rejection.

1.5 QUALITY ASSURANCE

A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the drawings to be salvaged and re-used.

1. Sun damaged or discolored PVC pipe will be rejected.

B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

C. The representatives of the Owner’s testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner’s testing lab representatives nor the testing by the Owner’s testing lab shall excuse the contractors or subcontractors for defects or deficiencies discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.

D. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction or incorrect grades will be the responsibility of the contractor.

E. Per 2022 NFPA 13 provide Contractor's material and test certificate to the Owner, Architect, Project Inspector and Local Fire Authority.

1.6 FEES, PERMITS, AND UTILITY SERVICES

A. Obtain and pay for permits and service charges required for installation of Work. Arrange for required inspections and secure written approvals from authorities having jurisdiction.

B. Upon completion of work within right-of-way, provide copies of written final approval to the Architect.

1.7 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.8 PROJECT CONDITIONS

A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

B. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

1.9 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

1.10 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.11 RECORD DRAWINGS

A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.

B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.

C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.

D. Properly identify on as-builts and provide dimensions for all stubs for future connections. Provide concrete markers 6” dia. 12” deep, flush with finish grade at the ends of all stubbed pipes.

1.12 WARRANTY

A. Refer to General Conditions and Section 01 78 36.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Pipe: Use one of the following, unless noted on the Drawings otherwise.

B. Polyvinyl Chloride Pipe (PVC): SDR35 conforming to ASTM D3034 with elastomeric joints conforming to ASTM D3212. Sun damaged pipe will be rejected.

C. High density polyethylene pipe (HDPE): The pipe shall be corrugated exterior/smooth interior pipe and water tight per ASTM D3212 with dual wall water tight gasket fittings.

D. Perforated Pipe (for subdrains): Shall be ADS N12 pipe, 3 hole, ASTM F 405, AASHTO M 252; PVC ASTM D3034 SDR-35 storm drain pipe

E. Manhole: Shall be as shown on the drawing details.

F. Drop Inlet: Shall be as shown on the drawing details.

G. Curb Inlet: Shall be as shown on the drawing details.

H. Mortar: For pipe connections to concrete drainage structures, conform to ASTM C270 type N mortar. Place within one half hour after adding water.

I. Crushed Rock: Imported washed crushed rock. Minimum 100% passing 3/4 inch sieve.

J. Trench drain: Polycast, Polydrain or equal and as shown on drawings.

K. Area Drains: Shall be as shown on the drawing details.

L. Floor Drains: Shall be as shown on the drawing details.

M. Clean-outs: Shall be as shown on the drawing details.

N. Planter drains: Shall be as detailed on the drawing details.

O. Filter Fabric: Mirafi 140N.

PART 3 – EXECUTION

3.1 INSPECTION LAYOUT AND PREPARATION

A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point were this installation may properly commence

B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.

C. Verify that specified items may be installed in accordance with the approved design.

D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.2 INSTALLATION

A. General: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.

B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.

C. Excavation and Bedding:

1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width in accordance with pipe manufacturer's recommendations and as per the drawings. Follow manufacturer's recommendations for use of each kind and type of pipe.

2. Bedding: Provide bedding as detailed on plans for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, which ever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.

3. If the trenches for the site drainage fall within areas to be lime treated, the piping shall be installed prior to any lime treatment operations.

4. If additional piping is added to previously lime treated areas, the contractor shall backfill the trench with class 2 aggregate base and compact to 95%.

D. Laying of Pipe:

1. General: Inspect pipe prior to placing. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe upgrade, true to line and grade.

2. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution or as recommended by manufacture. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.

3. Pipe shall be bedded uniformly throughout its length.

4. Pipe elevation shall be within 0.02 feet of design elevation as shown on plans.

5. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the governing agency.

E. Backfilling:

1. General: Do not start backfill operations until required testing has been accomplished.

2. Trenches and Excavations: Backfill with material as detailed on plans, filling both sides of the pipe at the same time, carefully tamping to hold pipe in place without movement. Refer to Section 31 23 33 – Trenching and Backfilling for fill above this layer.

F. Grouting of Pipes: Grout pipes smooth and water tight at drop inlet, manholes, and curb inlets. Grout back side of hood at curb inlets all grouting shall be smooth and consistent.

G. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the local agency.

H. Cutting and Patching: Remove and replace existing surface features per applicable specification section (i.e. asphaltic concrete or concrete paving) where pipe is installed in areas of existing improvements.

3.3 TOLERANCES

A. Storm Drain structure grates:

1. In landscape and lawn areas +- 0.05’.

2. In sidewalk and asphalt pavement +-0.025’.

3. In curb and gutter application +-0.0125’.

B. Cleanout Boxes and Lids:

1. In landscape areas; 0.10 higher than surrounding finish grade, +-0.05'.

2. In sidewalks and asphalt pavement; Flush with surrounding finish grade, +-0.025'.

3.4 DEWATERING

A. Contractor to provide trench dewatering as necessary, no matter what the source is, at no additional cost to the owner.

B. If the previously excavated material from trenching is too wet to achieve trench backfill compaction the contractor shall make a reasonable effort to aerate and dry the material per section 31 00 00, 3.8.B

3.5 FLUSHING

A. The Contractor shall thoroughly ball and flush the storm drain system to remove all dirt and debris. Discharge water to an approved location.

3.6 CLEANING

A. Refer to Section 01 77 00.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

C. Clean the dirt, rocks, and debris from all storm drain inlets, structures, and connecting pipes.

END OF SECTION

PAGE INTENTIONALLY LEFT BLANK.