PROJECT MANUAL

August 19, 2025

Classroom Renovation
at
Egling Middle School

George T. Egling Middle School
813 Webster St., Colusa CA 95932
Colusa Unified School District
Colusa, Colusa County, California

DSA Application #02-123327
DSA Submittal Date May 6, 2025

Boys Restroom
Alternate Bidding
document

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PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of the structure to install the new work.

B. Related Sections:

1. 01 73 29 Cutting and Patching
2. 01 74 19 Construction Waste Management and Disposal
3. 01 76 00 Protecting Installed Construction

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them.

B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

C. Existing to Remain: Existing items of construction that are not to be removed.

1.03 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be salvaged, reinstalled or otherwise indicated to remain the Owner's property, demolished materials shall become the Contactor's property and shall be removed from the site with further disposition at Contractor's option.

1.04 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition work, with starting and ending dates for each activity, and for each Phase indicated on the drawings.
2. Interruption of utility services.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing competency of portions of existing building and of Owner's partial occupancy of completed work.

1.05 PROJECT CONDITIONS

A. Owner will occupy portions of the site immediate adjacent to selective demolition area.

1. Conduct selective demolition so Owner operations will not be disrupted.
2. Provide the Architect with not less than 72 hours' notice prior to activities that will affect Owner operations.

B. Maintain access to existing walkways, corridors and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for buildings and structures to be demolished.

1. Before building demolition relocate or cover existing the following items

a. Educational delivery tools; e.g. textbooks, notebooks, computers, maps/diagrams or bulletin boards.

b. Furniture; e.g. student and staff desks or book cases.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

E. Fire Protection: Maintain fire protection services during selective demolition operations.

PART 2 – PRODUCTS

2.01 REPAIR MATERIALS

A. Where available and appropriate for use, provide repair materials that are identical to existing materials.

B. 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.

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

PART 3 – EXECUTION

3.01 EXAMINATION

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

B. Survey the condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

3.02 UTILITY SERVICES

A. Notify Owner's Representative five (5) days in advance of disconnecting utility services which will permanently or temporarily disrupt normal operations.

B. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

C. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by the Owner.

1. Provide temporary services during interruptions to existing utilities, as acceptable to the Owner.

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

E. 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.

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

G. Do not start selective demolition work until utility disconnection and sealing have been completed and verified.

3.03 PREPARATION

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

B. Temporary Enclosures: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

3.04 POLLUTION CONTROLS

A. Dust Control: Use temporary enclosures and other suitable methods complying with governing environmental protection regulations to limit the spread of dust and dirt.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding or pollution.

2. Wet mop floors to eliminate trackable dirt, and wipe down walls and doors of demolition enclosure.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Cleaning: Clean adjacent structures and site improvements of dust, dirt and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete selective demolition within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically. Conduct work in an order that avoids transporting removed items and debris through areas with completed selective demolition work, and that allows for removal of items before supports for those items are removed in another area.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage adjoining construction to remain. Use hand or small power tools designed for sawing or grinding, not for hammering and chopping, to minimize disturbance of adjunct surfaces. Temporarily cover openings to remain.

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

4. Do not use 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 staring flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations, and maintain adequate ventilation when using cutting torches.

5. Lower removed structural framing members to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

6. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors or framing.

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

B. Existing Facilities: Comply with the Owner's regulations for using and protecting stairs, walkways, loading docks, building entries and other building facilities during selective demolition operations.

3.06 PATCHING AND REPAIRS

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

B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to the manufacturer's written recommendations.

C. Finishes: Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. Disposal: Transport demolished materials off Owner property and legally dispose of them.

END OF SECTION

SECTION 03 10 00 CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Formwork for cast-in place concrete.
   2. Form accessories.
   3. Form stripping.

B. Related Sections:
   1. Section 03 20 00 - Concrete Reinforcing.
   2. Section 03 30 00 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318-19 - Building Code Requirements for Structural Concrete.
   3. ACI 347-13 - Recommended Practices for Concrete Formwork.

B. California Building Code (CBC) 2022.

C. The Engineered Wood Association: APAIEWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. West Coast Lumber Inspection Bureau: WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347-13.

B. For wood products furnished for work of this Section, comply with AF&PA PS-1.

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.

1.4 COORDINATION

A. Coordinate work with all affected trades to insure proper placement of all items in forms and to provide proper block-outs wherever required.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Unexposed Concrete Surfaces
   1 . Lumber Forms:
   a. Application: Use for edge forms and unexposed finish concrete.
   b. Boards: 6 inches or 8 inches in width, ship-lapped or tongue and groove,

"Standard" Grade Douglas Fir, conforming to WCLIB Standard Grading Rules for West Coast Lumber. Surface boards on four sides.

2. Plywood forms as noted for Exposed Concrete surfaces are also acceptable.

B. Exposed Concrete Surfaces

1 . Plywood Forms:

a. Application: Use for exposed finish concrete.

b. Forms: Conform to PS 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of AP AIEW A.

c. Plywood for Surfaces to Receive Membrane Waterproofing: Minimum of 5/8 inch thick; APAIEWA "B-B Plyform Structural I Exterior" grade.

d. Plywood where "Smooth Finish" is required, as indicated on Drawings: APAIEWA "HD Overlay Plyform Structural I Exterior" grade, minimum of 3/4 inch thick.

C. Chamfer strips: Milled from clear straight-grain lumber, surfaced on all sides. Other material of equal quality may be used only as authorized by Architect.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Use at Contractor's option; type to produce surface equal to those specified for wood forms.

2.3 FORMWORK ACCESSORIES

A. Form Anchors and Hangers:

1. Do not use anchors and hangers exposed concrete leaving exposed metal at concrete surface.
2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
3. Penetration of structural steel members is not permitted.

B. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

1. Form release agent shall meet federal standard TT-W-572; material which shall leave no residue on concrete surface that will interfere with surface coating.

C. Corners: Fillet or Chamfer as required, rigid plastic or wood strip type; maximum possible lengths.

D. Bituminous Joint Filler: ASTM 01751.

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

F. Joint Materials

1. Tongue-and-Groove Control Joint:

a. 26 ga. (minimum thickness) galvanized steel shapes to form tongue-and-groove joint

b. 24 ga. galvanized steel splice plates

c. 16 ga. galvanized steel stakes
d. Acceptable manufacturers:
    1) "Burke Joint Key" by Meadow Burke
    2) "Pro-Key" by BoMetals, Inc.
    3) Accepted equal

2. Expansion Joints: ½" asphalt saturated fiber expansion board; ASTM D1751.

PART 3 PRODUCTS

3.1 EXAMINATION

A. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with drawings.

B. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms:
1. Trench earth forms neatly, accurately, and at least 2 inches wider than footing widths indicated on Drawings.
2. Trim sides and bottom of earth forms.
3. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.
4. Form sides of footings where earth sloughs.
5. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.

B. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations and wind loads.
3. Forms shall be constructed of sufficient rigidity to maintain specified construction tolerances.
4. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
5. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
6. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.

6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Framing, Studding and Bracing:
   1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
   2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
   3. Construct beam soffits of material minimum of 2 inches thick.
   4. Distribute bracing loads over base area on which bracing is erected.
   5. When placed on ground, protect against undermining, settlement or accidental impact.

E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 347-13.

F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

G. Install fillet and chamfer strips on external corners as noted on plans

H. Do not reuse board formwork more than two times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots,

reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow ffushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

H. Construction Joints:
   1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
   2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
   3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
   4. Arrange joints in continuous line straight, true and sharp.
   5. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 16' for exterior concrete unless otherwise shown.
   6. Slab Joints: Install specified tongue-and-groove joint material for all interior slabs and elsewhere as indicated on Drawings. Maximum area between joints is limited to 225 square feet, maximum length between joints is limited to 16 feet, aspect ratio of length to width is limited to 1.25 to 1. Contractor can set joint spacing within above limits to suit placing schedule except that all joints specifically shown on structural drawings must be set as so located.
   7. Isolation Joints: Install #30 roofing felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, except if expansion joints are specifically indicated.

I. Embedded Items:
   1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
   2. Do not embed wood or uncoated aluminum in concrete.
   3. Obtain installation and setting information for embedded items furnished under other Specification sections.
   4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
   5. Verify conduits and pipes, including those made of coated aluminums, meet requirements of ACI 318-19 per CBC 2022 for size and location limitations.

J. Openings for Items Passing Through Concrete:
   1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
   2. Coordinate work to avoid cutting and patching of concrete after placement.
   3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

K. Screeds:
   1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
   2. Slope slabs to drain where required or as shown on Drawings.
   3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

L. Screed Supports:
   1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
   2. Staking through membrane is not be permitted.

M. Cleanouts and Access Panels:
   1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
   2. Clean forms and surfaces against which concrete is to be placed. Remove chips, sawdust and other debris. Thoroughly blowout forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as specified in ACI 347-13. Except as noted below:

E. Removal Time: 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 or above. For each day that temperature falls below 60 degrees F, add additional day to provide periods listed, unless otherwise directed.)

   1. Vertical forms of foundations and walls 7 days
   2. Slab edge screeds or forms 5 days

3.7 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

B. Check forms before and during placement of concrete to assure that no movement has taken place. Make appropriate corrections.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03 20 00 CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Reinforcing bars.
   2. Reinforcement accessories.

B. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 30 00 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318-19 per CBC 2022 - Building Code Requirements for Structural Concrete.
   3. ACI 530-16 - Specifications for Masonry Structures.
   4. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
   5. ACI SP-66 - ACI Detailing Manual.

B. Concrete Reinforcing Steel Institute:
   1. CRSI - Manual of Standard Practice.
   2. CRSI - Placing Reinforcing Bars.

C. ASTM- American Society for Testing and Materials, Referenced Standards

D. AWS- American Welding Society:
   1. AD1.4 Structural Welding Code- Reinforcing Steel
   2. A5.1 Mild Steel Covered Arc-Welding Electrodes

E. California Building Code (CBC) 2022.

1.3 SUBMITTALS

A. Section 01 33 01 - Submittal Procedures.

B. Section 01 45 29 - Testing Laboratory Services
   1. Retesting: Agency selected and paid for by the Owner; retesting paid for by Owner and backcharged to Contractor.

C. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules and supporting and spacing devices.

D. Manufacturer's Certificate: Submit one (1) electronic copy of mill test reports for reinforcing bars, indicating physical and chemical properties for each heat. In addition, show correlation between a specific heat number and specific sizes from that heat number and location in which those bars will be placed.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice and ACI 318-19 per CBC 2022.

B. Prepare shop drawings in accordance with ACI SP-66.

C. Maintain one copy of each document on site.

D. Welders shall be qualified in accordance with AWS D1.4.

1.5 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Steel Reinforcing: ASTM A615 or ASTM A706, deformed; Grade 60 required for No.4 and larger; either Grade 40 or 60 allowed for No.3. Dowel bars for installation through contraction joints shall be smooth or shall be wrapped on one end to allow slippage.

B. Reinforcing mesh: Welded wire fabric conforming to ASTM A185.

C. Tie wires and spirals: ASTM A82.

D. Reinforcement supports

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice ACI 318-19 per CBC 2022 applicable code.

B. Except where specified otherwise herein or shown otherwise on the plans, reinforcing steel shall be cleaned, fabricated, placed, tied and supported in accordance with ACI 301 and ACI 315.

C. Form standard hooks for 180 degree bends, 90 degree bend, stirrup and tie hooks, and seismic hooks as indicated on Drawings.

D. Form reinforcement bends with minimum diameters in accordance with ACI 318-19 per CBC 2022 applicable code.

E. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.

1. Do not weld crossing reinforcement bars for assembly

B. Do not displace or damage vapor retarder.

C. Accommodate placement of formed openings.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318-19 per CBC 2022 of one bar diameter, but not less than 1 inch.

1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

E. Conform to ACI 318-19 per CBC 2022 for minimum concrete cover over reinforcement.

F. Steel Dowels: Provide dowel bars where shown or required for connecting to in-place or subsequent work as shown. Dowels required to receive and engage subsequent work shall be left of sufficient length to develop the strength of the bar and be securely set in the form prior to placing the concrete.

3.2 ERECTION TOLERANCES

A. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth	*Depth Tolerance*	*Concrete Cover Tolerance*
Greater than 8 inches	plus or minus 3/8 inch	minus 3/8 inch
Less than 8 inches	plus or minus 1/2 inch	minus 1/2 inch

B. Install reinforcement within the tolerances specified in ACI 530-16 for foundation walls.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by Owner's Inspector of Record (IOR) in accordance with ACI 318 applicable code.

B. Provide free access to Work and cooperate with appointed inspector.

C. RETESTING: Make necessary corrections to work that is not in conformance with specified requirements. Retests will be paid for by Owner and backcharged to Contractor.

END OF SECTION

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
   1. Slabs on grade.
   2. Control, expansion, and contraction joint devices.
   3. Miscellaneous concrete elements.
   4. Concrete finishing including concrete curing.

B. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 20 00 - Concrete Reinforcing.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301-16 - Specifications for Structural Concrete.
   2. ACI 305R-16 - Hot Weather Concreting.
   3. ACI 306R-16 (R2002) - Standard Specification for Cold Weather Concreting.
   4. ACI 308.1-16 - Standard Specification for Curing Concrete.
   5. ACI 318-19 per CBC 2022 - Building Code Requirements for Structural Concrete.

B. ASTM- American Society of Testing and Materials, Referenced Standards.

C. NRMCA Check List for Certification of Ready Mixed Concrete Production Facilities

D. California Building Code 2022 (California Code of Regulations, Title 24, Part 2) Chapter 19A.

1.3 SUBMITTALS

A. Section 01 33 01 - Submittal Procedures: Submittal procedures.

B. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
      b. Air entrained concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
   4. Concrete mix design shall be stamped and signed by a California Civil engineer.

C. Closeout Submittals:
   1. Section 01 77 01 - Contract Closeout.
   2. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

D. Certification: The concrete supplier shall provide certification that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C150.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301-16 and ACI 318-19 per CBC 2022.

B. Batch plant inspection is required for this project in compliance with CBC §1705A.3.3.1 and the Division of the State Architect's Interpretation of Regulations IR 17-13, subject to the following:

1. A licensed Weighmaster shall positively identify the quantity of materials and certify each load with a batch ticket.

2. Batch tickets shall accompany the load and be transmitted to the Inspector of Record by the truck driver with the load identified thereon. The load shall not be placed without a batch ticket identifying the mix. The Inspector of Record shall keep a daily record of placements, identifying each truck, its load, and time of receipt at the job site, and the approximate location of deposit in the structure. A copy of the daily record shall be maintained.

C. Conform to ACI 305R-10 when concreting during hot weather.

D. Conform to ACI 306R-16 when concreting during cold weather.

E. Acquire cement and aggregate from one source for Work.

F. Quality Control:
1. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect and all governmental agencies having jurisdiction, and until copies are at the job site, the batch plant, and the Inspector of Record.
2. See Section 01 45 29 for general testing and inspection requirements. Give the inspector full cooperation.

G. Notice Of Intention To Place Concrete: Notify Architect, Structural Engineer, and Special Inspector at least 48 hours prior to an intended pour.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Environmental Requirements:
1. Cold Weather Placement: Per ACI 306R-16 and as specified. When temperature is 50 degrees F or lower, take suitable means as necessary to maintain minimum concrete temperature of 50 degrees F, at time of placing. Heat aggregate, or mixing water, or both, as required. Provide suitable means for maintaining concrete at a temperature not less than 50 degrees F for at least 72 hours after placement; provide screens or enclosures to protect concrete from prevailing winds and weather; provide temporary heaters if necessary. See CBC, Section 1905A.12.
2. Hot Weather Placement: Per ACI 305R-16 and as specified. When temperature

exceeds 85 degrees F, or when temperature exceeds 70 degrees F with North wind blowing, take suitable means as necessary to maintain fresh concrete temperature below 90 degrees F; use chilled water, chipped ice, or evaporative cooling of aggregate as necessary. In addition, dampen forms, subgrade, and reinforcing steel; cool by evaporation and protect from hot sun and wind until concrete is placed.

B. Protection: Finish surfaces shall be protected at all times from concrete adjacent to them. Inspect forming against such work and establish tight leak proof seal before concrete is placed. Finish work defaced with concrete on surface shall be replaced.

1.6 COORDINATION

A. General: Coordinate with other trades for the installation of concrete embedded items.

B. Buried Items: Do not place concrete until items have been tested for mechanical operation.

C. Concrete Surfaces to Receive Other Finishes: Coordinate with other applicable sections to assure concrete finish is suitable to receive specified finish.

D. Reinforcement: Do not place any reinforced concrete until inspected.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type II/Type V.
   1. ASTM C150, Type III, may be used upon request and approval. Normal Weight Aggregates: ASTM C33.
   2. Coarse Aggregate Maximum Size: 1 inch, except 3/4 inch maximum size for topping slabs and for concrete to be pumped.
   3. Fine Aggregate: Natural sand; grade within limits of 3/8" to No. 100 sieve.

B. Water: ACI 318-19 per CBC 2022; clean, potable, free of injurious materials, without deleterious amounts of chloride ions.

C. Non-Shrink Grout: "Masterflow 713 Plus" by ChemRex, Inc., "588 Precision Grout" by AW.R. Meadows, Inc., or approved equal; premixed, non-metallic, no chlorides, non-staining, and non-shrinking per CRD-C621 Corps of Engineers Specification. (Minimum Strength = 5000 psi @ 7 Days)

D. Exposure categories and classes per ACI 19.3.1:
   1. Freezing and thawing: F1
   2. Sulfate: S3
   3. In contact with water: W1
   4. Corrosion protection of reinforcement: C1

2.2 ADMIXTURES

A. Cement Dispersing Admixture: Use admixture to improve placing, reduce water cement ratio, and ultimate shrinkage. Such admixture must conform to ASTM

C494 and ACI 318 Section 26.4.1.4, and shall be included in original design mix.

B. Fly Ash: Not acceptable unless previously reviewed and approved by the Structural Engineer.

2.3 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Asphalt impregnated fiberboard or felt; 1/4 inch thick; tongue and groove profile.

B. Construction Joint Devices: Integral; *1/4* inch thick, formed to tongue and groove profile.

C. Expansion Joint Devices: Joint filler shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or accepted equal.

2.4 MATERIALS FOR CURING & PROTECTION

A. Curing Compound For Curing Exterior Slabs
1. For all Exterior Slabs: Furnish liquid membrane-forming water-based curing and sealing compound conforming to ASTM C309, Type I, Class B clear, non-yellowing; L.M. Scofield "Cureseal-W", or approved.

B. Curing Compounds & Protection Paper for Interior Slabs
1. For Interior Slab Surfaces: Furnish 6 mil clear visqueen or reinforced waterproof kraft paper conforming to ASTM C171, Type I; liquid membrane-forming curing compound shall <u>not</u> be used for curing interior recessed slabs.

2.5 CONCRETE MIX

A. All concrete used on this work will be designed for strength in accord with provisions of ACI 318 Section 26.4.3. All mixtures will be designed by Laboratory selected by School District and all costs of designing mixes will be borne by School District. (Should contractor desire to pump concrete, a modified class “B” mix will be designed Laboratory at School District expense.) Fly Ash may be used in concrete conforming to CBC Section 1903A.6 at or below grade to improve workability in amounts up to 15% of cement weight

Provide concrete to the following criteria:	
Material and Property	*Measurement*
Compressive Strength (28 day)	3000 psi
Cement Type	ASTM C150 Type II/Type V
Aggregate Type	Normal weight
Fine Aggregate	40% - 45% of total aggregate volume by weight
Water-Cement Ratio (maximum)	0.50
Aggregate Size (maximum)	1.5 inch
Aggregate Size (minimum)	3/8 inch
Fly Ash Content:	15% of cement weight
Slump	3 inches

B. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect/Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Cleaning Forms: Before placing concrete. Clean spaces within forms of all refuse, debris and dirt. Provide cleaning holes for removal of foreign matter; after cleaning, replace forms at openings and brace to prevent form failure.

E. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
   1. Concrete Fasteners:
      a. In addition to their use where the pins are loaded in shear, powder driven concrete fasteners may be used in tension for support of light loads such as duct work, conduits, pipes, and similar items when such loads are limited to less than 75 lbs.
      b. Where hanger rods, bolts, wire, or similar items are used to suspend construction items, place in the concrete as required and/or indicated.
   2. Reveals and Rebates:
      a. Form reveals and rebates as required to receive frames, flashing, and other equipment, and as shown on the Drawings.
      b. Verify the dimensions and positions of required reveals and rebates with the Architect and with trades whose work is related to or contingent upon such dimensions and positions.
   3. Embedded Piping & Rough Hardware:
      a. Coordinate the various trades who are required to fasten work to the structure, or are required to insert therein any sleeve, box, bolt, anchor, insert, or other rough hardware.
      b. Provide every facility for setting all required items accurately in the forms.
      c. Be responsible for changes in position of such items after they have been set.
      d. Provide in the forms for all sleeves, boxes, bolts, anchors, inserts,

strap anchors, for frames, and other rough hardware required for the Work, and which are shown or required to be embedded in the concrete.

e. Conduits and Sleeves.
   1) Place sleeves and core forms as required for mechanical and electrical work, sizes and locations as shown as directed by cognizant trades.
   2) Locate so as not to reduce the strength of construction. Do not place pipes, except conduits, in a slab of less than 4" thickness.
   3) In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing the thickness of the slab locally to at least 3" of concrete around the conduit on all sides.

4. Metal Fabrication Items To Be Set In Concrete: Coordinate installation of the various metal fabrication items to be set in concrete as indicated on Drawings and specified therefore under Section 05 50 00.

F. Repair damaged vapor retarder sheeting before covering.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301-16 and ACI 318-19 per CBC 2022.

B. Notify IOR and Architect/Engineer minimum 72 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with *1/4* inch thick joint filler.

E. Place joint filler in slab-on-grade pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

F. Extend joint filler from bottom of slab to within *1/4* inch of finished slab surface. Conform to Section 07 90 10 for finish joint sealer requirements.

G. Install construction joint devices in coordination with slab-on-grade pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor finish.

I. Install joint covers in longest practical length, when adjacent construction activity is complete.

J. Apply sealants in joint devices in accordance with Section 07 90 10.

K. Deposit concrete at final position. Prevent segregation of mix.

L. Place concrete in continuous operation for each panel or section determined by

predetermined joints.

M. Consolidate concrete.

N. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

O. Place concrete continuously between predetermined expansion, control, and construction joints.

P. Do not interrupt successive placement; do not permit cold joints to occur.

Q. Place floor slabs in checkerboard pattern.

3.4 CONCRETE FINISHING

A. Formed Surfaces:

1. Rough Form Finish: Surfaces shall be reasonably true to line and plane with no specified requirements for selected facing materials. Tie holes and defects shall be patched and fins exceeding *1/4* inch in height shall be rubbed down with wooden blocks. Fins and other rough spots at surfaces to receive membrane waterproofing shall be completely removed and the surfaces rubbed smooth. Otherwise, surfaces shall be left with the texture imparted by forms. Rough finish shall be used for the following areas:
   a. Below grade and unexposed surfaces.

2. Smooth Plywood Form Finish: Finish shall be true to line and plane. Tie holes and defects shall have been patched and ground with surface fins removed. Arrangement of plywood sheets shall be orderly, symmetrical, as large as practical and free of torn grain or worn edges. Surface concrete shall be treated with 1 part muriatic acid, in three parts water solution, followed immediately by a thorough rinsing with clear water. Surfaces which are glazed, have efflorescence, or traces of form oil, curing compounds or parting compounds shall be cleaned or treated to match other formed surfaces, except as otherwise indicated or specified. Smooth Plywood Form Finish shall be used for the following areas:
   a. All surfaces above grade unless otherwise specified.
   b. At Contractor's option, may also be used in lieu of rough form finish.

B. Flatwork: Unless otherwise indicated or specified, flatwork shall have an integral monolithic finish.

1. Integral Monolithic Finish: Apply as soon as freshly poured concrete slabs will bear weight of workers. Pour slabs full thickness to finish floor elevations indicated. At proper time, tamp surface repeatedly with a wire mesh or grid tamper in a manner to force aggregate down below surface and to bring sufficient mortar to surface to provide for a smooth coating of cement mortar over entire surface. Allow surface mortar to partially set, then float with wooden floats and finish with one of following, as required.
   a. Broom Finish: Steel trowel surface to a smooth dense surface free of lines, tool marks, cat faces and other imperfections. After troweling, and before final set, give surface a broom finish, brushing perpendicular to direction of traffic, or as directed, to form a non-Slip surface with a minimum 0.6 coefficient of friction. Broom finish shall be used typically on exterior

flatwork except as otherwise indicated or specified and shall be "medium" texture as approved by Architect.

2. Tolerances:
    a. For tolerances not indicated, refer to ACI 117-16.
    b. All floor surfaces shall be within ±1/8" of finished floor elevations designated on plans. If variations greater than this exist, the Architect may direct the Contractor to grind the surfaces to bring them within the requirements. Patching of low spots shall not be permitted. Grinding shall be done as soon as possible, preferably within 3 days, but not until the concrete is sufficiently strong to prevent dislodging coarse aggregate particles.
    c. Floor Flatness/Leveling Tolerances: All floors shall be measured in accordance with ASTM E-1155 "Standard Test Method for Determining Floor Flatness and Levelness Using the "F-Number" System (Inch-Pound Units). Evaluation shall occur within 24 hours of slab placement and be reported to the Architect within 72 hours.
        1) All trowel finished slabs to receive resilient and liquid-applied flooring or to be left exposed and sealed shall achieve overall values of flatness FF 30; and levelness FL 20; with minimum local values of flatness FF 24; and levelness FL 15.
3. Exterior Control Joint & Slab Edge Treatment:
    a. Steel tool all control joints, all exposed perimeter edges, and edges of expansion joints, prior to filling with sealant, to a smooth bullnose form, using an edger having a radius of 1/4 inch, as approved.
    b. Form control joints in uniform straight lines, spaced no greater than 5 feet apart.
    c. Coordinate exact locations and alignment with Architect.

C. Sacked Surfaces: Exposed surfaces that are unacceptable in appearance to the Architect shall be sacked.
    1. Prepare concrete surfaces in accordance with the referenced standards. Remove any form release materials by stoning by hand, power grinding or other method approved by the Architect.
    2. Prepare concrete surfaces to receive sack finishing with a light sand blasting.
    3. Grout application and rubbing should be performed when areas to be treated are shaded and during cool, damp weather. When work is to be performed in hot and dry weather, a fog spray should be available for continuous use.
    4. Prepare grout samples for matching of concrete surfaces for approval by the Architect. These shall be made in the following proportions of gray cement to white cement to sand: 1:1:2, 1:2:3, and 2:1:3, etc. until the correct matching color is obtained on the test areas. Sand should be fine enough to pass the Number 30 sieve. Mixes should be made to a good workable consistency in a clean container and the mix with the best color chosen, or modified if needed.
    5. Provide sufficient qualities of sand and cement from the same source for the complete work at the job site.
    6. Mixing and Application:
        a. Mixing of grout on the job should be timed for it to be used up within 1 to 1-1/2 hours.
        b. Let the grout stand 20 to 30 minutes after mixing, and then remixed before applying.
        c. Soak the concrete surface thoroughly with water at least 15 minutes before applying grout and again just before application 50 that the surface is

adequately wet during the operation.

d. Apply grout with plasterer's trowel or sponge rubber float in sweeping strokes from the bottom up. Brush or spray gun applications may be used when approved by the Architect.
e. Work in freshly applied grout vigorously with a sponge rubber float, then let sit until some of its plasticity is gone but not until it loses its damp appearance. At this point it shall be rubbed with clean, dry burlap to remove the excess grout, leaving no visible film on the surface but filling all air holes.
f. Keep the surface wet for a day after grouting and sack rubbing are completed.

7. Alternate methods of application and materials shall be subject to the approval of the Architect.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for minimum 7 days.

B. Maintain all concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete or a minimum of 14 days.

C. Cure interior floor surfaces by sprinkling with fine water mist immediately behind finish and cover while still moist and as soon as possible, but in no case more than 3 hours after finishing, with specified curing material.

D. Curing Exterior Slabs
   1. Curing Exterior Slabs: Spray slabs with liquid membrane-forming compound specified above, applied at not less than the manufacturer's specified and recommended rate.

E. Protection From Mechanical Injury
   1. During the curing period, protect all concrete during period from all damaging mechanical disturbances, more especially load stresses, heavy shock and excessive vibration.
   2. Protect finished concrete surfaces from damage from construction equipment, materials and methods, from application of curing procedures, and from rain and running water.
   3. Do not load self-supporting structures in manner to over-stress the concrete.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by Owner's Inspector of Record, unless assigned to a Testing laboratory, in accordance with ACI 318-19 per CBC 2022 and California CBC.

B. Provide free access to Work and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspector and testing firm

for review prior to commencement of Work.

D. Concrete Inspections:
   1. Continuous Placement Inspection: Inspect for proper installation procedures.
   2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

E. Strength Test Samples:
   1. Sampling Procedures: ASTM C172.
   2. Cylinder Molding and Curing Procedures: ASTM C31/C31 M, cylinder specimens, field cured.
   3. Sample concrete and make one set of five cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 2,000 sf of surface area for slabs and walls.
   4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
   5. Make one additional cylinder during cold weather concreting, and field cure.

F. Field Testing:
   1. Slump Test Method: ASTM C143/C143M.
   2. Measure slump and temperature for each compressive strength concrete sample.
   3. Measure air content in air entrained concrete for each compressive strength concrete sample.

G. Cylinder Compressive Strength Testing:
   1. Test Method: ASTM C39/C39M.
   2. Test Acceptance: In accordance with CBC 2022 code.
   3. Test one cylinder at 7days.
   4. Test one cylinder at 14 days.
   5. Test two cylinders at 28 days.
   6. Retain one cylinder for 56 days for testing when requested by Architect/Engineer or lOR.
   7. Dispose remaining cylinders when testing is not required.

H. RETESTING: Make necessary corrections to work that is not in conformance with specified requirements. Retests will be paid for by Owner and backcharged to Contractor.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed by Architect/Engineer.

3.8 DEFECTIVE CONCRETE

A. General: As directed by Architect, remove defective concrete from site, or cut out and repair before concrete is thoroughly dry. No patching is to be done until surfaces have been examined by Architect.

B. Permission: Consent to patch any area shall not be considered waiver of right to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.

C. Defective Concrete is:
   1. Concrete not meeting specified 28-day strength.
   2. Concrete which contains rock pockets, voids, spalls, cracks, exposed reinforcing, or other such defects which adversely affect strength, durability or appearance.
   3. Concrete which is incorrectly formed, out of alignment or not plumb or level.
   4. Concrete containing embedded wood or debris.
   5. Concrete having patched voids which were not filled under Architect's direction.
   6. Concrete not containing required embedded items.

D. CORRECTION OF DEFECTIVE WORK
   1. The Contractor shall, at his expense, make all such corrections as directed by the Architect and the Structural engineer.
   2. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings shall be chipped out until all unconsolidated material is removed.

END OF SECTION

METAL FABRICATIONS: SECTION 05 50 00

PART 1 GENERAL

1.01 SUMMARY

A. General Description of Work: The extent of the miscellaneous metal work is indicated on the drawings, which includes, whether specifically specified herein or not, all items fabricated from iron and steel shapes, plates, bars, strips and pipes which are not a part of structural steel or other metal systems in other sections of these specifications.

B. Related Work In Other Sections

1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.

2. Finish painting, except shop priming, covered under Section 09 91 10.

3. Coordinate with all applicable sections of these specifications for related work where miscellaneous metals work is to be used.

1.02 QUALITY ASSURANCE

A. Standard Specifications: Comply with the provisions of the following codes, standards and specifications, except as otherwise shown or specified:

1. AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings”, and including “Commentary of the AISC Specifications”.

2. AISC “Specification for the Design of Cold-Formed Steel Structural Members”.

3. AWS “Structural Welding Code”.

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with the AWS “Standard Qualification Procedure”.

1.03 SUBMITTALS

A. Manufacturer's Data: Submi1 manufacturer's specifications, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.

B. Shop Drawings

1. Submit in accordance with Section 01 33 01.

2. Include shop drawings for the fabrication and erection of all assemblies of miscellaneous metal work, which are not completely shown by the manufacturer's data sheets.

3. Include all details, elevations, welding and other connections, zinc-coating and shop painting information and dimensions; coordinate with connecting and adjacent work; show anchorage and accessory items.

4. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by other trades.

1.04 JOB CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

B. Inserts & Anchorages: Furnish inserts and anchoring devices which must be set in concrete and/or welded to building components for the installation of miscellaneous metal work. Coordinate delivery with other work to avoid delay.

C. Shop Assembly

1. Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site.

2. Disassemble units only to the extent necessary for shipping and handling limitations.

3. Clearly mark units for re-assembly and coordinated installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials - General

1. Metal Surfaces, General: For the fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes including zinc coatings.

2. Steel Wide Flange : ASTM AA572 Grade 50, Fy = 50 ksi.

3. Steel Angeles and Channels: ASTM A36, Fy = 36 ksi.

4. Steel Plates, Shapes and Bars: ASTM AA572 Grade 50, Fy = 50 ksi.

5. Steel Plates to be Bent or Cold-Formed: ASTM A1011 HSLAS Class1, Grade 50, Fy = 50 ksi & Fu = 65 ksi.

6. Cold-Finished Steel Bars: ASTM A 108, grade as selected by fabricator.

7. Steel Pipe: ASTM A53, type as selected; Grade A; black finish; standard weight (schedule 40), except where otherwise shown or specified as stronger.

8. Steel Tubing: ASTM A500, Grade B.

B. Anchors

1. Threaded-Type Concrete Inserts: Galvanized ferrous castings, internally threaded to receive machine bolts; malleable iron ASTM A27; hot-dip galvanized.

2. Drilled-in-Concrete Expansion Anchors: Shall be Hilti concrete anchors as manufactured by Hilti Corporation, or Rawl equivalent, or approved, of the type noted on Structural Drawings.

3. Anchor Bolts/Rods: ASTM F1554, Grade 36, Class 2A

C. Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls.

2. Standard Bolts and Nuts: ASTM A307, Grade A, regular hexagon head.

3. Lag Bolts: Hex head type.

4. Machine Screws: Cadmium plated steel.

5. Plain Washers: Round, general assembly grade carbon steel.

6. Lock Washers: Helical spring type carbon steel.

D. Zinc Coating

1. Unless specifically specified to be galvanized, all steel fabrications with any portion exposed to the exterior in the finished work shall be shop prime painted with mio-zinc filled primer as specified below, Paragraph 2.01E; do not galvanize.

2. Where items are specifically noted in this Section to be zinc-coated or galvanized, other than bolts and similar threaded fasteners, provide by

the “hot-dip” method in accordance with ASTM A123, of the following coating weight per square foot of actual surface:

Steel under 1/16”	1.1 oz. average, 0.8 oz. min.
Steel 1/16” to under 1/8”	1.5 oz. average, 1.2 oz. min.
Steel 1/8” to under 1/4”	2.0 oz. average, 1.8 oz. min.
Steel 1/4” and heavier	2.3 oz. average, 2.0 oz. min.

3. Galvanize bolts and similar threaded fasteners in accordance with ASTM A153, Class A, B, C and D, as applicable.

E. Metal Primer Paint

1. Ferrous Metals - Concealed in the Completed Work: Furnish Tnemec Company, Inc. “Series 10” rust-inhibitive, lead-free, modified alkyd primer, or approved. At fabricator's option, primer specified below for ‘exposed' applications may be used for ’concealed' work.

2. All Exterior Ferrous Metals - Exposed in the Completed Work: Furnish Tnemec Company, Inc. “Series 394 PerimePrime” one-component, moisture-cured, micaceous iron oxide and zinc filled primer, or approved, compatible with high performance primer and finish coats specified in Section 09 91 00.

F. Grout for Installation of Metal Fabrication: For general use, furnish Master Builders “Masterflow 928 Grout”, or approved, “flowable” consistency, with a minimum compressive strength in 28 days of 3000 psi.

2.02 FABRICATION - GENERAL

A. General

1. Use materials of the size and thicknesses shown or, if not shown, of the required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to the dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use the type of materials shown or specified for the various components of the work.

2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32” unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work; punch and shear leaving clean and true surfaces.

3. Weld corners and seams continuously and in accordance with the

recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.

4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown or, if not shown, use Phillips flathead (countersunk) screws or bolts.

5. Detail joints and fastenings for ample strength and stiffness as shown or approved; conceal fastenings wherever possible.

6. Provide holes, cuts and connections, where shown, for work of other trades. Provide far anchorage of the type shown, coordinated with the supporting structure and the progress schedule. Fabricate and space anchoring devices as shown and as required to provide adequate support for the intended use of the work.

7. Form joints to exclude water, where exposed to elements.

B. Shop Painting

1. Zinc-coated (galvanized) material: Not required.

2. All other ferrous metals:

a. Remove all mill scale, rust, loose rust, oil, grease, dirt and foreign matter. Clean and prepare surfaces in exterior work in accordance with SSPC Specification SP6. Clean and prepare surfaces in interior work in accordance with SSPC Specification SP3.

b. Concealed Work: Shop paint with one primer specified above, applied to an even consistency to provide a uniform dry film thickness of between 1.5 and 2.5 mils.

c. Exposed Work: Shop paint with one coat universal alkyd-phenolic primer specified above, applied to an even consistency to provide a uniform dry film thickness of between 2.5 and 3.5 mils.

2.03 FABRICATION - MISCELLANEOUS STEEL ITEMS

A. Bollards: 6-inch diameter, concrete filled steel pipe; 0.280-inch wall thickness. Length and setting as designated on the drawings.

B. Steel Sign Posts

1. Provide 2 inch diameter ASTM A53 schedule 40 steel pipe, lengths as required for mounting handicap and other various traffic control signs to heights above grade as specified under Section 10 14 00.

2. Drill holes of size and in locations required for signs as indicated, ready for installation of signs furnished under Section 10 14 00.

3. Furnish complete with welded cap plate.

4. Galvanized steel pipe posts inside and out after fabrication.

C. Other Items: Furnish all other miscellaneous metal fabrication items shown on Drawings and not classed as structural steel. Fabricate accurately.

PART 3 EXECUTION

3.01 PREPARATION

A. General: Coordinate setting drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous item having integral anchors, which are to be embedded in concrete construction. Coordinate the delivery of such items to the project site.

3.02 SURFACE CONDITIONS

A. Inspection

1. Prior to installation of work in this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where installation of the work of this Section may properly commence.

2. Verify that miscellaneous metal items have been fabricated for installation in strict accordance with the original design and the approved shop drawings.

3. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation of miscellaneous metal items in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 INSTALLATION - FABRICATED ITEMS

A. Installation - General

1. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal item to in-place construction; including threaded fasteners for concrete inserts, toggle bolts, through-bolts, Tag bolts and other connectors as required.

2. Cutting, fitting & placement:

a. Perform all cutting, drilling and fitting required for the installation of the

miscellaneous metal items.

b. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

c. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction. .

d. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

e. Grind joint smooth and touch-up shop paint coat.

f. Do not weld, cut or abrade the surfaces of units which have been hot-dip galvanized after fabrication, and are intended for bolted field connections.

B. Steel Pipe Bollards: Install at all locations shown, set in concrete as detailed or otherwise required for rigidity, and conforming to the following additional requirements:

1. Unless otherwise shown, pipe bollards shall extend a minimum 36 inches below adjacent finish grade, set in concrete footing as detailed.

2. Drill holes for footings in firm, undisturbed or compacted soil.

3. Place concrete around bollards in a continuous pour, tamp for consolidation. Check each bollard for vertical and top alignment.

4. After bollards have set, fill with concrete and form top to a convex shape.

C. Steel Sign Posts: Install at various site locations as shown on drawings for application of signage; set in concrete as detailed and required for rigidity, plus conforming to the following additional requirements:

1. Do not set posts prior to completion of final grading.

2. Drill holes for post footings in firm, undisturbed or compacted soil.

3. Place concrete around posts in continuous pour, tamp for consolidation.

4. Check each post for vertical and top alignment.

D. Other Fabricated Items: Install all other steel items as specified above and as otherwise shown on Drawings and not classed as structural steel. Install as detailed or required far rigidity and permanence. Grind all welds smooth in fabrication work to be left exposed in completed work.

E. Touch-Up Painting

1. Primed Surfaces: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal items are specified in Section 09 91 10 of these specifications.

2. Galvanized Surfaces: Clean galvanized surfaces damaged by welding o‹ other construction means and apply zinc-rich primer in accordance with manufacturer’s instructions.

END OF SECTION

SECTION 06 10 00: ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Miscellaneous wood blocking, nailers, and supports.

B. Preservative treated wood materials.

1.02 RELATED REQUIREMENTS

A. General Requirements: Drawings and general provisions of the Contract Documents including General, Supplemental and other Conditions and Division 01, "General Requirements" Sections, apply to the work specified in this Section.

1.03 REFERENCE STANDARDS

A. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016.

B. ASTM D 2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2017.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2020.

E. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.; 2015.

F. PS 1 - Structural Plywood; 2009.

G. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

H. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2017.

1 .04 SUBMITTALS

A. See Section 01 33 01 - Submittal Procedures.

B. Product Data:
   1. Include data for wood-fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials

comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.05 QUALITY ASSURANCE

A. Grading Rules
   1. Lumber (Softwoods):
      a. For lumber sizing, conform to U.S. Product Standard PS 20-05.
      b. Conform to Western Wood Products Association "Standard Grading Rules for Western Lumber", effective March 1, 1998, hereinafter called "WWPA".
   2. Plywood: Conform to "U.S. Department of Commerce Product Standard PS 1-09 "Construction & Industrial Plywood" hereinafter called "PS 1-09".

A. Grade Marks: Show applicable association grade mark and trade mark on each piece of material, or furnish certificate of inspection with each shipment, attesting conformance to specified grades.

B. Standard Specifications For Preservative Treatment: Conform to the standard specifications listed hereinafter as published by the American Wood Preservers Association, hereinafter called "AWPA".

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant and Preservative Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

A. Lumber Grades - Non-Load Bearing: Furnish the following lumber species and grades for the work specified below, of nominal sizes shown or specified:
   1. Blocking, Backing, Shims and Nailers: Hem-fir "Standard & Btr.", S4S, for 2 x 4 inch nominal size and smaller; Hem-fir "No.3", S4S, for 2 x 6 nominal size and larger.
   2. Sizes and thicknesses as shown on drawings or otherwise specified herein.

B. Grades Of Sanded Softwood Plywood, General Use
   1. Unless otherwise specified, provide conforming to PS 1-09, Group I Douglas Fir Grade "A" Int. APA rotary cut veneer on exposed face and/or

faces with Grade "B" on concealed face veneers; minimum 5-ply for 3/4 inch thickness.
2. Sizes and thicknesses as shown on Drawings or otherwise specified herein.

C. Nails, Screws & Bolts:
1. Furnish carbon steel bolts, square head, ASME B18.2.1 furnished with square nuts, unless noted otherwise on Structural Drawings.
2. Furnish lag bolts ASME B18.2.1, gimlet point, square head, unless noted otherwise on Structural Drawings.
3. Furnish wood screws, ASME B18.6.1, Type 17 point, Flat head, unless noted otherwise on the drawings. Provide stainless steel screws where specified on the drawings.
4. Furnish nails, ASTM F1667, Common, as specified and as approved, unless noted otherwise on Structural Drawings.
5. Provide all necessary nails, spikes, screws and bolts with nuts and washers required for proper installation of rough carpentry and carpenter's steel items.
6. Hot-dip galvanize hardware for exterior work or exposed to moisture.

D. Lumber: Douglas Fir-Larch unless otherwise noted. Lumber designated as Douglas Fir South is not acceptable. All lumber shall be graded under the American Softwood Lumber Standard DOC PS 20-15 and one of the following:

1. Standard Grading Rules, West Coast Lumber Inspection Bureau (WCLIB) or Western Lumber Grading Rules, Western Wood Products Association (WWPA).

2. Standard Specifications for Grades of California Redwood Lumber, current edition - RIS.

E. All lumber shall be new with no re-use except as permitted Architect. Lumber 6x or thicker will be free of heart center without any pitch enclosed within the piece or showing on any surface. Maximum moisture content 19%.

1. Lumber Grades: All lumber grades and plywood shall comply with the following minimum requirements for species and grades unless specifically noted otherwise on the Drawings.

a. General: Douglas Fir Larch as follows:
i. 2x4 No. 1 Vis. Graded
ii. 2x6 No. 1 Vis. Graded
iii. 2x8-2x14 No. 1 Vis. Graded
iv. 3x4-3x14No. 1 Vis. Graded
v. 4x4-4x10 No. 1 Vis. Graded
vi. 4x12-4x16 No.1 Vis. Graded

vii. 6x6-larger Select Structural Vis. Graded

2. Sills: Douglas Fir No. 1; pressure treated with approved preservative, marked or branded by an American Lumber Standards Committee (ALSC) approved inspection agency. Foundation grade Redwood sills may be used only for non-structural stud walls.

3. Blocking, bridging, furring, stripping and nailers - No. 1.

2.02 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative Treated Wood shall bear the quality mark up an inspection agency that maintains continuing supervision, testing and inspection over the quality of the preservative-treated wood. Such inspection agencies shall be listed by an accreditation body which complies with the requirements of the American Lumber Standards Treated Wood Program, or equivalent. The mark shall be stamped on, or a label affixed to the preservative-treated wood, and shall comply with CBC 2303.1.9.1.

PART 3 EXECUTION

3.01 PREPARATION

A. Preparation For Pressure Preservative Treatment
   1. Incising Materials: All lumber and timber members specified herein to be treated shall be incised by a machine having power driven rolls designed to incise to a uniform depth and continuity of predetermined pattern. Timber or lumber less than 3 inches in the least dimension shall be incised on the wide faces only.

B. Drying Of Treated Material: After treatment, dry lumber to a moisture content of 19 or less.

3.02 ROUGH CARPENTRY INSTALLATION - GENERAL

A. Rough Carpentry - General:
   1. Select material sizes to minimize waste.
   2. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
   3. Discard units of material with defects which might impair the quality of the work and units which are too small to fabricate the work with minimum joints or the optimum joint arrangement.
   4. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

5. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by recognized standards. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
6. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
7. All bolts and screws shall be tightened immediately before being covered or closed in.

END OF SECTION

SECTION 06 20 00: FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section specifies interior miscellaneous wood trim.

B. Related requirements specified elsewhere include:
   1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.
   2. Section 09 91 10 - Painting.

1.02 SUBMITTALS

A. Shop drawings of fabricated items and trim including all details of anchorage.

B. Samples of materials for making stain and transparent finish samples. Samples of putty for clear finished woods.

C. Mill grade certificate. if material cannot be marked on a concealed surface.

D. Manufacture's storage, handling and installation instructions.

1.03 QUALITY ASSURANCE

A. Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Wood: Store indoors, in well ventilated area in conditions as described in Chapter 1 of the referenced Manual of Millwork.

B. Stack lumber so that no pieces cantilever. Support wood lumber at maximum of 30-inches on centers. Support wood polymer lumber at maximum 24-inch centers.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Wood - General: Selected for exposed surfaces to meet requirements for WI "Custom Grade" work, Manual of Millwork Table 3-4, unless otherwise indicated.
   1. Interior wood: Dry; with moisture content between 6 and 12 percent, unless otherwise indicated. Milled solid stock; finger joints not permitted.
   2. Finger jointed wood: Not permitted.

B. Wood Trim:
   1. For trim designated to be painted, provide of Hemlock or Ponderosa Pine of nominal sizes shown, S4S.
   2. Construct and form trim to various sizes and shapes as noted and detailed on Drawings.

2.02 FABRICATION

A. General
   1. Mill and fabricate in as long pieces as practical.
   2. Machine all surfaces and ease exposed edges unless otherwise noted.
   3. Finish and assemble at shop to greatest extent possible.
   4. WI manual Sections 10 and 11, "Custom Grade" for transparent finish, unless otherwise indicated.

2.03 ANCILLARY MATERIALS

A. Hardware: Provide self-tapping, flathead drywall screws for securely attaching finish carpentry work to metal stud wall framing and furring. Screws shall be long enough to penetrate structure per the California Building Code regulations.

B. Putty: As proposed by Contractor and approved by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.

3.02 PREPARATION

A. Separate wood product bundles and condition wood materials for a minimum of 72 hours. Allow wood to achieve prevailing humidity conditions in installation areas prior to installing.

3.03 INSTALLATION

A. Wood Trim: Install with minimum number of joints possible. Use full-length pieces from maximum lengths available. Exposed surfaces free from tool marks, torn grain, cross sanding, and workmanship defects that cannot be concealed by specified finish.
   1. Install level, plumb and true, with members neatly and accurately scribed in place.
   2. Stagger joints in adjacent and related members.
   3. Cope at returns; miter exterior angles, cope interior angles. Produce tight fitting joints with full surface contact throughout length of joint.
   4. Joints: End-to-end scarfed
   5. Set screw heads 1/16 inch for puttying. Clean up trim after installation by sand papering and remove sharp external corners.

3.04 CONSTRUCTION

A. Tolerances
   1. Install the work plumb, level, true and straight with no distortions. Conceal shims.

a. 1/16-inch maximum offset in flush adjoining surfaces.
b. 1/8-inch maximum offset in revealed adjoining surfaces.

2. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

3.05 ADJUSTMENT AND FINISHING

A. Ease salient corners and edges and sand all exposed surfaces of smooth finish wood.

B. Repair damaged and defective finish carpentry work and eliminate functional and visual defects. Chipped or split members are considered a defect.

C. Replace where repair is not possible.

D. Adjust joinery for uniform appearance.

END OF SECTION

SECTION 07 62 00: SHEET METAL FLASHING & TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. Section specifies sheet metal flashings, copings, downspouts and other miscellaneous shop fabricated sheet metal items.
B. Related Work In Other Sections
   1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.
   2. Sealing - Section 07 90 10, Joint Sealing.
   3. Section 09 91 10, Painting.

1.02 QUALITY ASSURANCE

A. Standard Construction Manual: Conform to the construction and recommendation set forth in the "Architectural Sheet Metal Manual of the Sheet Metal & Air Conditioning Contractors National Association, Inc., September 2003 Edition, hereinafter in this Section called "Standard Manual".
B. Performance Requirements: Install work weather-tight and watertight, without waves, warps, buckles, and distortions resulting from fastening or expansion and contraction stresses. Sheet metal and roofing shall make watertight assembly.
C. Design Requirements
   1. In accordance with standards described in the SMACNA "Architectural Sheet Metal Manual," unless otherwise specified.
   2. Allow for expansion and contraction over an ambient temperature range of 60 degrees Fahrenheit.

1.03 SUBMITTALS

A. Samples & Shop Drawings
   1. Submit shop drawings showing the manner of forming, jointing and securing the metal to form flashings and trim. Show expansion joint details and waterproof connections to adjoining work and at obstructions and penetrations.
   2. Submit, for approval, 6 inch length minimum samples, full size, of each different item of formed sheet metal work specified and detailed.

1.04 JOB CONDITIONS

A. Coordination: Coordinate metal flashing and trim work with interfacing of the installation of roofing and other adjoining substrate work for proper sequencing of each installation.
B. Electrolytic Protection: Wherever metals of different galvanic range are to be in contacts provide industry-approved separation by bituminous paint coats, bitumen saturated felts, or tinning, as applicable and approved.

1.05 WARRANTY

A. Warranty
   1. Furnish prepainted sheet metal manufacturer's standard 20-year minimum warranty covering color fade, chalk, and film integrity of factory prepainted sheet metal finish.
   2. Warranty all roof flashings and sheet metal assemblies specified herein watertight and weather-tight for two (2) years from date of substantial completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless Steel Sheets: Type 304, ASTM A167, with AISI #2D finish, dead soft, fully annealed; 22 gauge unless otherwise shown or specified.

B. Unpainted Flashing Sheets: Unless otherwise specified herein or indicated on details, furnish 22-gauge minimum hot-dipped galvanized steel sheet complying with ASTM A924, Grade C, G90 zinc coating designation, or AZ50 zinc-aluminum coated steel, as approved.

C. Solder: Furnish conforming to Fed. Spec. 00-S-571 D, Type AC, Composition Sn50 unless otherwise specified.

D. Soldering Flux: Furnish conforming to Fed. Spec. O-F-506C Type AC or of type recommended by the industry for type of metal being soldered.

E. Fastening & Miscellaneous Materials
   1. Metal, - General: Stainless steel.
   2. Screws and Washers:
      a. Unless otherwise noted or shown, furnish of slotted panhead thread forming ASA Type A, of material specified hereinabove, as applicable; use screws for exposed applications.
      b. Where thread-cutting screws are required, use ASA Type B, of material specified hereinabove, as applicable.
      c. For exterior exposed screws, use dished type plain periphery washers of same material as specified hereinabove, as applicable, plus approved neoprene washer under each metal washer.
      d. Lengths and gauges as required and approved for secure and permanent fastening.
   3. Bolts, Nuts and Washers:
      a. Except as otherwise noted or shown, furnish standard hexagon head or square head bolts, of sizes shown and required for secure and permanent fastening of the work, of material specified hereinabove, as applicable, complete with flat washers and nuts of same material.
      b. On exterior exposed work, include dished type plain periphery metal washers, of same material as bolt, plus approved neoprene washer under each metal washer.

4. Nails: Furnish large headed annularly grooved nails of materials specified hereinabove, as applicable; use nails generally only for concealed application. Where absolutely necessary to expose nail heads, provide approved neoprene washer under head.
5. Rivets: Except as otherwise noted, furnish pop type rivets closed end type, or approved, of materials specified hereinabove, as applicable.
6. Cleats: Same metal and gauge as sheet being anchored, continuous, punched for anchors spaced 12 inches o.c.
7. Flashing Cement: Furnish conforming to Fed Spec. SS-C-153, Type I, asphalt base with asbestos fibers added.
8. Sealant: Furnish Pro-Seal (800/349-7325) "Pro-Seal 34" single component, non-sag, elastoplastic, M34 polycarbon/polycarbonate sealant; no substitutes. Color shall be clear.
9. Silicone Seal System: For spanning gap joints between parapet wall cap flashings, furnish Dow Corning's "123 Silicone Seal" preformed silicone extrusion strip seal system using Dow Corning Dow "791" or Dow "795" silicone sealant. Seal strip color as selected by Architect from manufacturer's standard colors.
10. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.

2.02 FABRICATION - GENERAL

A. Metal Fabrications - General
   1. General:
      a. Comply with details shown, and with applicable requirements of the SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Comply also with material manufacturer instructions and recommendations.
      b. Shop-fabricate work to greatest extent possible. Neatly form all work to size, shape and dimensions shown or required to fit substrates; make all angles and lines in true alignment. Verify all dimensions at the building.
      c. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work.
      d. Unless otherwise specified, fabricate items in 10 feet maximum sheet lengths, as approved, and hold number of JOINTS?? to a minimum. Shop form, lap, rivet and solder corners and angles into one piece 18 to 24 inches each way from corner or angle.
      e. Form exposed sheet metal work without excessive Oil-canning, buckling and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems; hem all drip legs of copings and flashings at 45 degrees.
   2. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
   3. 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 industry standards.

4. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

2.03 FABRICATED ITEMS

A. Miscellaneous Flashings

1. Furnish all other miscellaneous flashings shown on the drawings but not specifically specified above, constructed of 24 gauge prepainted steel, of configurations and sizes as shown; color as selected in each case.
2. Fabricate miscellaneous formed flashing units with formed joint covers of same material as flashings, for installation behind main members where possible.

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Examine all surfaces to be covered with sheet metal; report any improper of defective previous work and do not proceed with work under this Section until previous defective work is corrected.

3.02 INSTALLATION

A. Sheet Metal Workmanship
1. Except as otherwise shown or specified, comply with the recommendations and instructions of the manufacturer of the sheet metal being installed, and with SMACNA "Architectural Sheet Metal Manual".
2. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat seams with minimum exposure of solder, welds and sealant. Except as otherwise shown, fold back the sheet metal to form a hem on the concealed side of exposed edges.
3. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners and expansion provisions wherever possible in exposed work, and locate so as to minimize the possibility of leakage. Cover and seal work as required for a watertight installation.
4. Provide cleat-type anchorages for metal flashing and trim wherever practical, arranged to relieve stresses from building movement and thermal expansion. Erect all work straight, sharp, plumb and level in true plane free of bulges and waves.
5. Install work with laps, joints and seams which will be permanently watertight and weatherproof; make all lap joints with opening away from prevailing winds; laps 3 inches minimum. Install sealant as shown as work proceeds.

B. Miscellaneous Flashings: Install all other miscellaneous flashings shown on the Drawings, securely anchored to adjacent construction.

END OF SECTION

SECTION 07 90 10: JOINT SEALING

PART 1 - GENERAL

1.01 SUMMARY

A. Section specifies joint sealing complete for the following applications:
   1. Interior joints where indicated and wherever there is an exposed joint between materials, which do not fit tightly together.
   2. Sealant where indicated and where required to make building watertight.

1.02 SYSTEM DESCRIPTION

A. Design Requirements: Conform to recommendations of ASTM C 1193
   1. Sealing building envelope
      a. Seal typical building joints with non-sag type sealant.
      b. Seal indicated floor joints with self-leveling type sealant.

B. Performance Requirements
   1. Building envelope
      a. Make watertight and weather-tight.
      b. Exterior work that does not remain watertight and all work which does not retain all properties inherent in the product as stipulated by the manufacturer will be considered faulty.

1.03 SUBMITTALS

A. Manufacturer's product literature and installation instructions for type and grade of product. Indicate sealant chemical characteristics, substrate preparation, limitations and color availability.

B. Sample beads for color selection by Architect.

C. Certification of compatibility by sealant manufacturer of accessory components.

D. Schedule of proposed sealant for each and every type of joint to be filled.

E. Submit SWRI certificate of validation verifying Manufacturer's published specification data.

1.04 QUALITY ASSURANCE

A. Manufacturer of sealant and caulking material to certify that cleaners, joint filler or bond breakers, and primers, for a particular application, are compatible with sealant.

B. Manufacturer certifications: Certify that sealant has been tested for cohesion and adhesion to surfaces onto which the sealant is placed.

1.05 QUALITY CONTROL

A. Mock up: Test sealant for adhesion and cohesion to surfaces in accordance with ASTM C 1521; and for foam sealants, test for expansion onto which the sealant is placed.

1.06 PROJECT CONDITIONS

A. Environmental Requirements
   1. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
   2. Do not apply materials when temperature is below 40 degrees Fahrenheit, or under extreme temperature conditions when joint openings are at maximum or minimum width.

1.07 WARRANTY

A. Provide five year warranty. Include coverage for installed sealants and accessories which fail to achieve watertight seal exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ChemRex Corporation, Sonneborn, or approved equal.

2.02 MATERIALS

A. General: Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Products of, or certified as compatible by, the approved manufacturer of the sealant or caulking material.

C. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24);
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

D. Sealants and caulking compounds
   1. Interior caulking compound and acoustical sealant for non-moving joints in dry areas. Siliconized acrylic latex, conforming to ASTM C 834; VOC Content: maximum 42 grams/liter; colors as selected from manufacturer's standard colors.
   2. Exterior wall sealant - general purpose: Non-priming, non-sag, one-part polyurethane. Conform to ASTM C 920, Type S, Class 25, Grade NS, Use NT, M, T, A, I, a and Federal Specification TT-S-00230C, Type II, Class A. VOC content Maximum 45 grams/liter; Colors as selected from manufacturer's standard colors.
   3. Floor and pavement sealant: Pourable, self-leveling, two-part polyurethane; ASTM C 920, Type M, Grade P, Class 25, Use T, zero VOC; colors as selected from manufacturer's standard colors. Minimum Shore hardness of 35.
   4. Butyl Sealant: Meeting Federal Specification TT-S-001657, Type I and ASTM C 1311.

5. Sealer Tape for concealed joints between two assembled rigid surfaces in compression: Presstite No. 579.6 as manufactured by Inmont Corporation, Presstite Products Division or "Tacky Tape - SM 5227" as manufactured by Schnee-Moorehead, Inc.; medium density as manufactured by Norton Performance Plastics Corporation, Granville, NY.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Indoor Air Quality:
   1. Temporary ventilation: Provide temporary ventilation during work of this Section.
      a. Coordinate interior application of joint sealants with interior finishes schedule.

A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.
B. Ensure that newly placed surfaces that are to be sealed have fully cured.

3.02 PREPARATION

A. In accordance with manufacturers' instructions
   1. Mask adjacent surfaces where necessary to maintain neat edge.
   2. Joints and spaces to be sealed: Make clean, dry and free of dust, loose mortar and other foreign materials.
   3. Verify that environmental requirements are within tolerance range as recommended by the manufacturer of the sealant.

3.03 APPLICATION

A. In accordance with manufacturers' instructions and ASTM C 1193.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Fill joint space completely from back to top, without voids, and tool slightly concave; finish uniformly smooth without laps, sags, or depressions.

3.04 FIELD QUALITY CONTROL

A. Testing: Perform non-destructive test for adhesion and cohesion in accordance with ASTM C1521.

3.05 ADJUSTING

A. Finishing: For work that is exposed to view, tool to a uniform surface with neat, straight edges and no excess material on adjacent surface.

3.06 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan

B. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.

C. Place used sealant tubes and containers in areas designated for hazardous materials.

END OF SECTION

HOLLOW METAL DOORS: SECTION 08 11 13

PART 1 GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.

B. Section 08 71 00, Door Hardware.

C. Section 09 91 00, Painting.

1.03 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. 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. Manufacture all labeled doors in strict conformance with the specifications and procedures of Underwriters Laboratories Inc. (UL) or Warnock Hersey.

1.04 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. CAL-GREEN Submittals:

1. Product Data — VOC Limits: For adhesives, sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 61 16.

D. Shop Drawings: Show all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

E. Executed Guarantee of Contractor/Subcontractor per Article 1.5.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 00.

B. Submit fully executed Guarantee with submittal package required by Article 1.4.

C. Guarantee doors from defects in materials and workmanship including twisting, buckling or warping.

1.06 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code, edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

C. NFPA 80, Standards for Fire Doors and Other Opening Protectives.

D. American National Standards Institute (ANSI) A250.7 “Nomenclature for Steel Doors and Steel Door Frames”.

E. Hollow Metal Manufacturers Association (HMMA) recommended standards for hollow metal doors

F. Recommended Locations for Builder’s Hardware, Door and Hardware Institute.

G. ANSI/DHI A115, Hardware Preparation in Hollow Metal Doors and Frames.

1.07 FIRE RESISTIVE LABELS

A. Labeled Doors : Construct frames for labeled openings per UL or Warnock Hersey requirements and their listings. Provide UL metal label, pop-riveted to door and frame, for fire resistive rating indicated; embossed labels are not acceptable. Do not paint over labels.

B. Doors to be in compliance with UL 10B for Fire Test of Door Assemblies and UL 10C for Positive Pressure Fire Tests of Door Assemblies

1.08 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 an upright position, protected under cover, dry conditions at least 4 inches off the ground and in areas so as to not interfere with the

progress of the work. Doors with dents or other defects not repairable will be rejected.

C. Transport, store and handle in strict conformance 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. Assembled frames shall be stored in a vertical position, five units maximum in a stack.

F. Do not use non-vented plastic or canvas shelters, which create a humidity chamber and promotes rusting. Remove wet wrapping or packing from doors immediately. Provide 1/4 inch space between doors and between frames to promote air circulation.

1.09 PROJECT CONDITIONS

A. Verify that conditions are correct and proper for installation of products. Obtain accurate job dimensions of openings including floor elevations. Ascertain correct locations and arrangements of anchorage required to accommodate work.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. VOC Limits for adhesives, sealants, fillers, coatings and primers. Comply with limits specified in related Section.

B. Provide products conforming to local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application. If specified product exceeds current requirement, provide conforming product at no additional cost. Provide written confirmation to Architect describing reason for revision and demonstrate compliance of replacement product with specified requirements.

2.02 ACCEPTABLE MANUFACTURERS

A. Titan Metal Products of Sacramento, CA; Forderer Cornice works of Hayward, CA; Door Components, Inc., Fontana, CA; or accepted equal.

2.03 HOLLOW METAL DOORS

A. General: Shop fabricate to required sizes and shapes. Form and weld with straight arises, edges and corners; surfaces free from warp, wave, buckle,

dents or other defects. Use of excessive plastic filler to conceal manufacturing defects is not acceptable. Construct per HMMA specifications and standards (latest edition) in addition to requirements as indicated in these specifications.

1. Door faces and core reinforcing shall be formed from A60 Galvanealled Sheet Steel, conforming to ASTM A653-96.

B. Fabrication: Flush Doors; Type II, heavy duty, 1-3/4 inches, 18 ga. minimum thickness steel face sheets at interior doors and 16 ga. minimum thickness zinc-coated sheets at exterior doors with 18 ga. interlocking steel stiffeners at 6” o.c. +/- °7” vertically. Faces shall be free of seams or joints. Top and bottom edges to be closed with a continuous steel channel, not less 16 ga., spot welded to both face sheets. Doors to have an additional flush closing channel at their top edges. Openings to be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture. Seal top edge to make waterproof using plastic filler sanded flush. Vertical edges shall be beveled 1/8” in 2”.

C. Reinforcement: Stiffen as recommended by HMMA or using any method conforming with ANSI A151.1 criteria for determining twist test strength or as indicated by these specifications. Exposed spot welding is not acceptable.

D. Insulation: Door manufacturer’s standard sound deadening material on door interior. Sound deadening material in labeled doors shall conform to UL or Warnock Hersey requirements. Thermal insulation properties to have a U factor of 0.263 (R value of 3.8) for polystyrene core and U factor of 0.09 (R value of 11.1) for polyurethane core at exterior doors.

E. Cutout: Make cutouts for required louvers and glazing.

F. Preparation for Hardware: Factory prepare and reinforce doors for indicated finish hardware. Make cutouts and mortises for mortise hardware.

1. Provide 7 ga. (0.167 in., 4.2 mm) offset steel reinforcement for hinges; 12 ga. (0.093 in., 2.3 mm) for locksets and surface applied hardware. All thicknesses provided are minimum.

2. Internal reinforcing shall prevent collapse of face sheets by stress of lockset installation. Provide reinforcement on both faces of all doors for surface mounted closers (regular and parallel arm type) whether or not closers are indicated.

3. Perform drilling and tapping for mortise hardware at factory to templates furnished by hardware vendor. Drilling and tapping for surface applied hardware by hardware installer.

4. Doors to be prepared for finish hardware per templates supplied by the hardware supplier.

G. Louvers: Factory prepare and reinforce doors as necessary for louvers and vision frames.

1. Louvers (fixed): Anemostat Door Products PLSL louver with 12 gauge cold rolled steel security grille, 20 gauge cold rolled steel non-vision louver blades, non-rated with galvanized steel (zinc plated) finish at interior and exterior location, field painted. Provide insect screens at exterior locations

2.04 PRIMING

A. Bonderize and factory paint doors with one coat of rust inhibitive primer. Back coat frames with asphaltic emulsion wherever frames will be in contact with masonry. Verify and coordinate primer compatibility with finish painting. Prior to and after primer is applied, store and protect doors properly to prevent the possibility of rusting or moisture damage. Doors shall be re-primed on-site prior to finish painting (by painting contractor).

PART 3 EXECUTION

3.01 INSPECTION

A. Prior to installation of the work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

B. Verify that specified items may be installed in accordance with the approved design.

C. Prior to fabrication, verify every opening size, including wall thickness, and coordinate with door sizes as shown on drawings.

D. In the event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 INSTALLATION

A. General: Install metal doors and accessories in conformance with reviewed Shop Drawings and manufacturer’s data, and as specified herein.

B. Install door flashing system components as described in this specification, indicated in drawings and as recommended by the flashing manufacturer.

C. Doors: Hang with clearances noted in Section 08 71 00, Door Hardware, unless otherwise indicated or required for rated assemblies. Apply hardware in conformance with SDI-100 and the manufacturer’s written instructions.

D. Louvers: Install with tamperproof screws as provided by the manufacturer.

3.03 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Immediately prior to punch list walk-through, check and re-adjust operating finish hardware items, leaving metal doors undamaged and in complete operating condition.

3.04 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, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

END OF SECTION

DOOR HARDWARE: SECTION 08 71 00

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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.

2. Thresholds, gasketing and weather-stripping.

3. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.

1. Division 8: Section - Steel Doors and Frames.

1.03 REFERENCES (Use date of standard in effect as of Bid date.)

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 - Fire Doors and Other Opening Protectives

2. NFPA 105 - Smoke and Draft Control Door Assemblies

F. UL - Underwriters Laboratories.

1. UL 10C - Fire Tests of Door Assemblies

2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.04 SUBMITTALS & 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 one electronic copy 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. Contractors 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. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 – Exterior from Corridor 101	(b)90º	(c) RH
			(d) 3’ 0”x7’ 0” x 1-3/4” x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges – (k) 5BB1HW 4.5 x NRP (l) ½ TMS	(m) 626	(n)IVE
2	6AA	1 ea	Lockset – ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(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.

1.05 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 pans 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.

1.06 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. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

1.07 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: Seven (7) years.

2. Closers: Ten (10) years, except electronic closers shall be two (2) years.

3. Exit devices: Three (3) years.

4. All other hardware: Two (2) years.

1.08 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.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and

coordination required with related work. Review District's keying standards.

PART 2 PRODUCTS

2.01 MANUFACTURERS

Item		Manufacturer	Acceptable Substitutes
A.	Hinges	Ives	Stanley, McKinney
B.	Locks, Latches & Cylinders	Schlage	None
C.	Closers	LCN	None
D.	Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
E.	Dust Proof Strikes	Ives	Trimco, BBW, DCI
F.	Stops	Ives	Trimco, BBW, DCI
G.	Thresholds	National Guard	Pemko, Zero
H.	Seals & Bottoms	National Guard	Pemko, Zero

2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

1. Hinges shall be sized in accordance with the following:

a. Height:

1) Doors up to 41” wide: 4-1/2” inches.

2) Doors 42” 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.

2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Continuous Hinges: As manufactured by Ives, an Ingersoll-Rand Company. UL rated as required.

C. Heavy Duty Cylindrical Locks and Latches: Schlage “ND” Series as scheduled with “Rhodes” design, fastened with through-bolts and threaded chassis hubs.

1. Locksets to comply with ANSI A156.2, Series 4000, Grade 1; tested to exceed 3,000,000 cycles. Locksets shall meet ANSI A117.1, Accessible Code.

2. Chassis: One piece modular assembly and multi-functional allowing function interchange without disassembly of lockset.

3. Spindle shall be deep-draw manufactured not stamped. Spindle and spring cage to be one-piece integrated assembly.

4. Anti-rotation plate to be interlocking to the lock chassis. Lock design utilizing bit-tabs are not acceptable.

5. Lever Trim: Accessible design, bi-directional, independent assemblies.

6. Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge. When provided, deadbolt to be controlled with a strike on the lever hardware.

7. Thru-bolts to secure anti-rotation plate without sheer line. Fully threaded thru-bolts are not acceptable.

8. Spring cage to have double compression springs. Manufacturers utilizing torsion springs are not acceptable.

9. Latchbolt to be steel with minimum ½” throw deadlatch on keyed and exterior functions; ¾” throw anti-friction latchbolt on pairs of doors. When provided, deadbolt to be controlled with a strike on the lever hardware.

10. Strikes: ANSI curved lip,1-1/4” x 4-7/8”, with 1” deep dust box (K510-066). Lips shall be of sufficient length to clear trim and protect clothing.

D. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. 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.

2. 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.

3. 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.

4. 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.

5. Closers shall be installed to permit doors to swing 180 degrees.

6. 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.

7. 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.

8. Maximum effort to operate closers (interior and exterior) 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. Doors shall comply with CBC 11B-404.2.8.1.

9. Provide sex-bolted or through bolt mounting for all door closers.

E. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.

2. Do not install floor stops more than four (4) inches from the face of the wall or partition.

3. 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.

F. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10” high and 2” LDW at single doors and 10” high and 1” less door width at pairs of doors. 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.

G. 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 1/4” fasteners, red-head flat-head sleeve anchors (SS/FHSL).

4. Thresholds shall comply with CBC Section 11B-404.2.5.

H. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified, Category “J” listed seals complying with NFPA 80 & NFPA 252 Standards. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.

2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Category “G” furnish fire-labeled opening assembly complete and in full compliance with NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.

3. Smoke & Draft Control Doors, Provide Category “H” listed seals complying with NFPA 105 for use on “S” labeled Positive Pressure door assemblies.

I. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

J. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Door Locks: Arrange a keying meeting with Architect, Owner, Hardware Supplier and other involved parties to ensure locksets, and locking hardware, are functionally correct and keying complies with project requirements. Master key all locksets and cylinders to the existing (Grand) Masterkey system as directed by the Owner. Provide temporary brass construction cores for all locksets and cylinders.

B. Supply 3 keys for each lock.

C. Supply additional keys/cores in the following quantities.

1. 5 master keys for each set.

2. 2 grand masterkeys.

3. 8 construction keys.

4. 2 control keys.

5. 10 extra cores.

D. Permanent keys will not be made available to the General Contractor, any Subcontractor, or Supplier under any circumstances. Transmit all permanent keys to

Owner by Registered Mail, return receipt requested.

E. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the hardware supplier. Construction cores and keys remain the property of the Hardware Supplier.

F. Permanent Keys and Cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent Keys are to be stamped "Do Not Duplicate."

2.04 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.

2.05 FASTENERS

A. 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.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 EXECUTION

3.01 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.

3.02 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 Installer shall coordinate with security contractor to route cables to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing o1 the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

3.03 ADJUST AND CLEAN

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.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturer's instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. The Door and Hardware Schedule on the Drawings indicates which hardware set is used with each door.

HW Set: 01 (Door Replacement – Student Multi-Stall Exterior)				
Quantity	*Item*	*Part Number*	*Finish*	*Manufacturer*
3 EA	Hinge	T231 NRP 4½" x 4½"	US32D	McKinney
1 EA	Deadbolt	B663	626	Schlage
1EA	Lock Cylinder	SFIC/Schlage Core	Keyway	Schlage
1EA	Push Plates	8200 6 x 16	Stainless Steel	Ives
1EA	Pull Plates	8302 4 x 16	Stainless Steel	Ives
1 EA	Closer	4040XP	689	LCN
1EA	Kick Plate	K1050	US26D	Rockwood
1 EA	Wall Stop	409	US26D	Rockwood
1EA	Threshold	158A	Alum	Pemko
1 EA	Door Bottom Sweep	2221 AV	Alum	Pemko
1EA	Door Gasket	S44 BL	BLK	Pemko

Manufacturer Abbreviations

IVE	Ives	Hinges, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN	LCN	Door Closers
McKinney	McKinney Door Solutions	Hinges
NGP	National Guard Products	Thresholds, Gasketing & Weather-stripping
Pemko	Pemko ASSA ABLOY	Thresholds, Gaskets, Sweeps
Rockwood	Rockwood ASSA ABLOY	Kickplates, Wall Stops
SCH	Schlage Lock Company	Locks, Latches & Cylinders

END OF SECTION

SECTION 09 29 00: GYPSUM BOARD

PART 1 GENERAL

1.01 SUMMARY

A. Section specifies gypsum board applied to wood or metal framing and furring. Section also specifies gypsum board furring systems.

B. Related requirements specified elsewhere:

1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.

2. Section 06 10 00 Rough Carpentry.

3. Section 09 91 10, Painting.

1.02 SYSTEM DESCRIPTION

A. Design Requirements

1. Install fire rated assemblies per listed designs shown on drawings and applicable code requirements. Use only one manufacturer’s products in the fabrication of each assembly, unless otherwise permitted by governing authorities.

1.03 SUBMITTALS

A. Brochures: Furnish for all materials used under work of this Section; include descriptive literature and installation instructions.

1.04 QUALITY ASSURANCE

A. Extend gypsum board and joint treatment behind cabinets, cases, and other surface installed fixtures, bases, and other trim.

B. Standard Specifications

1. For installation and finishing of gypsum board conform to the American Society for Testing Methods Standard ASTM C840, “Standard Specifications for Application and Finishing of Gypsum Board”, hereinafter called “ASTM C840”, and to the gypsum board manufacturer's standard specifications and recommendations.

2. In addition, installation and finishing of gypsum board shall conform to the following:

a. Gypsum Association Publication GA - 201, Gypsum Board for Walls and Ceilings, latest edition.

b. Gypsum Association Publication GA - 216, Application and Finishing of Gypsum Board, latest edition.

c. Gypsum Association Publication GA - 600, Fire Resistance Design Manual, latest edition.

3. Where “USG” is used herein it shall mean “United States Gypsum Company”.

1.05 DELIVERY, STORAGE AND HANDLING

A. In accordance with Referenced Standards. Stack off the ground, in a level and flat position, taking care to avoid sagging and damage to board surface or edges.

1.06 PROJECT CONDITIONS

A. Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

B. Maintain temperature of not less than 55 degrees F during, and for a minimum period of 48 hours prior to and following application of gypsum board, joint treatment, or bonding adhesives.

C. Do not install compound in draft areas in hot dry weather.

PART 2 PRODUCTS

2.01 MATERIALS

A. Standard Gypsum Board (“GWB”): Furnish USG “Sheetrock Firecode Gypsum Panels” or Georgia-Pacific “ToughRock Fireguard” or National Gypsum “Fire-Shield” panels, or approved, in 4 foot widths, 5/8 inch thickness, long edges tapered and eased, with surface suitable for decoration and conforming to ASTM C36, Type “X”; U.L. listed.

a. Use for all wall applications.

b. Use for all ceiling applications.

2.02 ACCESSORIES

A. Drywall Screws: Self-drilling, self-tapping steel screws similar to those manufactured by USG, or approved, of the following types and lengths for applications specified:

A. For Single-Layer or Base-Layer Attachment to Wood Framing:

a. 1 inch Type S bugle head for attachment to wood framing.

B. For Face-Layer Attachment of Double-Layer Board to Steel Framing, Runners and/or Furring Channels:

a. 1-7/8 inch Type S bugle head for attachment to 22 ga. or lighter 1raming.

b. 1-7/8 inch Type S-12 bugle head for attachment to 20 ga. or heavier framing.

B. Drywall Adhesive: Furnish ASTM C475 joint compound and as recommended by manufacturer of board used in the work, as suitable in regular or fire-rated assemblies.

C. Cornerbeads, trim and casings: ASTM C1047; Galvanized steel as manufactured by USG Beadex; or equal.

   a. Corner Bead: Furnish galvanized metal corner with tape reinforcement; USG “Flexible Metal Corner Reinforcing Tape” or Beadex “B1 Splay” flexible corner bead, or approved.

   b. Board Edge Trim: Except as otherwise specified below, furnish similar to USG No. 801-B galvanized steel, proper size and type for board thickness and installation conditions, subject to prior approval.

   c. Control Joints: Furnish USG No. 093, or approved equivalent, of roll-formed zinc with tape-protected opening, 7/16 inch depth, perforated flanges each side.

D. Joint Treatment Materials

   a. Bedding and Reinforcement Cement: ASTM C475 joint compound and of same manufacture as board used or approved by board manufacturer.

   b. Joint Tape: Plain or perforated, ASTM C475 and of same manufacturer as board used or approved by board manufacturer.

   c. Topping Coat Over Joints and Screw Heads: ASTM C475 finishing or topping compound as manufactured or recommended by manufacturer of board used in the work for joint topping work, and as approved.

E. Textured Coating Materials

   a. General: Furnish specifically formulated for application to gypsum drywall surfaces properly prepared to receive them, compatible with joint materials.

F. Primer-Sealer for Textured Finish: One coat Glídden Professional “Ultra-Hide” 1030 PVA Interior Primer-Sealer or Sherwin Williams “PrepRite 200” B28W200 Interior Latex Primer, or approved.

G. Sound Sealant

   a. At exposed applications in sound attenuating partitions, furnish pumpable sealant similar to USG “Sheetrock Acoustical Sealant” or Pecora “AC 20 FTR Acoustical Sealant”.

   b. At concealed applications in sound attenuating partitions, furnish sealant similar to Tremco “Tremco Acoustical Sealant” or Pecora “BA-98”.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.

3.02 INSTALLATION

A. Install materials in accordance with gypsum board application and finishing standards: GA 201, GA 216 and ASTM C840.

1. Provide expansion and contraction (control) joints in ceilings exceeding 2500 sq.ft. in area and in partition, wall and wall furring runs exceeding 30 feet. Do not exceed a distance of 50 feet, in either direction, between ceiling control joints and install a control joint where ceiling framing or furring changes direction. Do not exceed a distance of 30 feet between control joint4 in walls or wall furring, and install a control joint where an expansion joint occurs in the base exterior wall. In fire-rated walls and ceilings, provide backing at control joint as recommended by gypsum board manufacturer to conform to U.L. Inc. and IBC requirements.

2. Float interior angles, except where required to conform to fire or acoustical separation requirements.

3. Do not install scored, scratched, broken, damp, or otherwise damaged boards.

4. Smooth cut edges and ends to obtain neat fitting joints. Use specially designed cutting tool for opening of exact shape and size needed.

5. At walls where shown to have gypsum board extending continuous through ceiling, install wall panels, fire tape and mud above ceiling line prior to installation of ceiling panels; where wall panels are shown to terminate at ceiling line, apply gypsum ceiling board panels on ceilings first.

6. Install board panels perpendicular to supports with end joints over supports, with 1/16 to 1/8 inch space between butted ends of boards.

7. Space fasteners 3/8 inch minimum from ends and edges. Stagger screws on adjoining edges and ends.

8. Bottom edge of all panels shall be 1/4-inch above floor surface and filled with acoustical sealant. Top edge of all panels extending to ceiling structure above shall be terminated 1/4-inch from ceiling surface and filled with acoustical sealant, except with fire rated sealant at all fire rated wall assemblies.

9. At fire-rated wall assemblies, run gypsum board back behind all recessed equipment such as fire extinguisher cabinets, electrical panels, etc., to provide continuation of fire rating behind such equipment.

10. Gypsum board shall be installed to within the following tolerances:
    a. Between board faces: 1/16 inch offset.
    b. Plane, level, warp, or bow: 1/8 inch in 10 feet

B. Layout: Minimize joints

1. Resilient channels: Install in accordance with manufacturer's written and graphic instructions.

   a. Install perpendicular to framing with smaller flange facing downward.

   b. Do not place in direct physical contact with intersecting walls, ceilings or floors.

2. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.

3. Stagger end joints. Minimize the number of end-butt joints.

4. Position boards so that like edges abut.

5. Stagger vertical joints over different studs.

6. Form joints with space between edges; and boards prepared to receive trim accessories.

7. Shim gypsum board on wood framing to get even joints without offsets.

8. Partitions:

   a. Do not align joints located on opposite sides of partitions.

   b. Place all boards on any wall with long dimensions either vertical or horizontal

   c. Place joints at least 12 inches from jambs of openings.

C. Fastening

1. Mechanically fasten boards in direct contact with framing with edges or ends in continuous contact with framing.

2. Fasten ends at end-butt joints to framing with both glue and mechanical fasteners.

3. Install gypsum board backing to reinforce both edge and butt joints at ceilings. Provide for additional support at openings and cutouts.

4. Space fasteners in gypsum boards in accordance with Referenced Standards and manufacturer's recommendations.

   a. Place fasteners no less than 3/8-inch from edges of gypsum boards. Install fasteners with heads dimpled slightly below surface; do not cut through paper. Use crown face hammers for driving nails and accepted power tools for self drilling screws. For sell drilling screws fasten gypsum board to all bearings as follows:

      1) Non-Rated Walls: Screws, 12 inches on center.

D. Sound Sealant Installation:

A. Prior to application of drywall on back side of partitions with sound insulation, apply a 1/4 inch bead of acoustical sealant around all cut-outs for electrical boxes and other penetrations. Caulk sides and backs of electrical boxes.

B. Seal perimeter of construction with acoustical sealant complying with ASTM C919; apply one continuous bead of sealant at each side of framing member interface with substrate for single layer construction; for double layer construction, install continuous bead of sealant after installation of base layer and after installation of face layer.

C. Apply along edges of boards where abutting dissimilar finish material. Seal around all window and door frames, and all other wall openings or penetrations.

D. Where sealant is to be left exposed, tool joint surfaces smooth in manner recommended by sealant manufacturer.

E. Upon completion, remove and dispose of masking materials; remove any excess sealant material.

E. Accessories, unless otherwise indicated on the Drawings.

A. Corner Bead: Install at all exterior corners in finished spaces from 6 inches above ceiling line, of full stock lengths wherever possible, in alignment with wall surfaces, cemented in accordance with manufacturer's instructions. In all cases, gaps in at adjoining board edges, behind corner beads, shall be over-filled completely with taping mud immediately prior to application of bead.

B. Board Edge Trim: Install approved type trim in finished spaces below ceiling line, full stock lengths, at all exposed ends and edges of board and where board abuts dissimilar materials, screwed or screwed and cemented, as applicable, in accordance with manufacturer's instructions. Install flexible edge trim along cut radiused edges of multi-layer board application at Fresh Express serving station.

C. Control Joints: Install on walls and ceilings in locations shown and in conformance with requirements specified above; install on walls, floor to ceiling, in long partition runs; install from each top corner of door frames to ceiling above, and extending minimum 6 inches above ceiling line where suspended acoustical ceilings occur.

3.03 TAPING & FINISHING

A. General

1. Tape and finish all joints, corners, fastener heads, imperfections, etc., in accordance with manufacturer's specifications and recommendations and as herein specified.

2. All drywall finishing, including sanding, shall be carried down to floor level.

3. Apply tape and joint compound to all joints in partitions above finished ceiling line; all surfaces from a point of 3 inches above finish ceiling line up to the structure above shall receive fire-taping only (Finish Level 1).

4. Apply tape and joint compound to all joints in gypsum board. Except as specified above, taping and cementing required on all other gypsum board whether concealed or not, including gypsum board scheduled to receive wainscot coverings.

    a. Finish at gypsum board panels to receive panel wainscot coverings shall be finished to a minimum Level 3 finish consisting of taping and two (2) coats of joint

    b. Finish at gypsum board panels scheduled to receive various paint finishes shall be finished to a minimum Level 4 finish, ready for application of primer-sealer and texture treatment as specified below.

B. Taping & Finishing

1. All exposed joints, angles, and inside vertical corners shall be reinforced with tape embedded with joint compound and finished with not less than three applications of topping compound, allowing each application to dry thoroughly and sanding between coats as required.

2. All outside vertical corners shall be finished with not less than three applications of topping compound, allowing each application to dry thoroughly and sanding between coats as required.

3. Taping:

    a. Apply a uniform layer of taping compound to all joints and angles to be reinforced.

    b. Apply reinforcing tape immediately centered over the joint and seated into the compound.

    c. Skim coat shall follow immediately but shall not function as a fill or second coat.

    d. Tape shall be properly folded and embedded in all angles to provide a true angle.

4. Filling: After taping compound has hardened, apply topping compound, filling the board flush with the surface. Fill coat shall cover tape and feather out slightly beyond the tape.

5. Finishing:

    e. Fastener Depressions: Apply taping compound to all fastener depression followed when hardened by at least two (2) coats of topping compound, leaving all depressions level with plane of the surface.

f. Apply topping compound to all exposed corners of beads and trim, feathering out from the ground to the plane of the surface as specified for joints.

g. Finish joints with at least two (2) coats of topping compound, each coat extending beyond preceding coat. Feather joints to 6 inches each side of the joint; feather joints at square edges or butt ends af boards 12 inches each side of the joint.

h. All coats of joint compound shall be sanded after each application has dried. Exercise care when sanding to avoid roughing the face of panel. For final sanding, use 150 grit or finer sandpaper. Provide a smooth surface with joints fully concealed.

6. The final application of compound and sanding shall leave all gypsum board surfaces uniformly smooth and in proper condition to receive primer-sealer specified herein and other finishes as scheduled.

1.02 SPRAYED TEXTURE ON EXPOSED BOARD SURFACES

A. Surface Preparation — Application Of Primer-Sealer

1. Proceed with this work only when surfaces, joints, and fastener heads are properly prepared.

2. Prior to texture application, evenly apply one coat latex primer-sealer as specified above using roller at an approximate coverage rate as recommended by the manufacturer and to achieve a “smooth wall”, free from surface blemishes, irregularities, holidays, sags, etc.; apply coat to a minimum of 350 square feet per gallon. Do not thin material.

3. Use rollers of a type as recommended by the primer manufacturer. Back-roll primer if applied by spray. Apply additional coat to surfaces that have been damaged.

B. Texture Application

1. General:

a. Do not apply texture coating to wall board surfaces to receive fire taping only. Do not apply texture coating to surfaces scheduled to receive miscellaneous wall panel coverings, wainscot coverings, and the like.

b. Apply texture coating to all other gypsum board surfaces not otherwise noted above.

2. Texture Application: Machine spray-apply texture to an ‘orange peel’ texture to match existing wall texture, as approved, in manner recommended by texture material manufacturer.

END OF SECTION

SECTION 09 67 23 RESINOUS FLOORING AND WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Epoxy composition flooring.
2. Vapor control membrane.
3. Primer.
4. Wall coating.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 61 16, Volatile Organic Compound (VOC) Content Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.

B. Section 09 29 00, Gypsum Board; finishing of wall surfaces to receive resinous coating.

C. Division 22, Plumbing, for floor drains.

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code, edition as noted on Drawings, as adopted by the California Division of the State Architect (DSA).

C. ASTM International (ASTM):

1. ASTM C 307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
2. ASTM C 579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
3. ASTM C 580, Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
4. ASTM D 56, Standard Test Method for Flash Point by Tag Closed Cup Tester.
5. ASTM D 522, Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
6. ASTM D 638, Standard Test Method for Tensile Properties of Plastics.
7. ASTM D 695, Standard Test Method for Compressive Properties of Rigid Plastics.
8. ASTM D 952, Standard Test Method for Bond or Cohesive Strength of Sheet Plastics and Electrical Insulating Materials.
9. ASTM D 1044, Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
10. ASTM D 2240, Standard Test Method for Rubber Property—Durometer Hardness.

11. ASTM D 2794, Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
12. ASTM D 4258, Standard Practice for Surface Cleaning Concrete for Coating.
13. ASTM D 4259, Standard Practice for Abrading Concrete.
14. ASTM D 4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
15. ASTM E 648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
16. ASTM G 21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.4 SUBMITTALS

A. Submittal Procedures:

1. Submittals shall be submitted in accordance with Section 01 33 01.
2. Sustainable Design Submittals shall comply with the additional requirement of Section 01 81 13.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00.

B. Pre-installation Meeting:

1. Conduct meeting at the Project site to review methods and procedures related to resinous flooring including, but not limited to, the following:
   a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
   b. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   c. Review special patterns and termination conditions.
2. Notify participants at least 5 working days before conducting meeting.
3. Record discussions of meeting and any conflict, incompatibility, or inadequacy.

C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.

1. Include manufacturer's specifications and installation instructions.
2. Include EPA licensing documents for antimicrobial additive in topcoat.

D. Samples: The following samples are required.

1. Manufacturer's full range of colors for Architect's selection.
2. Submit 2-1/2 inch x 4 inch samples of color chips selected by the School District.
3. Topcoat samples with anti-slip textures, as specified, for Owner’s approval.

E. CAL-Green Submittals:

1. Product Data – VOC Limits: For adhesives, sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 61 16.
2. Low / No-VOC Paints and Coatings: Provide certification that all primers and coatings meet VOC emission limits specified in Section 01 61 16. List manufacturer, brand, application, type (flat or non-flat), and the VOC emissions per gallon in terms of grams/liter. Include MSDS and product data sheet indicating VOC limits for each product provided.

F. Letter from the manufacturer offering a joint applicator / manufacturer labor and material warranty for this specific project and with this particular installation contractor.

1.5 CLOSEOUT SUBMITTALS

A. Warranty: Submit executed warranty.

B. Maintenance Data: For resinous flooring, to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: An entity manufacturing resinous flooring continuously for a period of 10 years minimum.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.

C. Engage an installer with 5 years of experience minimum in the application of specified flooring and who provides a letter from the manufacturer offering a joint applicator/manufacturer labor and material warranty for this specific project and with this particular installation contractor.

D. Source Limitations: Obtain primary resinous flooring and wall/ceiling coating materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

B. Transport and handle in strict accord with the manufacturer's written recommendations.

C. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity.

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.

B. Permanent lighting and HVAC will be in place and working before installing resinous flooring. Repairs of defects or failures in the flooring resulting from the General Contractor's failure to provide manufacturer's recommended installation and environmental conditions (i.e., HVAC) will be charged to the General Contractor.

1.9 WARRANTY

A. Special Joint Warranty: In addition to the Contractor's Standard Guarantee, furnish Owner with a written joint Applicator / Manufacturer labor and material warranty, signed by Contractor and manufacturer, agreeing to replace resinous flooring on this specific project that does not comply with requirements or that fails within specified warranty period.

1. Job Log: Installation Contractor is responsible for documentation of substrate preparation and flooring installation in accordance with manufacturer's recommendations. Job Log is required for Joint Warranty.
2. Warranty Period: Two (2) years.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:

1. VOC Limits for field-applied adhesives, sealants, fillers, coatings and primers shall comply with limits specified in Section 01 61 16.

B. Slip Resistance: Resinous flooring shall provide a value equal to or greater than 0.42 when tested in accordance under dry conditions with DCOF AcuTest procedure contained in ANSI A137.1:2012, Section 9.6, and under wet conditions with DCOF AcuTest procedure of ANSI B101.3.

C. Flooring System Physical Properties: Provide resinous flooring system that generally complies with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 6,100 psi, ASTM C 579.
2. Tensile Strength: 1,000 psi, ASTM C 307.
3. Flexural Strength: 2,000 psi, ASTM C 580.
4. Surface Hardness, Shore D: 85 to 90, ASTM D 2240.
5. Adhesion: Greater than 400 psi (100 percent failure in concrete), ASTM D 4541.
6. Flammability: Class 1; ASTM E648.
7. Microbial Resistance: Passes Rating 1, ASTM G21.
8. Thermal Coefficient of Linear Expansion: 1.4x10-5, ASTM C531
9. Water Absorption 0.64%, Mil-D-3134

D. Wall System Physical Properties: Provide resinous finish system that generally complies with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 8,000 psi, ASTM D 695.
2. Elongation: 13 percent, ASTM D 638.
3. Surface Hardness, Shore D: 70 to 75, ASTM D 2240.
4. Adhesion: Exceeds internal strength of backing systems; ASTM D 952.
5. Impact Resistance: 44 inch/pounds on metal panel, ASTM D 2794 (Gardner Impact Tester).
6. Flexibility: Passes 1/8 inch mandrel at 180 degree bend without cracking, ASTM D 522.
7. Water Absorption: Less than 5 percent at 70 degrees F, MIL-D 3134.
8. Flash Point (Tag Closed Cup): Exceeds 200 degrees F, ASTM D 56.
9. Microbial Resistance: Passes Rating 1, ASTM G 21.

2.2 RESINOUS FLOORING

A. Epoxy Composition Flooring: Troweled urethane cement composition flooring with Double Broadcast Decorative Color Flake; Dex-O-Tex Tek-Crete SL-CF by Crossfield Products Corporation. Rancho Dominguez, CA; 800-704-5571 as specified, or equal. Local Representative: Chris Morales: 925-513-1500: email chrism@dexotex.com

1. Thickness: 1/8 - 3/16 inch nominal.
   a. Floor and coved base flake size to be 1/8”.
2. Color: As selected by District.
   a. Floor and coved base color to be one color all restrooms.

B. System Components:

1. Base Coat: 1/8” thick with color flake chip double broadcast, Dex-O-Tex TekCrete SL-CF.
2. Grout Coat: Two component, 100% solids, epoxy resin, high build slurry or mortar: Dex-O-Tex Decor-Flor.
3. Topcoat: Clear, low VOC, Ultraviolet light-stable, aliphatic polyester urethane, with antimicrobial additive. Dex O Tex QuikGlaze Polyaspartic.”
4. Integral Cove Base: Manufacturer’s cove base mix applied to wall surfaces at locations shown on Drawings.

C. Accessories and Additional Materials:

1. Anti-Microbial Additive: Factory-added, N-butyl-1,2-benzisothiazolin-3-one (BBIT); Dex-O-Tex “Antimicrobial Additive,” or equal that will remain effective for the lifetime of the epoxy flooring.

2.3 EPOXY WALL COATING

A. Wall Coating: Two-component epoxy resin coating with antimicrobial additive; Dex-O-Tex “Wallcote E” or Wall Glas with double broadcast flakes by Crossfield Products Corporation, or equal.

1. Thickness: 5-7 mils DFT per coat.
   a. Wall flake size to be 1/4".
2. Color: As selected by District.
   a. Wall color to be one color all restrooms.
   b. Floor color to be different than wall color.

B. System Components:
1. Base Coat: 5-7 mils each coat thick with color flake chip double broadcast, Dex-O-Tex Wall E with double broadcast flakes.
2. Grout Coat: Two component, 100% solids, epoxy resin, high build slurry or mortar: Dex-O-Tex Decor-Flor.
3. Top Coat: Clear, low VOC, ultraviolet light stable, aliphatic polyester urethane with antimicrobial additive. Dex O Tex QuikGlaze Polyaspartic

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that field conditions are acceptable and are ready to receive work.
2. Verify that surfaces are smooth and level with no more than 1/8 inch in 10 feet variation from level.
3. Verify that all flange-type area drains are installed properly and are at the proper elevation.
4. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation of resinous flooring in areas of discrepancy until all such discrepancies have been resolved and all unsatisfactory conditions have been corrected.

B. Concrete Floors: Perform tests as specified to determine the subsurface moisture content of the concrete slab to receive resinous flooring.

C. Tile floors: check for loose floor tiles.

D. Start of installation indicates Contractor's acceptance of substrate surfaces and conditions.

3.2 PREPARATION

A. Concrete Slab-On-Grade and Above-Grade Concrete Subfloor Testing.

1. If test results are within limits recommended by resinous flooring manufacturer, prepare floor substrates for installation of resinous flooring in accordance with ASTM D 4258 and as recommended by resinous flooring manufacturer.

2. If test results are not within limits recommended by resinous flooring manufacturer,

prepare floor substrates for installation of resinous flooring in accordance with ASTM D 4259. Dry broom or vacuum clean in accordance with ASTM D 4258 and install Vapor Dissipation System as specified in this Section.

a. Where Moisture Vapor emission rate (MVER) exceeds 22 lbs. and Relative Humidity (RH) exceeds 99 percent notify the Architect prior to proceeding.

B. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

1. Concrete floors with curing, hardening and breaking compounds shall be abraded with mechanical methods to remove compounds.

C. Concrete Subfloors: Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with underlayment as specified in this Section.

D. Condition of Existing Surfaces: Prepare existing concrete subfloors to receive new resinous flooring installation.

1. Concrete surfaces: Shot-blast or diamond grind per SSPC SP-13/NACE 6. Remove material to provide a sound surface free of laitance, glaze, efflorescence, bond inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition per ACI 546.R-04. Produce a surface profile equal to ICR 310.25 CPS 2, CPS 3 or CPS 4. Leave surface free of dust, dirt, laitance and efflorescence.
2. Cut 1/8" x ½" keyways around the perimeter, around drains, clean outs, access panels or other flooring interruption, and at expansion or isolation joints.
3. Using only mechanical or physical means, remove existing flooring, dirt, paint, old adhesive, curing agents or any other material that would inhibit the adhesion of resinous flooring.
4. Complete preparation with cleaning of subfloors, patching of cracks and other imperfections.

E. Condition of existing surface; Prepare existing tile flooring to receive new resinous flooring installation:

1. Check entire tile floor area for loose tiles. If tiles are loose, remove all loose tiles and grout; then repair. Contractor to provide an allowance of 5% of existing tile floor area for removal and repair of loose tiles.
2. Remove tile glaze to provide a sound surface.
3. Remove grease, oil and other contaminants.
4. Repair damaged and deteriorated tile areas

F. Sweep and vacuum clean substrates to be covered by resinous flooring immediately before installation.

G. Walls: Confirm that walls are finished to Level 4 finish.

1. Provide filler where required by manufacturer

3.3 INSTALLATION

A. Flooring:

1. Flooring and Wall System components according to manufacturer's written instructions. Produce a uniform, monolithic wearing surface of thickness, color and texture indicated.
    a. Coordinate application of components. Provide optimum adhesion of coatings to substrate and optimum intercoat adhesion.
    b. Cure coatings per manufacturer's written instructions. Prevent contamination during application and curing processes.
    c. Expansion, Isolation and Control Joint Treatment: at substrate expansion, isolation and control joints, comply with resinous flooring manufacturer's written instructions.
    d. Contractor shall keep daily logs recording the work performed and environmental conditions as required by the materials manufacturer.
2. Install 4" integral cove base with 5/8" radius at all vertical horizontal transitions.
3. Self-Leveling Body Coats: Apply in thickness indicated for flooring system.
    a. Flakes: Broadcast flakes to excess or at rate recommended by manufacturer. After resin cures, remove excess aggregate. Provide surface texture indicated.
4. Second Broadcast: Self-Leveling Body Coats: Apply Decor-Flor at 14-16 mils thickness indicated for flooring system.
    a. Flakes: Broadcast flakes at rate recommended by manufacturer. After resin cures, remove excess aggregate. Provide surface texture indicated.
5. Grout Coat: Apply Decor-Flor at 12 mils or recommended by resinous flooring manufacturer, to fill voids in final body coat surface.
6. Top Coat: Quik-Glaze Clear Gloss. Apply QuikGlaze at 8-10 mils indicated for flooring system and/or at a spreading rate recommended by manufacturer to produce wearing surface indicated.

B. Application for Wall E with Broadcast Flakes:
1. General: apply each component epoxy resin chemical resistant wall coating system according to manufacturer's directions to produce a uniform monolithic wall coating of thickness indicated.
2. Bond Coat: Apply bond coat over prepared substrate at manufacturer's recommended spreading rate.
3. Body Coat: Over bond coat apply one coat 5-7 mils each epoxy resin chemical resistant wall coating: Broadcast flakes into wet Wall E and allow to cure.
4. Second Body Coat: Apply 5-7 mils of Decor-Flor and broadcast flakes to excess.
5. Grout Coats: After body coat has cured sufficiently, apply one coat of Decor-Flor at 4-6 mils to produce finish matching approved sample and in number of coats and spread rates recommended by manufacturer.
6. Top Coat: Quick-Glaze Clear Gloss. Apply QuikGlaze at 3-5 mils indicated for wall system and/or at a spreading rate recommended by manufacturer to produce wearing surface indicated.
7. Finished wall coating shall by 20-25 mils thick and uniform in color and texture.

3.4 DEFECTIVE WORK

A. Repair damaged and defective work and eliminate functional and visual defects. Where repair is not possible replace work.

B. Provide exposed finishes that are free from scratches, dents, permanent discolorations and other defects in workmanship or material.

3.5 CLEANING AND PROTECTION

A. Upon completion of Work, thoroughly clean all exposed surfaces in a manner that will not affect the finish appearance. Clean products after 96 hours cure time. Use manufacturer's recommended cleaner.

B. Prohibit all foot and wheel traffic over flooring for 24 hours. Light foot traffic is acceptable after 24 hours. Normal traffic after 48 hours.

C. Do not expose to harsh chemicals until full 7 days cure.

D. Protect the resinous flooring from water, spills or cleaning for a minimum of 4 days following installation.

E. Protect the installed work and materials of other trades.

F. In the event of damage after installation, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

G. Perform final cleaning just before inspection for Substantial Completion.

END OF SECTION

SECTION 09 91 10: PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section specifies both interior and exterior field painting for all exposed and semi-exposed surfaces.

B. Related requirements specified elsewhere:
   1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.

1.02 DEFINITIONS

A. In accordance with ASTM D16, except that the term "Paint" shall be defined as opaque, transparent, or semi-transparent coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.03 DESIGN REQUIREMENTS

A. Design Intent
   1. General
      a. Paint all Work that is normally painted in a building of this type and quality, whether or not the item or surface is specifically identified within the Contract Documents.
      b. Where painting is required, paint all exposed and semi-exposed surfaces.
      c. Non-scheduled items: Provide manufacturer's approved and recommended system as set forth in Manufacturer's "Specifications Architectural Finishes ".
      d. The number of coats specified is the minimum to be applied. The Design Intent is that paint finishes be of even, uniform color, free from cloudy or mottled surfaces. Provide one additional coat required where "deep colors" are required.
      e. Provide split finishes for painted doors and interior windows where different connected room colors are selected.
      f. Touch-up factory paint finishes where damaged.

   2. Specific surfaces to be painted: The listing which follows is intended to provide additional guidance to the Design Intent but it is not intended to be definitive to each and every portion of the Work to be painted.
      a. Paint panelboards and exposed conduits, ductwork and plumbing piping, unless otherwise specified not to be painted.
      b. Paint all exposed and semi-exposed galvanized metal, including projections through and on roofs.
      c. Paint air grilles and other exposed and semi-exposed mechanical and electrical equipment.
      d. Paint reveal moldings, exterior expansion joints, screeds, and interior handrails.
      e. Paint miscellaneous connections, unless otherwise specified not to be painted.
      f. Paint exterior equipment and galvanized metal flashings.

   3. The following items are specifically excluded from painting.
      a. Do not paint bright metal, including but not limited to chromium, copper, nickel, brass, bronze or stainless steel.

b. Do not paint glass or integral colored materials.
c. Do not paint surfaces indicated on the Drawings as not to be painted.
d. Do not paint over code-required labels, or any equipment identification, performance rating, name, or nomenclature plates.
e. Exterior concrete flatwork and concrete slab surfaces.
f. Existing areas not affected by work of this project, unless specifically noted otherwise.

1.04 SUBMITTALS

A. Product Data
1. Listing of all materials proposed for use. Identify manufacturer, catalog number and proposed locations and surfaces on which it is to be used.
2. Manufacturer's color wheel identifying of the manufacture's standard and custom colors.
3. Color chip samples from manufacturer for each color selected from the Manufacturer's color wheel.
4. Manufacturers' technical information and application instructions for each material proposed for use.
5. For non-specified but acceptable manufacturers submit side by side comparison showing specified product number and the equivalent manufacturer's product number.

B. Submit 6 samples of each color, sheen, and texture on 8-1/2 by 10-inch hardboard. Label and identify each as to location and application.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements
1. Environmental
a. Verify that formulation of product conforms with local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application.
b. Conform to Air Pollution Control Rules in the District in which they are applied.
2. Fire Safety: California State Fire Marshal Registration No. C-4.16 for flame and smoke retardant coating on finished wood surfaces.
B. Field Samples: Final acceptance of colors will be from samples applied to actual surfaces on the job. Coat approximately 100 square foot area for each field color. Adjacent to field area coat approximately 10 linear feet of each trim.
C. Pre-Installation Meeting: Prior to the commencement of painting work conduct a pre-installation meeting to discuss the preparation of surfaces to be painted.

1.06 DELIVERY AND STORAGE

A. Store in accordance with manufacturer's printed instructions. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.

B. Take all precautions and ensure that workmen and work areas are protected from fire hazards and health hazards resulting from handling, mixing and application of paint materials.

1.07 PROJECT CONDITIONS

A. Do not apply exterior materials during fog, rain or mist. Do not paint exterior materials when inclement weather is expected within the full drying time specified by the manufacturer.
B. Do not paint until surfaces are thoroughly dry and cured.
C. Environmental Requirements
    1. Do not apply paint in rain, fog or mist, or when relative humidity exceeds 85 percent or to damp surfaces, or when temperature is below 55 degrees F or above 90 degrees F unless otherwise expressly approved in writing by paint manufacturer.
    2. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated and dry within temperature and humidity limits specified by paint manufacturer during application and drying periods.

1.08 SCHEDULING

A. Schedule work to avoid painting surfaces when surfaces are exposed to direct sunlight.

1.09 WARRANTY

A. Warrant for 2 years that the painted surface colors will be substantially unchanged and finishes will maintain their specified appearance without blisters, flaking, peeling, scaling, staining or evidence of other forms of defects as defined by the Master Painters Institute, "Maintenance Repainting Catalog of Defects and Failures".

1.10 EXTRA MATERIALS

A. Furnish 1 gallon for each type of finish coat of paint in each color used on the project. Trim colors; 1 gal. Label and correspond to any paint out submittals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Dunn Edwards Corp., Los Angeles, CA, Sherwin-Williams Company, ICI Paints, Frazee Paint Company,as indicated on finish schedule, or equal.

2.02 MATERIALS

A. Indoor Air Quality: Provide low or no voc paints and primer systems.

B. Recycled Content: No recycled content paints and primers will be allowed.

C. General
    1. Furnish paints ready-mixed, except for field catalyzed coatings.
        a. Pigments to be fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixture.
        b. Paints to have good flowing and brushing properties and be capable of drying or curing free of streaks and sags.
    2. Furnish and use thinners and additives approved by paint manufacturer.
    3. Systems: Furnish primers and other undercoat paint produced by same manufacturer as finished coats.

4. Cleaners, as recommended by the paint manufacturer:
   a. Dirt: Tri-sodium phosphate
   b. Stains on cementitious surfaces: Sodium metasilicate

D. Paint types: Where product is listed by Master Painters Institute product categories provide listed voc compliant product. Where no voc compliant product is listed under the MPI product number, propose and submit product that is equal to those listed and which is voc compliant.
   1. Exterior Paints
      a. Primers/Undercoaters
         1) Surface Tolerant Metal Primer: Rust-Oleum CV740 Alkyd Metal Primer
         2) Epoxy Anti-Corrosive Metal Primer: Rust-Oleum 9100.
         3) Exterior Latex-Based Solid Hide Stain: Dunn Edwards Acri-Hues 100% Acrylic Exterior Flat ACHS10
         4) Etching Cleaner: Consult Paint Manufacturer for Recommendation
      b. Secondary and finish opaque coats
         1) Exterior Latex, Gloss: Rust-Oleum 5200 System
         2) Exterior Latex, Semi-Gloss: Dunn Edwards Spartashield 100% Acrylic Exterior Semi-Gloss SSHL50
         3) Exterior Latex Flat: Dunn Edwards Acri-Hues 100% Acrylic Exterior Flat ACHS10
   2. Interior Paints
      A. Primers/Undercoats
         1. Interior enamel undercoat: Not permitted.
         2. Surface tolerant primer: Rust-Oleum C740 Alkyd Metal Primer
         3. Galvanized primer: Dunn Edwards Ultrashield Galvanized Metal Primer ULGM00
         4. Epoxy anti-corrosive metal primer: Rust-Oleum 9100.
         5. Interior alkyd primer sealer: Not permitted.
         6. Interior latex primer sealer: Dunn Edwards Vinylastic Select Zero VOC Interior latex wall Sealer
         7. Alkali resistant primer: Dunn Edwards Eff-Stop Select 100% Acrylic Masonry Primer ESSL00
         8. Etching cleaner: Consult paint manufacturer for recommendation.
      B. Secondary and finish opaque coats
         1. Institutional Low Odor/VOC Interior Latex eggshell: Dunn Edwards Spartawall Zero VOC Acrylic Interior Eggshell SWLL30
         2. Institutional Low Odor/VOC Interior Latex, semi-gloss: Dunn Edwards Spartawall Zero VOC Interior Semi-Gloss SWLL50
         3. Institutional Low Odor/VOC Interior Latex, gloss: Dunn Edwards Evershield 100% Acrylic Exterior Gloss EVSH60
         4. Epoxy Cold Cured Gloss: N/A
      C. Stains and clear finishes
         1. Wood Filler Paste: Old Masters Wood Filler
         2. Interior Wood Stain, Semi-Transparent; Old Masters Penetrating Stain

2.03 FINISHES

A. Fabricate paints and stains in accordance with the Color Schedule which will include both standard colors and special, non-standard colors.

B. Deep and ultra colors
   1. If not available in a specified product, propose substitute formula for approval.

2. Factory mix deep and ultra deep colors.

C. Tint undercoats slightly to approximate finish coat color.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.

B. Inspect and test to ensure that no painting occurs over surfaces where moisture content or alkalinity exceeds that permitted in manufacturer's printed directions.

C. Identify dirt, rust, scale, grease, moisture, scuffed surfaces, and other conditions detrimental to formation of a durable paint film.

3.02 PREPARATION

A. Indoor Air Quality

1. Provide temporary ventilation as specified in Indoor Air Quality (IAQ) Management.
2. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.
3. Maximize ventilation during application and drying.
4. Isolate area of application from rest of building.
5. Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms.

B. General: In accordance with Referenced Standards for each particular substrate condition.
1. Protect work and surrounding areas from damage.
   a. Mask hardware, accessories, fixtures, before surface preparation or painting.
   b. Remove hardware, accessories and fixtures, if necessary, to complete painting of these items and adjacent surfaces.
   c. Reinstall removed items immediately following completion of painting of each space or area.
2. Make surfaces to be painted clean and dry. Remove bond breakers and curing agents.
3. Provide barrier coats over incompatible primers, or remove and re-prime.
4. Spot prime shop primed materials in field as required and ensure that all surfaces are primed before finished coats are applied.

C. Metal
1. Un-coated and primed ferrous
   a. Scrape and sand as required to remove loose primer, rust, and mill scale. Sand out scratches.
   b. Clean with solvent.
   c. Prime within 3 hours after preparation.
2. Coated ferrous and zinc
   a. Solvent clean with lacquer thinner:
   b. Etch with solution which is approved by the paint manufacture and which will not

damage coating or zinc.

c. Perform cleaning, etching and priming of each segment of galvanized and cadmium coated metal on same day.
d. Prepare hot-dipped galvanized surfaces for repair in accordance with ASTM A 780.

3.03 APPLICATION

A. In accordance with the coating manufacturers; and in accordance with Master Painters Institute recommendations where MPI recommendations do not conflict with recommendations of the coating manufacturer.

B. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until:
   1. Paint has dried to where it feels firm.
   2. Paint does not deform or feel sticky under moderate thumb pressure.
   3. Application of another coat of paint will not cause lifting or loss of adhesion of the undercoat.

C. Minimum coating thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer.

D. Lightly sand and dust first and intermediate coats before succeeding coats are applied. Tint each coat different from preceding coat to approved finish color.

E. Make work uniform without sags, runs, skips or brush marks. Make all edges sharp including interior intersections and transitions between split finishes.

F. Exterior metal primers to be re-coated within the time limits as recommended by the paint manufacturer.

3.04 FIELD QUALITY CONTROL

A. Owner's Representative will review each coat of paint, stain or varnish separately before next coat is applied. Give notice to Owner's Representative when work is ready for review.

B. Furnish Owner's Representative with Tooke Dry Mil Coating Inspection Gage manufactured by Micro Metrics Company.

3.05 CLEANING

A. Clean-up
   1. During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
   2. Upon completion of work, clean window glass and other paint-spattered surfaces.
   3. Remove oily rags and waste daily.

B. Touch-up
   1. Remove spatters, spots, runs, sags, blemishes and other defects without marring adjacent unpainted surfaces.
   2. Repaint defective surfaces.

3.06 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra paint for future color matches, or reuse by Owner. Where local options exist for leftover paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility.

B. Close and tightly seal all partly used paint and finish containers and store protected in well-ventilated, fire safe area at moderate temperature.

C. Place empty containers of solvent based paints in areas designated for hazardous materials.

D. Do not dispose of paints or solvents by pouring on the ground. Place in designated containers for proper disposal.

E. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. Close and seal all partially used containers of paint to maintain quality as necessary for reuse.

3.07 PROTECTION

A. Provide "Wet Paint" signs as required to protect newly-painted finishes.
B. Do not allow material to enter the storm drain system, sewer system, or the soil.

3.08 PAINT SCHEDULE

A. Exterior Systems
   1. EP-1: Metal Doors and Frames — Ferrous — Semi-Gloss Finish
      a. Primer: Dunn Edwards Enduraprime Acrylic Metal Primer
      b. Topcoat: Dunn Edwards Aristoshield Water Borne Alkyd Semi-Gloss Enamel
   2. EP-2: Mechanical and electrical equipment, panels, conduits and piping
      a. 1 Coat Dunn Edwards Ultra-Grip Premium Acrylic Multi-Surface Primer UGPR00 (Water Based Option)
      b. 2 Coats Dunn Edwards Aristoshield Water-Based Urethane Alkyd Gloss Enamel ASHL60 (Water Based Option)
   3. EP-3: Galvanized steel
      a. 1 Coat Etching Cleaner
      b. 1 Coat Dunn Edwards Ultrashield Acrylic Galvanized metal Primer ULGM00
      c. 2 Coats Dunn Edwards Aristoshield Water-Based Urethane Alkyd Gloss Enamel ASHL60
   4. EP-4: Cementitious Surface—Semi-Gloss Finish
      a. Primer: Dunn Edwards Eff-Stop Select Interior/Exterior 100% Acrylic primer/sealer
      b. Second Coat: Dunn Edwards Spartshield 100% Acrylic Exterior Semi-Gloss Finish
      c. Third Coat: Dunn Edwards Spartshield 100% Acrylic Exterior Semi-Gloss Finish
   5. EP-5: Existing Wood Trim
      a. 1 Coat Dunn Edwards EZ-Prime Premium Wood Primer EZPR00
      b. 2 Coats Dunn Edwards Spartashield 100% Acrylic Exterior Semi-Gloss SSHL50

B. Interior Systems
   1. P-1: Metal Doors and Frames –Semi-Gloss Finish

a. Primer: Dunn Edwards Enduraprime Ferrous Metal Primer or Ultrashield Galvanized Metal Primer

b. Second Coat: Dunn Edwards Enduracoat DTM Acrylic Interior/Exterior Semi-Gloss Finish ENCT50
c. Third Coat: Dunn Edwards Enduracoat DTM Acrylic Interior/Exterior Semi-Gloss Finish ENCT50

2. P-2: Gypsum Board Walls -- Semi-Gloss Finish
   a. Primer: Dunn Edwards Vinylastic Select Primer/Sealer VNSL00
   b. Second Coat: Dunn Edwards Spartawall Interior Acrylic Semi-Gloss Finish SWLL50
   c. Third Coat: Dunn Edwards Spartawall Interior Acrylic Semi-Gloss Finish SWLL50

3. 3. P-3: Cementitious CMU Block Surface—Semi-Gloss Finish
   a. Primer: Dunn Edwards Eff-Stop Select Masonry Primer EZSL00
   b. Second Coat: Dunn Edwards Spartashield Exterior 100% Acrylic Semi-Gloss Finish SSHL50
   c. Third Coat: Dunn Edwards Spartashield Exterior 100% Acrylic Semi-Gloss Finish SSHL50

4. 4. P-4: Galvanized Steel (Ceiling Grid) –Semi-Gloss Finish
   a. Primer: Dunn Edwards Ultrashield Galvanized Meta Primer ULGM00
   b. Second Coat: Dunn Edwards Aristoshield Interior/Exterior WB Alkyd Semi-Gloss Enamel ASHL50
   c. Third Coat: Dunn Edwards Aristoshield Interior/Exterior WB Alkyd Semi-Gloss Enamel ASHL50

3.09 COLOR SCHEDULE

A. Exterior Colors

1. Color EP-1: Doors and Door Frames Black.
2. Color EP-2: color to match existing adjacent surface.
3. Color EP-3: color to match existing adjacent surface.
4. Color EP-4: color to match existing adjacent surface.
5. Color EP-5: color to match existing adjacent surface.

B. Interior Colors

1. Color P-1: Door Frames Black.
   Doors: Benjamin Moore Balboa Mist OC-27.
2. Color P-2: Benjamin Moore Balboa Mist OC-27.
3. Color P-3: Benjamin Moore Balboa Mist OC-27.
4. Color P-4: Benjamin Moore Balboa Mist OC-27.

END OF SECTION

SECTION 10 14 00: SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section specifies building and site signage of types and contents.
B. Related requirements specified elsewhere:
   1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.

1.02 SUBMITTALS

A. Schedule of identifying devices showing locations, type and copy.
B. Drawings for shop fabricated items with attachment details and instructions.
C. Samples of each type of building mounted sign with mounting accessories for each type of sign.
D. Listing of completed project. Photographic and physical samples as required by the Architect to demonstrate fabricator's qualifications.
E. Submit manufacturer or fabricator certification that exterior grade photopolymer signs will not swell.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements for accessibility signage: California Code of Regulations, 2022 California Building Code, Title 24, Part 2, Chapter 11B.
   1. Color and Symbols:
      a. International symbol of accessibility; White figure on blue background, unless otherwise specified or indicated on the Drawings.
      b. Color blue equal to Color number 15090, Federal Standard 595C or otherwise as designated with characters and symbols which contrast from their background.
   2. Braille symbols: Below text.
      a. Contracted Grade 2.
      b. Braille shall be California Contracted (Grade 2) Braille. Dots shall be 0.10- inch on centers in each cell and 0.30-inch on center between corresponding dots in adjacent cells. Dots shall be raised a minimum of 0.025-inch and a maximum of 0.035-inch above the background.
      c. Raise dots a minimum of .025-inch per CBC 11B-703.3.1, above background, as approved by Architect.
   3. Proportions: As indicated on the Drawings or otherwise approved by the Architect.
      a. Width-to-height ratio of between 3:5 and 1: 1.1. Width of the uppercase letter “O” is 60% minimum and 110% maximum of the height of the uppercase letter “I”. (Raised Characters 11B-703.2.4 and Visual Characters 11B-703.5.4.)
      b. Stroke width to height ratio between 1:5 and 1:10 (is from Visual Characters 11B-703.5.7).
      c. Stroke thickness for the uppercase letter “I” shall be 15% maximum of the height of the character (Raised Characters 11B-703.2.6).
   4. Raised letters and numbers:
      a. Raised 1/32-inch; Sans-serif uppercase characters.
      b. Height: As indicated on the Drawings or specified elsewhere; minimum

5/8" high and 2" maximum based on the height of the uppercase letter "I". (Raised characters 11B-703.2.4 and visual characters 11B-703.5.4.)

5. Pictorial Symbol Signs: Minimum 6-inches high with verbal description directly below.
6. Signs and identification devices shall be field inspected after installation and approved by the enforcing agency prior to the issuance of a final certificate of occupancy (11B-703.1.1.2).
7. Characters, pictograms, symbols of accessibility and their background shall have a non-glare finish (11B-703.5.1, 11B-703.6.2 and 11B-703.7.1).
8. Inspection: Tactile signs shall be field inspected for compliance after installation (11B-703.1.1.2).

1.04 WARRANTY

A. Guaranty in full, that exterior grade photopolymer sign will not swell, delaminate and keep all specified properties of gloss and color for a period of 3 years.

PART 2 - PRODUCTS

2.01 FABRICATORS

A. Qualifications: Fabricators shall have a minimum of 5 completed projects in the manufacturer of the specific fabrication technique specified for the signage they will furnish for the project.

2.02 SIGNAGE TYPES:

A. Plaque Signage - General: Fabricate the following signs by the specified tactile fabrication process, with eased edges, rounded corners, 1/32 inch raised copy, braille where indicated. Plate: 1/8 inch thick, unless otherwise indicated.
   1. Sign Type S-1 – Accessible Entrance sign: International symbol of accessibility as indicated on drawings.
   2. Sign Type S-2 – Tactile Exit sign: Text and Braille with raised rule line as indicate on drawings.
   3. Sign Type S-3 – Assistive Listening System Available sign: Graphics, text and Braille as shown on drawings.

2.03 FABRICATION

A. Tactile signs
   1. Tactile inscription: 1/32-inch raised inscription, either PYA acrylic or nylon photopolymer resin.
   2. Backing plate: Cast phenolic or polyethylene. Furnish permanently and fully fusion bonded to photopolymer. 1/8 inch thickness unless otherwise indicated. Fabricate with eased edges, rounded corners.
   3. Exterior grade signage: Minimum durometer hardness rating of 90 Shore D, with a manufacturer or fabricator certified 0 percent swell rate in moisture-saturated environments.
      a. Manufactured signs scheduled for mounting at exterior locations or

interior locations subject to moisture, high humidity, or sunlight; from a exterior grade photopolymer and backing assembly that has either:
1) Been permanently adhered and then fused by a baking process; or
2) Been permanently laminated with a clear exterior grade adhesive to a .017-inch aluminum alloy. Furnish un-framed; color as selected by Architect from manufacturer's standards.

b. Tested in accordance with ASTM G154, after 300 hours, shall show not peel, fade, or crack.
c. Provide a positive angle of 25-30 degrees, for the shoulder of inscription to backing.

1. After inscribing, coat plaque with baked-on acrylic polyurethane paint. Two (2) colors as selected by Architect, from manufacturer's choice at least 20 standard contrasting colors.
2. Inscription symbols, text and size: As noted on the Drawings.

B. Non-tactile signs: Lettering and pictograms "subsurface" processed.
1. Plates:
a. 0.063-inch matte acrylic face plate laminated to a .12S-inch acrylic back plate.
b. Furnish with a premium colored, 7 year durability rated; vinyl film interlayer as manufactured by 3M Company, or approved equal.
c. Furnish in 2 standard lengths depending upon text. One standard length for text up to 6 characters and one additional length for characters 7 or more characters in length.
d. Provide hole in each corner for mounting hardware
2. Letters and numbers:
a. Contrasting color to face plate.
b. Letters .035 x 1-inch and permanently adhered to either face or backing plate.
3. Edges: Beveled .032-inch.; painted to match film color.
4. Corners: Square
5. Colors: As selected by Architect from [standard] [and premium] film, acrylic and vinyl colors available.
6. Inscription symbols and text: As noted on the Drawings.
7. Non-tactile signs shall comply with 11B-703.5.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.

3.02 INSTALLATION

A. Install sign units level, plumb and free from distortion or other defects in appearance.

B. Install signage in accordance with manufacturers' recommended installation

instructions and approved methods as noted on the shop drawings, unless otherwise indicated in the Drawings or Specifications.

1. General: Non-tamper 1/4-inch screw fasteners. Provide fasteners at sign corners and elsewhere along edges at 8-inches on centers.
   a. Substrates
      1) Signs having gypsum board or tackable surface substrate: Round head wood screws long enough to penetrate 3/4 inch into blocking or studs.
      2) Signs having concrete substrate: 3/4-inch long expansion anchors.
      3) Signs having masonry substrate: 3/4-inch long expansion anchors installed into block or brick unit pieces.
   b. Plaques: Specified manufacturer's standard concealed plaque mounting as selected by Architect.

C. Mounting locations
   1. Room identifications signs:
      a. On wall adjacent to strike side of doors at height of 60 inches above finish floor to centerline of sign.
      b. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door. Where there is no wall space at the latch side of a single door or at the right side of the double doors, signs shall be located on the nearest adjacent wall. Signs containing tactile characters shall be located so that a clear floor space of 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45° open position. Where provided, signs identifying permanent rooms and spaces shall be located at the entrance to, and outside of the room or space. Where provided, signs identifying exits shall be located at the exit door when approached in the direction of egress travel.
   2. Accessible entrance signs (ISA): Lower bottom corner closest to entrance, of closest adjacent window.
   3. Mounting in accordance with code requirements and as indicated and detailed on the Drawings.

END OF SECTION

SECTION 10 21 13: PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.

B. Section 10 28 00, Toilet Accessories.

1.03 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. Use materials and products of one manufacturer whenever possible.

C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking. 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. Manufacturer Qualifications: Minimum 5 years experience in manufacturing of solid plastic (HDPE) toilet compartments with products in satisfactory use under similar service conditions.

E. Installer Qualification: Minimum 5 years experience in work of this section.

1.04 SUBMITTALS

A. Refer to Section 01 33 01

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. Certification: Submit certification showing independent testing that compartments comply with NFPA 286 and AC150, Acceptance Criteria for Plastic Partitions Used in Public Restrooms.

D. Sustainable Design Submittals:

1. Recycled Content: Certify percentage of post-consumer recycled content.

2. Regional Materials: Certify distance between manufacturer and Project and between manufacturer and extraction or harvest point in miles.

E. CAL-GREEN Submittals:

1. Product Data - VOC Limits: For adhesives, sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 61 16

F. Samples: The following samples are required. Submit per Section 01 33 01.

1. Submit sample for each type of panel and finish to Architect for review.

2. Manufacturer's full range of colors for Architect's selection.

3. Provide a sample of each type of hardware, if requested by Architect

G. Shop Drawings: Submit plan, interior elevations and details showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted. Include blocking layout for use in structural framing.

H. Guarantee of Contractor/Subcontractor per Article 1.5.

1.05 WARRANTY

A. Refer to General Conditions and Section 01 33 01.

B. Submit fully executed Guarantee with submittal package required by Article 1.4.

C. Provide manufacturer's standard 25-year warranty, to include breakage, warpage, corrosion or delamination of installed plastic components, door latch and strike, integral hinge system and plastic shoes and wall brackets. Defective components shall be replaced. Labor for reinstallation included.

1.06 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted the on drawings, as adopted by the California Division of the State Architect (DSA).

1. Chapter 8, Section 803.

2. Chapter 11B, Section 213.2.

B. California Green Building Standards Code, edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

C. International Code Council (ICC)

D. National Fire Protection Agency (NFPA)

1. NFPA 101 Life Safety Code

a. Chapter 10

b. Chapter 14

2. NFPA 286: Fire Test for Evaluation Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

E. California Fire Code (CFC), edition as noted on drawings, as adopted by the California State Fire Marshal.

1. Chapter 8

F. American Society for Testing and Materials

1. ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium. Nickel Steel Plate.

2. ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

3. ASTM A666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

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

G. U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Program, Version 2.1

1.07 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 not to interfere with the progress of the work.

C. Transport, store and handle in strict accord with the manufacturer's written recommendations to avoid deformation.

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.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

1.09 COORDINATION

A. Coordinate placement of backing in walls.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. VOC Limits for adhesives, sealants, fillers, coatings and primers. Comply with limits specified in related Section.

B. Provide products conforming to local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application. If

specified product exceeds current requirement, provide conforming product at no additional cost. Provide written confirmation to Architect describing reason for revision and demonstrate compliance of replacement product with specified requirements.

C. Performance Requirements:

1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
4. Smoke Developed Index (ASTM E 84): Less than 450.
5. Flame Spread Index (ASTM E 84): Less than 75.

2.02 MANUFACTURER

A. Floor Mounted, Overhead Braced type, system as manufactured by Scranton Products Hiny Hiders (Santana/Comtec/Capitol) scrantonproducts.com 801 East Corey Street, Scranton, PA 18505, phone 800.445.5148, info@scrantonproducts.com or accepted equal meeting requirements specified herein, modified as shown on the Drawings.

2.03 MATERIALS

A. Panel, pilaster, and door material: Fire-rated high density polyethylene (HDPE) tested in accordance with NFPA 286, containing a minimum of 25% recycled resin, manufactured under high pressure forming a single component section that is waterproof, nonabsorbent, with a self-lubricating surface resistant to marking with writing utensils.

B. Panel material shall comply with CAS/CAR, CBC and ADA for accessibility for the physically disabled.

2.04 COMPONENTS

A. Pilaster Sleeve: Formed one-piece plastic.

B. Head Rail: ASTM B221; aluminum extrusion, 6364-T5 alloy with clear anodized finish and anti-grip configuration, minimum 1.188 lbs. per lineal foot.

1. Headrail Brackets: 20 gauge stainless steel, satin finish.

C. Attachments, Screws and Bolts: ASTM A167; Type 304 stainless steel, anti-theft head.

D. Hardware:

1. Continuous Hinges: Hinges shall be fabricated from heavy 14 gauge, #304 stainless steel with a brushed finish. The helix hinge contains a ¼" stainless steel pin that is welded and ground. Hinge flanges are pre-drilled, surface mounted and thru-bolted to doors and pilasters with one-way sex bolts; 54" heavy duty helix hinges shall be used throughout; self-closing (HH54SCAMOP) gravity type assembly permitting door to rest partially open (30 degrees open at in swing, closed at out swing (HH54SCAMCL) and disabled accessible). Provide 1 hinge at typical doors.

2. Door latch Housing: Aluminum extrusion with clear anodized finish, surface mounted and fastened to door with Type 304 stainless steel, anti-theft head screws. Slide bolt and button shall be "Tough coat black" finish. Thumb turn type latch is not acceptable. Latch must comply with all applicable codes for disabled accessibility.

3. Strike and Keeper: 6 inch long extruded aluminum with clear anodized finish, with wrap-around flanges, equipped with rubber bumper, fastened to pilaster with anti-theft head sex bolts.

4. Equip each door with sliding door latch and coat hook with bumper. Mount lock at +42-inches above the finished floor in the disabled accessible stall. Mount hook at +48 inches above the finished floor in center of door on the inside of the stall.

5. Provide door pull and wall stop for out-swinging doors. Equip disabled accessible doors with inside and outside pulls. Pulls shall be "U" shaped.

E. Wall and Pilaster Brackets: 54 inches long, continuous stainless steel channel brackets.

F. Floor to wall Posts: 1-1/4 inch square x 18 ga. stainless steel with satin finish.

2.05 FABRICATION

A. Fabricate partitions from HDPE material with finished faces, free of saw marks, and all edges machined to .250 inch radius.

B. Bevel or round corners and edges of cutouts.

C. Doors, Panels and Pilasters:

1. Thickness: 1 inch minimum.
2. Door Width: 24 inches minimum.
3. Door Width for physically disabled: minimum 36 inch clear opening.
4. Door and Panel Height: 55 inches, mounted 14" above finish floor.
5. Pilaster: 82 inches high.
6. Pilaster Height: 82 inches typical; full height where shown on plans.
7. Panel Height: 55 inches, mounted 14 inches above floor.
8. Aluminum edging strips to be fastened to the bottom edge of all doors and panels.

D. Urinal Screens:

1. Thickness: 1 inch.
2. Screen Depth: 18-inches
3. Screen Height: 42 inches mounted 14 inches above floor with full height bracket. Screen shall be floor pilaster supported.
4. Aluminum edging strips to be fastened to the bottom edge of all screens.

2.06 FINISHING:

A. Color of HDPE (orange peel texture – Class A NFPA 286): As selected by School District. Panel color to be one color in all restrooms.

B. Stainless Steel: No. 4 satin finish.

C. Aluminum: Clear Anodized.

PART 3 EXECUTION

3.01 INSPECTION

A. Prior to installation, carefully inspect and verify that the installed work of other trades is complete to the point where this installation may properly commence.

B. Verify that toilet partitions may be installed in complete accordance with the original design. Verify solid blocking has been provided in walls and ceilings at all partition and bracing connection locations. Do not install if blocking is missing.

C. In the event of discrepancy, immediately notify the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.02 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. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.03 INSTALLATION

A. Install all toilet partitions and screens where indicated on the Drawings and reviewed shop Drawings, anchoring all components firmly in place into solid blocking and in compliance with manufacturer's recommendations.

B. General: Install partitions and screens rigid, straight, plumb and level. Maximum variation from plumb is 1/8 inch. Provide clearances of not more than 3/8 inch between pilasters and panels; not more than 1/2 inch between panels and walls; and not more than 3/8 inch between vertical edge of doors and pilasters. Secure panels to walls with full length, continuous wall brackets using stainless steel fasteners spaced maximum 12 inches on-center. Attach panels and pilasters to continuous brackets with anti-theft sex bolts. Anchor shoes to floor with #14 x 1 ½-inch stainless steel screws in metal expansion anchors. Pilaster secured within shoe with anti-theft sex bolt.

C. Overhead-braced partitions: Secure pilasters to supporting floor and walls with specified anchorage devices. Level, plumb, and tighten. Secure overhead brace to face sheets with not less than 2 fasteners per face. Adjust tops of doors parallel with overhead brace when doors are in closed position.

D. Provide Floor to Ceiling Post at Urinal Screens.

E. Hardware adjustment: Adjust and lubricate hardware for proper operation after installation.

1. Set hinges on in-swing doors to hold doors open approximately 30-degrees from closed position when unlatched.

2. Set hinges on out-swing doors to return to fully closed position.

3.04 ADJUSTING AND CLEANING

A. Upon completion, and as a condition of acceptance, visually inspect the entire work of this Section and adjust all components for proper operation and straight alignment. All surfaces shall be free of imperfections, scratch marks, blemishes or color variations.

B. Upon completion, thoroughly wash surfaces, remove foreign material and polish surfaces. Leave entire work in neat, orderly, clean, acceptable condition as approved. Replace damaged parts and surfaces which are not free from imperfections. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.05 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. Adequately protect products during and after installation against damage. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects.

END OF SECTION

SECTION 10 28 13: TOILET ACCESSORIES

PART 1 GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 81 13, Sustainable Design Requirements.

C. Section 06 10 00, Rough Carpentry, for blocking and backing.

D. Division 26, Electrical.

1.03 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. 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.

1.04 SUBMITTALS

A. Refer to Section 01 33 01.

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. CAL-GREEN Submittals:

1. Product Data — VOC Limits: For adhesives, sealants, fillers and primers, documentation including printed statement of VOC contents, comply with limits specified in Section 01 61 16.

D. Shop Drawings: Submit showing all parts, connections and anchorages, adjacent materials, fully dimensioned and noted.

E. Guarantee of Contractor/Subcontractor per Article 1.5.

1.05 GUARANTEE

A. Refer to General Conditions and Section 01 33 01.

B. Submit fully executed Guarantee with submittal package required by Article 1.4.

1.06 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the state Architect (DSA).

B. California Green Building Standards Code, edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

C. Codes and Standards: Conform to all applicable requirements of the CBC for disabled accessibility and ASTM F446 “Standard Consumer Safety Specifications for Grab Bars and Accessories Installed in a Restroom Area.”

1.07 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.

1.08 FIELD MEASUREMENTS

A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

B. Verify wall depths are adequate for each item prior to ordering. Notify Architect of conflicts or discrepancies.

1.09 PRODUCTS FURNISHED BY OWNER AND INSTALLED HEREUNDER

A. The following products will be provided by the Owner for installation by Contractor. Provide adequate blocking for attachment. All miscellaneous items are to be provided and installed by Contractor.

1. Soap dispensers.

2. Paper towel dispensers. In the location shown the paper towel dispenser shall be maximum 4” in depth.

3. Toilet tissue dispensers: Accessible.

4. Toilet Seat Protector Dispensers.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. VOC Limits for adhesives, sealants, fillers, coatings and primers. Comply with limits specified in related Section.

B. Provide products conforming to local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application. If specified product exceeds current requirement, provide conforming product at no additional cost. Provide written confirmation to Architect describing reason for revision and demonstrate compliance of replacement product with specified requirements.

2.02 MATERIALS

A. Grab bars: Bobrick Series B-6806, Bradley 812 Series, or accepted equal; 18 ga. 1-1/2 inch o.d. type 304 stainless steel welded to 1/8 inch type 304 solid stainless steel wall plates. Grab bar shall withstand a 250 lb. point load. Intermediate supports similar. All joints ground and polished. Satin finish on all exposed surfaces. Concealed vandal resistant mounting. Provide in configuration and lengths as shown.

B. Mirror: Bobrick Series B-165, Bradley 781 Series, or accepted equal; 1/4 inch thick No. 1 (mirror glazing) quality, clear polished plate glass, with protective copper backing over silver coating and non-metallic elastic paint. Edges protected by friction-absorbing filler strips.

1. Size; unless otherwise shown

   a. Toilet Rooms: 24”w x 30”h.

2. Safety Backing: Full size, shock absorbing, water resistant, non-abrasive, 3/16” thick polyethylene padding.

3. Backs: Galvanized steel backing with formed edges, integral horizontal hanging brackets. Provide “theftproof” concealed hangers.

4. Frames: Stainless steel, 1/2” x 1/2” x 3/8” channel with bright polish finish. Use “theftproof’ screws in countersunk holes where screws are exposed. Corners, square and mitered, weld or mechanically fasten to tight hairline joint, or frame one piece with rounded corners

2.03 FASTENINGS

A. All toilet accessories shall be complete with all required fastenings. All fastenings shall either harmonize with the item being fastened, or be of the concealed type. All to be theft and vandal-proof.

PART 3 EXECUTION

3.01 INSPECTION

A. Coordination: Coordinate with all other trades as required to ensure proper and adequate provision in framing and wall finish for the installation of the selected toilet accessories in the locations required (including all recessed items)

B. Prior to installation of the work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this installation may properly commence.

C. Verify that specified items may be installed in accordance with the approved design.

D. In the event of discrepancy, immediately notify the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

E. Confirm power is provided to hand and hair dryers.

3.02 PREPARATION

A. The General Contractor shall provide recesses, anchorage and back-up blocking in sizes and in locations as required for proper installation of all accessories. Coordinate with other trades where necessary to make provisions for installation.

B. Securely anchor all items in place in locations and at mounting heights indicated. Where specific dimensions are not noted, installed as directed by Architect.

C. Securely fasten grab bar mounting plates to solid framing or blocking, in accordance with CBC.

D. Provide cut-outs in toilet partitions for napkin disposal units as required.

3.03 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturer's printed instructions where shown or as directed by Architect.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Use concealed vandal-proof fastenings wherever possible. Adhesive installation not permitted. Provide anchors, bolts and other necessary fasteners, and attach accessories securely to walls or toilet partitions as recommended by manufacturer for each item and each type of substrate condition.

D. Grab bars: Solidly anchor grab bars to withstand minimum downward pull of 500 lbs. between any 2 supports after installation.

E. Verify type, location and attachment methods of items furnished by Owner to ensure proper preparation of substrate for solid attachment of accessories.

3.04 CLEANING AND ADJUSTING

A. Upon completion of installation, remove manufacturer's temporary labels, marks of identification. Thoroughly wash surfaces, remove foreign materials, polish surfaces. Leave entire work in neat, orderly, clean, acceptable condition as approved. Replace damaged parts, surfaces which are not free from imperfections.

3.05 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. Exposed finish shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

END OF SECTION

SECTION 22 00 00: PLUMBING

PART 1 - GENERAL

1.1 RESPONSIBILITY

A. Use only qualified persons experienced in the particular work described herein. Use only new material of the best quality. Install all work in a neat and orderly manner. Coordinate this work with other portions of the project to result in complete operable systems.

1.2 ALTERNATIVE MATERIALS AND METHODS

A. These plans and specifications describe the general scope of the plumbing systems. These plans and specifications do not preclude the submittal of alternative methods or materials. Manufacturer's names and catalog numbers are stated to identify the type and quality of the equipment or materials required for the project.
B. The contractor may submit shop drawings and/or technical information on alternative equipment, materials or installation details to accomplish the intent of the plans and specifications. Approval of the alternative equipment, materials or installation details shall not relieve the contractor of any responsibility for complying with the intent of the plans and specifications. Submit the manufacturers' technical information, shop drawings, and/or written description of alternative methods for each item described by manufacturer's name and catalog number and for each component, equipment, material, or installation detail required.

1.3 WORK INCLUDED IN DIVISION 22:

A. Plumbing systems.

1.4 DIVISION OF WORK BETWEEN DIVISIONS 22 AND 26

A. Close coordination between the electrical and plumbing trades is a part of the work that is required by this contract. No allowance will be made for omissions based on incorrectly assuming another trade will be performing your work. Confirm your scope of work with the general contractor.
B. This section applies only to Divisions 22 and 26. The division of responsibilities between trades supplying equipment in other Divisions may be different. For instance, Division 26 contractor may be required to supply disconnect switches and starters for non-HVAC mechanical equipment supplied under other Divisions.

    1. Division 22 Responsibilities:

        a. Assume responsibility for the proper functioning of the plumbing systems in their entirety.
        b. Furnish and install all conductors and conduit required for control of plumbing equipment.
        c. Make all terminations with the exception of power conductors.
        d. Furnish and install all control panels and devices to provide a complete and functional controls system, including all controls transformers.

e. Furnish and install motor starters for all equipment specified in Division 22.
f. All electrical work performed under Division 22 shall conform to the requirements of Division 26.

2. Division 26 Responsibilities

a. Furnish and install all raceways, conduit, disconnect switches, and conductors necessary for electrical power supply.
b. Make all power supply terminations to motors, starters, disconnect switches, control transformers, and other Division 22 devices.
c. Coordinate all work with Division 22 contractors.

1.5 WORK NOT DESCRIBED:

A. Include all minor items not typically shown or specified as required to produce complete, operational plumbing systems.

1.6 RULES AND REGULATIONS

A. All work and materials shall comply with the 2022 rules and regulations of:

1. California Building Standards Code (California Code of Regulations, Title-24) as applicable, including the California Building, Electrical, Mechanical, Plumbing, Energy, Fire, and Green Building Standards (CalGreen) Codes.
2. NFPA Standards.
3. Other standards as referenced in individual specification sections.
4. The State Fire Marshal.

1.7 SITE EXAMINATION

A. Thoroughly examine the site and verify the actual work conditions. No extra compensation will be allowed for expenses due to failure to discover site conditions which affect the work.

1.8 PLAN AND SPECIFICATION ACCURACY

A. The plans and specifications are diagrammatic in nature and do not represent exact locations or distances, except where specifically noted. Include all required offsets, bends, and other special fittings. Coordinate with the other building trades and make all modifications required at no extra cost.
B. The plans showing existing plumbing systems show the systems as illustrated on the best available as-built documents and on limited field inspection of the site by the Engineer. Inspect and field-verify actual existing conditions. The plans reflect the desired new configuration. Include all required modifications to implement the new configuration at no extra cost.
C. Plans showing existing buried piping systems reflect information available on existing plans and surface examination at the site. Actual pipe locations, materials, depths, and grades have not been determined. Call the Underground Utility Service Alert hot line 1-800-642-2444 before digging to have existing buried utilities labeled.

1.9 SUBSTITUTIONS AND SUBMITTALS

A. Provide submittals of all data as required in each section of these Division 22 specifications. Submittal data to be sufficient to verify complete compliance with the plans and specifications. Provide complete data even if using materials specified. Conform to the submittal requirements of the General Conditions. Submit in as few packages as possible to expedite the review process.
B. Submit proposed deviations from the plans or specifications in material type, size, configuration, quantity, or routing for Engineer's review. Contractor to pay for all required redesign costs. Unless otherwise agreed, Contractor shall pay for all additional costs incurred for approved alterations.

1.10 AS-BUILT DRAWINGS

A. Provide and keep up-to-date a complete set of prints which shows every change from the original contract drawings, including change orders. Deliver an as-built set to the Engineer upon project completion and acceptance. Include dimensions, exact locations, and invert elevations of all exterior underground piping.

1.11 SEISMIC CONSTRUCTION

A. Anchor all devices and system components with seismic restraint systems and devices meeting California Building Code requirements, sized to match component weights and installed at intervals as pre-approved by anchorage manufacturer. If required by the local inspector, provide structural calculations.

PART 2 - PRODUCTS

2.1 QUALITY

A. Install only new materials. No used, "seconds", or "blemished" materials may be installed. Do not install materials received in a damaged condition or damaged at job-site. Return all damaged components. Repair of minor and incidental damage, if first approved by Engineer and manufacturer, is acceptable.

2.2 SAFETY

A. Install all equipment with required safety devices, such as belt or coupling guards, heat shields, electrical disconnects, etc.

2.3 EQUIPMENT SUPPORTS, SLEEVES, CHASES, INSERTS, AND OPENINGS

A. Install all sleeves, inserts, anchorages, etc. required for this Division and which are embedded in work of other trades.

PART 3 - EXECUTION

3.1 TESTS

A. When complete, performance test all plumbing systems at one time to the Engineer's satisfaction. No system will be accepted until it proves satisfactory in every detail. Provide Engineer 48 hours notice before testing.

3.2 FOUNDATIONS AND SUPPORTS

A. Install equipment on concrete foundation pads anchored to the slab floor, if shown on the Plans, listed in the Specifications, or recommended by the manufacturer. Anchor equipment to the pad to meet normal load and seismic requirements.
B. Securely attach all equipment, piping, etc. to the building as detailed in the related construction code or as described in these plans and specifications. Allow for expansion and contraction, if applicable.
C. Install vibration isolators under rotating machinery without internal isolation, or other devices capable of producing significant or objectionable vibration.

3.3 CUTTING AND PATCHING

A. Make all cuts and patches required to install the work according to good construction practice. Coordinate all required structural modifications or structural member cutting with the other trades, and only after Engineer's approval.
B. Do not cover concealed piping or other systems installed under this Division until inspected and approved by the Engineer and all other required construction inspectors. If systems are covered up before inspection and approval, Contractor will remove covering and replace after inspection at no extra cost.

3.4 EQUIPMENT IDENTIFICATION

A. All plumbing equipment labeled in the equipment schedule on the plans shall be identified at their location with two (2-ply) laminated layers of permanently bonded ABS/acrylic plastic equipment labels.

3.5 TRAINING, OPERATION, AND MAINTENANCE

A. After all plumbing systems have been tested and accepted, provide at least 4 hours training to the Owner's maintenance crew. Cover operating and maintenance procedures for all plumbing systems and components installed.
B. Submit two (2) bound sets of Operations and Maintenance Manuals (O&M Manuals) to the Owner. Submit a draft copy to the Engineer for approval prior to issuing the final copies. The O&M Manuals shall include, at a minimum:

    1. All available manufacturers' O&M literature, parts lists, etc.
    2. Wiring diagrams.
    3. Controls diagrams of all pneumatic, electric, and electronic control systems.
    4. Written sequence of operations of all controls.
    5. Any unusual or unique system O&M procedures not covered by manufacturers' literature.
    6. Summary maintenance schedule showing maintenance intervals as recommended by the manufacturers. (lubrication, filter changes, etc.)

C. The Contractor is obligated to meet the guaranty requirements of the General Conditions.

END OF SECTION

SECTION 22 10 00: PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. Provide and install the following:

1. Domestic cold water system.
2. Domestic hot water system.
3. Drain, waste, vent systems.
4. Rainwater system.
5. Condensate drain system.

1.2 CODES AND STANDARDS

A. Furnish and install all materials and equipment in conformance with the 2022 rules and regulations of the following:

1. California Building Standards Code (California Code of Regulations, Title-24) as applicable, including the California Building, Electrical, Mechanical, Plumbing, Energy, Fire, and Green Building Standards (CalGreen) Codes.
2. NFPA Standards.
3. The State Fire Marshal.
4. Other standards as referenced in individual specification sections.

1.3 TESTING

A. Perform pressure tests on all plumbing systems in conformance with the CPC.
B. Repair any nonconforming sections and re-test until the test criteria are satisfied.
C. Conduct tests conducted before piping is concealed in walls, floor, ceiling, or buried.
D. Construction inspector to witness all tests.
E. After pressure testing, provide an operational test on all systems.

1.4 WARRANTY

A. Provide one-year unconditional warranty on all plumbing equipment and systems, as described in the General Conditions.

1.5 SUBMITTALS REQUIRED FOR THIS SECTION

A. All equipment shown in schedules in plans.
B. Clean outs, Hydrants, and valves.
C. Piping and equipment insulation.
D. Shop drawings for all contractor-proposed piping layouts varying significantly from plans.
E. Proposed pipe hanger, seismic restraint, and roof pipe support systems.
F. Operation and maintenance manual.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Domestic Cold and Hot Water Piping

1. Inside and outside building, above floor, copper option

a. Type "L" hard copper tubing.
b. Conforming to ASTM B-88.
c. Wrought copper fittings and 95/5 solder joints.
d. Viega Pro-Press or equivalent press fittings may be substituted for solder joint fittings.
e. Grooved copper fittings and mechanical couplings may be used provided fittings are not flared.
f. Type "M" may be used for unpressurized drain piping.

2. Inside building, below-floor slab and grade

a. Type “K” soft or hard temper copper tubing.
b. Conforming to ASTM B-88.
c. Wrought copper fittings and 95/5 solder joints above grade only.
d. Minimize joints below slabs.
e. Using wrought copper fittings and brazed joints below slab only where unavoidable.

3. Outside building, below-grade

a. Schedule 40 PVC pipe.
b. Conforming to ASTM D1785
c. PVC socket fittings and solvent joints.

B. Sanitary Soil, Waste and Vent Piping:

1. Inside building, above-grade

a. Schedule 40 PVC-DWV
b. ASTM F 1866
c. PVC socket fittings & solvent joints.

2. Inside building, below-floor and grade

a. Schedule 40 PVC-DWV
b. ASTM F 1866
c. PVC socket fittings & solvent joints.

3. Outside building, above-grade

a. Schedule 40 PVC-DWV
b. ASTM F 1866
c. PVC socket fittings & solvent joints.

d. Paint pipe for UV protection

4. Outside building, below-grade

a. Unless otherwise noted, shall be SDR-35 PVC Pipe.
b. ASTM D3034.

C. Rainwater and Storm Drain Piping:

1. Inside building, above grade

a. Cast iron.
b. No-hub joints.
c. Stainless steel clamps.

2. Inside building, below grade

a. Schedule 40 PVC-DWV
b. ASTM F 1866
c. PVC socket fittings & solvent joints.

D. Indirect Waste Piping

1. Cooling Coil Condensate Drain

a. Type "M" hard copper tubing conforming to ASTM B-88.
b. Wrought copper fittings and 95/5 solder joints.
c. Press fittings may be substituted for solder joint fittings. Viega Pro-Press or equivalent.
d. Use DWV fittings for pipe 1½” or larger.

2.2 VALVES, COCKS, AND FAUCETS

A. Valve Connections

1. Use full pipe size valves.
2. Use threaded valves and fittings for pipe sizes 2” and smaller.
3. Use flanged valves and fittings for pipe sizes 2½” and larger sizes.
4. Use solder joint valves or screw to solder adapters for copper tubing.

B. Check Valves

1. Threaded or solder joint

a. Bronze.
b. Swing disc.

2. Flanged

a. Iron body.
b. Bronze trim.

c. Swing disc.
d. Renewable disc and seat.

C. Gate Valves

1. Threaded or solder joint

a. Bronze.
b. Non-rising stem.
c. Inside screw
d. Double wedge or disc.

2. Flanged

a. Iron body.
b. Bronze trim.
c. Rising stem.
d. O.S.& Y.
e. Solid wedge.

D. Ball Valves

1. Bronze body and trim.
2. Solder or screwed ends.

E. Pressure Ratings

1. Unless otherwise indicated, rate at 200 psig WSP and 250°F.

F. Valve Boxes

1. One-piece pre-cast concrete with cast iron cover labeled "Water", "Sewer", "Gas", or other label as appropriate.
2. Install valve box and cover with H20 traffic loading in traffic areas.

2.3 CLEANOUTS

A. Finished Floor

1. Adjustable round heavy-duty floor cleanout with cast iron body and frame.
2. Lead seal and bronze plug.
3. Provide nickel-bronze top.
4. J.R. Smith model 4021.

B. Unfinished Floor

1. Adjustable round double extra heavy-duty floor cleanout with cast iron body and frame.
2. Lead seal and bronze plug.
3. Provide non-skid bronze top.
4. J.R. Smith model 4221.

C. Outside or Grade

1. Adjustable round double extra heavy-duty flanged cleanout with cast iron body and frame.
2. Lead seal and bronze plug.
3. Provide non-skid bronze top.
4. J.R. Smith model 4251.
5. Install with 12" square by 6" deep concrete case.

D. Tiled Finished Wall

1. Extra heavy-duty wall cleanout tee with cast iron body.
2. Lead seal and bronze plug.
3. Provide square chrome-plated face-of-wall access cover.
4. J.R. Smith model 4551.

E. Other Walls

1. Extra heavy-duty wall cleanout tee with cast iron body.
2. Lead seal and bronze plug.
3. Provide round stainless steel shall face-of-wall access cover.
4. J.R. Smith model 4521.

2.4 PIPE INSULATION

A. Hot Water Supply and Return

1. Fiberglass insulation with Kraft reinforced vapor barrier.
2. All service jacket with self-sealing lap (ASJ-SSL).
3. Smoke/flame rating of 50/25 or less in accordance to ASTM E84 or UL 723.
4. Knauf, Owens-Corning, Certainteed, Johns Manville, or equivalent.
5. Insulation thermal conductivity and thickness based on maximum operating water temperature and pipe size per table below:

Fluid Temp. Range (°F)	Thermal Conductivity Range (Btu·in/ hr·ft^2·°F)	Insulation Mean Rating Temp. (°F)	Nominal Pipe Size				
			< 1”	1” - 1¼”	1½” - 3½”	4” - 6”	
			Insulation Thickness (in) (R-Value)				
40 -104	0.21-0.27	75	0.75” (R-6)	0.75” (R-5)	1” (R-7)	1” (R-6)	
105 - 140	0.22-0.28	100	1.0 (R-7.7)	1.5 (R-12.5)	1.5 (R-11)	1.5 (R-9)	

B. Cold Water Supply

1. Insulate all cold water piping in uninsulated attics exterior walls, and other areas of potential freezing. Use insulation meeting hot water supply requirements.

PART 3 - PART 3 EXECUTION

3.1 PIPE INSTALLATION

A. Make screwed joints with full cut standard taper pipe threads with teflon tape or teflon-based pipe dope applied to male threads only.
B. Steel to PVC connections may be made with service saddles, or screwed fittings.
C. Use unions at all equipment connections.
D. Use di-electric unions at all copper to steel connections.
E. Bury outside water and drainage pipe minimum 2 feet.
F. Extend vents six inches above roof, ten feet minimum from outside air openings.
G. Backfill drain lines under slab with sand, compacted to 95% in 6" lifts maximum. Provide copper tracer wire over all exterior non-metallic piping.
H. See structural plans for penetrations through or under foundations and details under slabs.
I. Use left\right nipples and couplings in lieu of unions for gas piping, except at equipment connections.
J. Install buried copper tubing in red (hot water) or blue (cold water) plastic sleeves.
K. Provide pipe sleeves around pipe penetrations through floor slabs as required in the structural plans.
L. Unless otherwise noted on the plans install piping on roofs using B-line Dura-Blok or equivalent recycled rubber rooftop supports with integral galvanized steel channels. Attach supports to roofing with mastic as recommended by roofing supplier.

3.2 PIPE ROUTE AND GRADES

A. Install to conserve headroom and interfere as little as possible with use of space.
B. Run exposed piping parallel to walls.
C. Group piping whenever practical at common elevations.
D. Install concealed pipes close to building structure to keep furring to minimum.
E. Slope water piping 1 inch in 40 feet and install drain valves and hose nipples at low points.
F. Grade horizontal sanitary sewer drainage and vent piping ¼” per foot minimum. For ultra-low flush water closets, slope waste ½” per foot to the building main.
G. Offset waste lines as required to avoid encroaching the restricted areas adjacent to foundation footings parallel to the waste lines. See structural plans for restricted areas.
H. Install piping to allow for expansion and contraction without stressing pipe or equipment connected.
I. Provide clearance for installing pipe insulation and for access to valves, air vents, drains and unions. Install 12" x 12" access doors for all concealed valves.
J. Install same type piping material specified for inside building to 8 feet outside of building.

3.3 SUPPORTS, ANCHORS AND SLEEVES

A. Pipe Hangers and Supports

1. Use B-Line or equivalent hanger or trapeze system, including the factory pre-approved seismic restraint system (OPM-0052-13) or equivalent OSHPD pre-approved seismic restraint system.

2. Provide copper plated or plasticized hangers for copper piping, or wrap pipe with 20 mil PVC wrap.
3. Use insulation shields and rigid calcium silicate insulation inserts at least 6" long for insulated piping to prevent insulation crushing.
4. Use steel threaded hanger rods.
5. For single pipes, use adjustable wrought steel clevis hangers.
6. Use "U"-shaped pipe clamps and channel struts where piping is routed tight to walls, ceilings, or exposed structure. Use lag screws to attach strut to structure.
7. Where copper piping passes through wood or steel studs, use plastic pipe guide bushings.
8. Provide metal support plates at pipe terminations at fixtures.
9. Use PVC pipe supports with integral pitch pockets on pipe runs over flat roofs.
10. Support horizontal steel and copper piping as follows:

Nominal Pipe Size (in)	Support Spacing (ft)	Hanger Rod Diameter (in)
1/2	5	3/8
3/4 to 1	6	3/8
1-1/4 to 2	8	3/8
2-1/2 to 3	10	1/2
4 to 5	12	5/8
6	14	3/4
Note: Use one size larger hanger rod if pipe hanger is seismically braced.		

11. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work.
12. Place a hanger within one foot of each horizontal elbow.
13. Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.
14. Support horizontal soil pipe near each hub, with 5 feet maximum spacing between hangers.
15. Support vertical piping at every floor. Support vertical soil pipe at each floor at hub.
16. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
17. Where practical, support riser piping independently of connected horizontal piping.

3.4 FLASHING

A. 26 gauge galvanized steel, installation to architectural roofing specifications.

3.5 SLEEVES

A. Install 18 gauge galvanized steel sleeves through all pipe penetrations through footings, foundation walls, and other concrete work.
B. Set sleeves in position in advance of concrete work.
C. Provide suitable reinforcing around sleeves.
D. Extend sleeves through potentially wet floors one inch above finished floor level.
E. Caulk sleeves full depth and provide floor plate.
F. Where piping passes through floor, ceiling or wall close off space between pipe or duct and construction with a UL-listed sealant rated at the penetration's fire rating.
G. Provide tight fitting metal caps on both sides and caulk.
H. Install chrome plated escutcheons where piping passes through finished surfaces.

3.6 VALVE INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.
B. Install gate or ball valves for shut-off and isolating service, to isolate equipment, part of systems or vertical risers.
C. Use unions at or near valves to facilitate servicing.
D. Install backflow prevention valves at the service fill connection of each piping system or component requiring a water service connection.

3.7 CLEANOUT INSTALLATION

A. Lubricate cleanout plugs with mixture of graphite and linseed oil.
B. Prior to building turnover, remove cleanout plugs, re-lubricate and reinstall using only enough force to ensure permanent leakproof joint.

3.8 PIPE INSULATION INSTALLATION

A. Follow manufacturer's recommendations.
B. Use the proper sealing tool.
C. Insulate elbows, tees, and other fittings with unfaced insulation and pre-molded PVC fitting covers. Insulate the first five feet of cold water supply piping connections to water heaters.
D. Stuff insulation in wall, floor, or ceiling penetrations, except where noted to apply fire-rated sealants or gasketing.
E. Apply weatherproof aluminum jacketing and banding over all exterior insulated piping.

3.9 PAINTING

A. Prime coat and finish paint to match building all exposed pipe, steel hangers, and supports.
B. Hangers and supports, located in crawl spaces, pipes shafts and suspended ceiling spaces are not considered exposed.

3.10 PIPE CLEANING AND STERILIZATION

A. Flush lines to remove all chips, burrs, and debris from pipe interior after system rough-in, but before final fixture connection.
B. Use compressed air for gas lines and water for water lines.
C. Clean all strainers after flushing. Sterilize all potable water lines to AWWA standards, and then flush out lines to remove all residual hyper-chlorinated water.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Plumbing fixtures.

1.2 WARRANTY

A. Provide one-year unconditional warranty on all plumbing equipment and systems, as described in the General Conditions.

1.3 SUBMITTALS REQUIRED FOR THIS SECTION

A. All equipment shown in schedules in plans.
B. Operation and maintenance manual.

PART 2 - PRODUCTS

2.1 COMMERCIAL PLUMBING FIXTURES

A. Water Closets

1. ADA (Adult) Floor-Mount Flush Valve Water Closet

a. Similar to standard floor-mount flush valve water closet except 16" to 17” height to rim.
b. Install flush valve handle on accessible side of water closet enclosure.

2. Standard Floor-Mount Flush Valve Water Closet

a. White vitreous china flush valve type with closet ring.
b. Siphon jet action and elongated bowl designed for 1.28 gallon flushes.
c. Height: 14” to 15" to rim.
d. Open extra heavy-duty plastic seat.
e. Top spud mounted flush valve designed for 1.28 gallon flush with all stainless internal components and vacuum breaker.

B. Urinals

1. White vitreous china wall-mount washout type.
2. Top spud mounted flush valve designed for 0.125 gallon flushes. Use same brand as for water closets.
3. Floor support hanger.

C. ADA Accessible Wall-hung Single-Bowl Lavatories

a. White vitreous china wall-mount with concealed arm carrier and faucet holes matching faucet type.
b. Chromed brass single handle hot/cold mixing handle with 0.5 gpm aerator. Use metering faucet for student restrooms.

c. individual below deck ASSE 1070 certified thermostatic mixing valve at each lavatory. Set for tempered water temperature of 105°F.
d. Chromed brass grid strainer with offset drain tailpiece.
e. Meets California ADA accessibility requirements.

D. Floor Drain

1. Cast iron floor drain with integral P-trap and trap primer connection.
2. Nickel plated brass strainer.
3. Include NSF and UPC approved PPP Prime-rite trap primer, installed at the nearest plumbing fixture with a cold water connection.

E. Hose Bibb

1. Interior

a. Chrome plated bronze.
b. Hose thread spout.
c. Vacuum breaker.
d. Locking stainless steel recessed hose box
e. Acorn model 8151 or equivalent.

PART 3 - EXECUTION

3.1 PLUMBING FIXTURES AND TRIM INSTALLATION

A. Install each fixture with a trap, easily removable for servicing and cleaning. At completion thoroughly clean plumbing fixtures and equipment.
B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
C. Install wall mounted lavatories, urinals, and water closets with approved wall carriers. Carrier model to suit installation.
D. Install stainless steel bellows type or piston type water hammer arrestors on water lines connected to dishwashers, clothes washers, other devices with solenoid valves, flush valves, and to fixture or group of fixtures complete with accessible isolation valve. Size to match connected fixture units. Piston-type to have brass piston and EDPM seals and O-rings. Provide access door to allow future service. Watts series 15 or equivalent.
E. Anchor floor-mounted water closets with manufacturer's recommended lag screws or bolts.

3.2 FIXTURE PIPE INSULATION

A. ADA Accessible Lavatories and Sinks

1. Enclose exposed traps and water connectors with pre-fabricated closed cell vinyl insulated safety covers.
2. Complies with ASTM E84-07 Class A Material 25 Flame/450 Smoke.
3. Plumberex Trap Gear equivalent.
4. Field-applied pipe wrap is not acceptable.

END OF SECTION

SECTION 23 00 00: HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

PART 1 - GENERAL

1.1 RESPONSIBILITY

A. Use only qualified persons experienced in the particular work described herein. Use only new material of the best quality. Install all work in a neat and orderly manner. Coordinate this work with other portions of the project to result in complete operable systems.

1.2 ALTERNATIVE MATERIALS AND METHODS

A. These plans and specifications describe the general scope of the mechanical systems. These plans and specifications do not preclude the submittal of alternative methods or materials. Manufacturer's names and catalog numbers are stated to identify the type and quality of the equipment or materials required for the project.

B. The contractor may submit shop drawings and/or technical information on alternative equipment, materials or installation details to accomplish the intent of the plans and specifications. Approval of the alternative equipment, materials or installation details shall not relieve the contractor of any responsibility for complying with the intent of the plans and specifications. Submit the manufacturers' technical information, shop drawings, and/or written description of alternative methods for each item described by manufacturer's name and catalog number and for each component, equipment, material, or installation detail required.

1.3 WORK INCLUDED IN DIVISION 23:

A. Heating, ventilating, and air conditioning systems.

1.4 DIVISION OF WORK BETWEEN DIVISIONS 23 AND 26

A. Close coordination between the electrical and mechanical trades is a part of the work that is required by this contract. No allowance will be made for omissions based on incorrectly assuming another trade will be performing your work. Confirm your scope of work with the general contractor.

B. This section applies only to Divisions 23 and 26. The division of responsibilities between trades supplying equipment in other Divisions may be different. For instance, Division 26 contractor may be required to supply disconnect switches and starters for non-HVAC mechanical equipment supplied under other Divisions.

1. Division 23 Responsibilities

    a. Assume responsibility for the proper functioning of the HVAC systems in their entirety.
    b. Furnish and install all conductors and conduit required for control of HVAC equipment.
    c. Make all terminations with the exception of power conductors.

d. Furnish and install all control panels and devices to provide a complete and functional controls system, including all controls transformers.
e. Furnish and install motor starters for all equipment specified in Division 23.
f. Install duct smoke detectors furnished by fire alarm contractor in buildings with fire alarm systems.
g. Furnish and install duct smoke detectors in buildings without fire alarm systems.
h. Furnish and install all control conductors and conduit connecting duct smoke detectors to smoke dampers and fan start controls.
i. All electrical work performed under Division 23 shall conform to the requirements of Division 26.

2. Division 26 Responsibilities

a. Furnish and install all raceways, conduit, disconnect switches, and conductors necessary for electrical power supply.
b. Make all power supply terminations to motors, starters, disconnect switches, control transformers, and other Division 23 devices.
c. Fire alarm contractor to furnish duct smoke detectors in buildings with fire alarm systems.
d. Provide power to all duct smoke detectors and smoke dampers.
e. Coordinate all work with Division 23 contractors.

1.5 WORK NOT DESCRIBED:

A. Include all minor items not typically shown or specified as required to produce complete, operational mechanical systems.

1.6 RULES AND REGULATIONS

A. All work and materials shall comply with the latest rules and regulations of:

1. The Uniform Building, Mechanical, and Plumbing Codes, as amended by the California State Building Code.
2. NFPA Standards, including the National Electrical Code
3. Other standards as referenced in individual specification sections.
4. The State Fire Marshal.

1.7 SITE EXAMINATION

A. Thoroughly examine the site and verify the actual work conditions. No extra compensation will be allowed for expenses due to failure to discover site conditions which affect the work.

1.8 PLAN AND SPECIFICATION ACCURACY

A. The plans and specifications are diagrammatic in nature and do not represent exact locations or distances, except where specifically noted. Include all required offsets, bends, and other special fittings. Coordinate with the other building trades and make all modifications required at no extra cost.

B. The plans showing existing mechanical systems show the systems as illustrated on the best available as-built documents and on limited field inspection of the site by the Engineer. Inspect and field-verify actual existing conditions. The plans reflect the desired new configuration. Include all required modifications to implement the new configuration at no extra cost.

C. Plans showing existing buried piping systems reflect information available on existing plans and surface examination at the site. Actual pipe locations, materials, depths, and grades have not been determined. Call the Underground Utility Service Alert hot line 1-800-642-2444 before digging to have existing buried utilities labeled.

1.9 SUBSTITUTIONS AND SUBMITTALS

A. Provide submittals of all data as required in each section of these Division 23 specifications. Submittal data to be sufficient to verify complete compliance with the plans and specifications. Provide complete data even if using materials specified. Conform to the submittal requirements of the General Conditions. Submit in as few packages as possible to expedite the review process.

B. Submit proposed deviations from the plans or specifications in material type, size, configuration, quantity, or routing for Engineer's review. Contractor to pay for all required redesign costs. Unless otherwise agreed, Contractor shall pay for all additional costs incurred for approved alterations.

1.10 AS-BUILT DRAWINGS

A. Provide and keep up-to-date a complete set of prints which shows every change from the original contract drawings, including change orders. Deliver an as-built set to the Engineer upon project completion and acceptance. Include dimensions, exact locations, and invert elevations of all exterior underground piping.

1.11 SEISMIC CONSTRUCTION

A. Anchor all devices and system components with seismic restraint systems and devices meeting California Building Code requirements, sized to match component weights and installed at intervals as pre-approved by anchorage manufacturer. If required by the local inspector, provide structural calculations.

PART 2 - PRODUCTS

2.1 QUALITY

A. Install only new materials. No used, "seconds", or "blemished" materials may be installed. Do not install materials received in a damaged condition or damaged at job-site. Return all damaged components. Repair of minor and incidental damage, if first approved by Engineer and manufacturer, is acceptable.

2.2 SAFETY

A. Install all equipment with required safety devices, such as belt or coupling guards, heat shields, electrical disconnects, etc.

2.3 MOTORS

A. Where not otherwise specified, all electrical motors shall meet NEMA standards, continuous duty, non-overloading over the entire performance range of the driven devices, have conduit terminal boxes, and all required thermal and electrical safety devices. Provide disconnects at all driven devices. Use special premium efficiency motors meeting PG&E rebate requirements for all integral horsepower motors 1 HP and larger.

2.4 MOTOR STARTERS

A. All motor starters to be at least size 1 with 24 or 115 VAC coil, as shown on control diagrams, full voltage start, with NEMA class 10 overload relays with single-phasing protection.

2.5 EQUIPMENT SUPPORTS, SLEEVES, CHASES, INSERTS, AND OPENINGS

A. All sleeves, inserts, anchorages, etc. required for this Division and which are embedded in work

2.6 VIBRATION ISOLATORS

A. Neoprene isolation pads, ¼" thick, under all support points for equipment anchored to or supported by the building structure.

B.

PART 3 - EXECUTION

3.1 TESTS

A. When complete, performance test all mechanical systems at one time to the Engineer's satisfaction. No system will be accepted until it proves satisfactory in every detail. Provide Engineer 48 hours notice before testing.

3.2 FOUNDATIONS AND SUPPORTS

A. Install equipment on concrete foundation pads anchored to the slab floor, if shown on the Plans, listed in the Specifications, or recommended by the manufacturer. Anchor equipment to the pad to meet normal load and seismic requirements.

B. Securely attach all equipment, piping, ductwork, etc. to the building as detailed in the related construction code or as described in these plans and specifications. Allow for expansion and contraction, if applicable.

C. Install vibration isolators under rotating machinery without internal isolation, or other devices capable of producing significant or objectionable vibration.

3.3 CUTTING AND PATCHING

A. Make all cuts and patches required to install the work according to good construction practice. Coordinate all required structural modifications or structural member cutting with the other trades, and only after Engineer's approval.

B. Do not cover concealed piping, ductwork, or other systems installed under this Division until inspected and approved by the Engineer and all other required construction inspectors. If systems are covered up before inspection and approval, Contractor will remove covering and replace after inspection at no extra cost.

3.4 EQUIPMENT IDENTIFICATION

A. All mechanical equipment labeled in the equipment schedule on the plans shall be identified at their location with two (2-ply) laminated layers of permanently bonded ABS/acrylic plastic equipment labels. Equipment controllers, thermostats, and sensors shall also be permanently labeled to identify the equipment served.

3.5 TRAINING, OPERATION, AND MAINTENANCE

A. After all mechanical systems have been tested and accepted, provide at least 4 hours training to the Owner's maintenance crew. Cover operating and maintenance procedures for all mechanical systems and components installed.

B. Submit two (2) bound sets of Operations and Maintenance Manuals (O&M Manuals) to the Owner. Submit a draft copy to the Engineer for approval prior to issuing the final copies. The O&M Manuals shall include, at a minimum:

1. All available manufacturers' O&M literature, parts lists, etc.
2. Wiring diagrams.
3. Controls diagrams of all pneumatic, electric, and electronic control systems.
4. Written sequence of operations of all controls.
5. Any unusual or unique system O&M procedures not covered by manufacturers' literature.
6. Summary maintenance schedule showing maintenance intervals as recommended by the manufacturers. (lubrication, filter changes, etc.)

C. The Contractor is obligated to meet the guaranty requirements of the General Conditions.

END OF SECTION 23 00 00

SECTION 23 30 00: HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Heating, ventilating, and air conditioning (HVAC) ductwork, fittings, air inlets/outlets, fans, and hoods, covered in Division 23 of these Specifications.

1.2 RELATED WORK

A. Entire Division 23

1.3 CODES AND STANDARDS

A. Comply with the following agencies' standards:

1. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
2. Air Diffusion Council (ADC)
3. Associated Air Balance Council (AABC)
4. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
5. Underwriter's Laboratory (U.L.)
6. National Fire Protection Association (NFPA)
7. California Code of Regulations Title 8 and 24.
8. California Building Code (CBC) and California Mechanical Code (CMC).

1.4 TESTING

A. Test and balance all mechanical systems to achieve flows and temperatures shown on plans.

1.5 SUBMITTALS REQUIRED FOR THIS SECTION

A. All equipment shown in schedules in plans.
B. Duct and refrigerant piping insulation.
C. Shop drawings for all contractor-proposed duct or equipment layouts varying significantly from plans.
D. Air balance report.
E. Operation and maintenance manual.

PART 2 - PRODUCTS

2.1 HVAC DUCTS

A. Rigid ductwork

1. Use galvanized steel for all rigid ductwork.

2. Use thicknesses, seams, and stiffening procedures as recommended in SMACNA low-pressure duct standards.
3. The plans show round ductwork wherever appropriate.
4. Rectangular ductwork specifically shown on the plans reflect areas that round duct is not appropriate or clearance, acoustic, aesthetic, or other design reasons.
5. Rectangular duct substitutions for round duct will be considered only if the Contractor first submits revised duct layouts showing all new duct sizes to the Engineer for review with the equipment submittals.
6. New duct sizes shall provide equivalent friction drop rates as duct sizes shown on plans.
7. Rectangular duct sizes shown connecting to equipment inlets and outlet reflect duct sizes as required for equipment of make and model specified on plans and are for reference purposes only.
8. Contractor shall modify connecting duct sizes as required for actual installed equipment.

B. Fabrication

1. Lap metal ducts in direction of airflow.
2. Hammer down edges and slips to leave smooth duct interior.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times diameter of duct on centerline.
4. Duct square-to-round and other size transitions to have maximum 15° divergence wherever possible.
5. Maximum divergence upstream of equipment to be 30° and 45° convergence downstream.
6. Rigidly construct metal ducts with joints mechanically tight, substantially air tight, braced and stiffened so as not to breathe, rattle, vibrate, or sag.
7. Caulk duct joints and connections with sealant as ducts are being assembled.
8. Seal all ductwork seams with canvas and lagging, Airobol, or equal.
9. Construct plenums of galvanized panels jointed by standing seams on outside of casing riveted or bolted on approximately 12 inch centers.
10. Reinforce with steel angles and provide diagonal bracing.
11. Tightly fit at apparatus and seal with sealant.

C. Ductmate and AccuFlange duct connection systems are acceptable.

D. Use airfoil duct turns at all rectangular tees and elbows. Use metal straps or angle iron to support ductwork, space and size supports per SMACNA standards.

E. Duct Support

1. Use metal straps or angle iron to support ductwork, space and size supports per SMACNA standards.

F. Duct Penetrations

1. Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.
2. Seal with mastic.

3. At each point where ducts pass through non-rated partitions, seal joints around duct with non-combustible material.

G. Flexible ductwork

1. Use minimum 5 feet flexible ducting to connect terminal units to the sheet metal ducts.
2. Flexible ducts to be 5 feet long maximum.
3. Flexible ductwork to be steel wire helix reinforced polyester, wrapped with fiberglass insulation and reinforced mylar or vinyl jacket. U.L. smoke/flame rating of 50/25 or less and be listed as a U.L. Class 1 air duct.
4. Duct to comply with UMC Standard no. 6-1 and be so labeled.
5. Support at mid length. Use only factory supplied connection collars.
6. Install in accordance with the terms of the duct listing.
7. Certainteed, Knauf, OC-F, or equal.

H. Spiral seam ductwork

1. Use spiral seam round ductwork in exposed areas where specifically shown on plans.
2. All exposed round fittings to be welded factory pre-fabricated.
3. Use caulking type duct sealants on all exposed ducts.
4. AccuFlange connections are acceptable.
5. Do not insulate exposed duct unless specifically noted.

2.2 AIR DUCT ACCESSORIES

A. Branch, Volume, and Splitter Dampers

1. Provide branch, volume, or splitter dampers on all supply, return, and exhaust branch ducts with two or more registers, and other ducts as required to throttle excess static pressure for air balancing.
2. Galvanized steel, minimum 16 gauge and provide with quadrants or adjustment rod and lock screw.
3. Use single-blade dampers for duct sizes under 18" and multi-blade for larger dampers.
4. Provide accessible operators with linkages and access plates for dampers in inaccessible locations.
5. Use extraction dampers at each appropriate diffuser take-off.
6. Provide equalizing grids on supply diffusers.

B. Backdraft and Barometric Dampers

1. Multi-blade, parallel action, gravity balanced, felt or flexible vinyl sealing edges, linked together in rattle-free manner, adjustable opening and closing pressures.

C. Automatic Return, Outside Air, and Exhaust Dampers

1. Steel parallel-blade dampers with steel shafts and teflon bearings to resist corrosion and seizing.

D. Flexible Connectors

1. Neoprene-coated fiberglass approximately 2 inches wide, tightly crimped into metal edging strip and attached to duct by screws or bolts at 6 inch intervals.
2. UL listed with 25/50 flame/smoke rating maximum.
3. Provide sheet metal covers to protect all flexible connections exposed to sunlight or weather.

2.3 HVAC Fans

A. Rooftop Exhaust Fans

1. Centrifugal, direct-driven, aluminum exhaust fan.
2. Mushroom spun, aluminum discharge hood.
3. Dynamically balanced, backward inclined fan wheel.
4. Solid steel shaft and support frame.
5. Heavy-duty ball bearings.
6. Adjustable cast iron sheaves.
7. Motor with overload protection.
8. Bird screen.
9. Backdraft damper.
10. Factory curb with flashing fabricated to match metal roof system.
11. Make, model, size, and performance as shown on the plans.

2.4 DIFFUSERS, REGISTERS, AND GRILLES

A. General

1. Base air outlet application on space noise level of NC 25 maximum.
2. Provide supply outlets with sponge rubber seal around edge.
3. Provide baffles to direct air away from walls, columns, or other obstructions within radius of diffuser operation.
4. All air registers, diffusers, and grilles by a single manufacturer unless specifically noted otherwise in plans.
5. Ceiling and sidewall diffusers and registers factory baked white enamel finish.
6. Paint ductwork visible behind air registers flat black.

B. Supply Diffusers/Registers

1. Tee-Bar Ceiling Diffusers

a. White square steel with center cones in 24"x24" tee-bar pan, with volume dampers.
b. Include U.L. listed ceiling fire dampers and insulation pads on all diffusers in 1 hour rated ceilings.
c. Make and model per plans.
d. Factory baked white enamel finish.
e. Paint ductwork visible behind air registers flat black.

C. Return and Exhaust Registers/Grilles

1. Tee-Bar Ceiling Return and Exhaust Registers

    a. White perforated steel, identical to supply diffusers except without deflectors.
    b. U.L. listed ceiling fire dampers with insulation pads at all rated penetrations.
    c. Make and model per plans.
    d. Factory baked white enamel finish.
    e. Paint ductwork visible behind air registers flat black.

2. Gyp. Board Ceiling Return and Exhaust Registers

    a. White steel with single horizontal fixed bars fixed at 35 degrees.
    b. Include volume dampers. U.L. listed ceiling fire dampers at all rated penetrations.
    c. Make and model per plans.
    d. Factory baked white enamel finish.
    e. Paint ductwork visible behind air registers flat black.

D. Grilles

1. One inch deep aluminum louvers with inverted V cross-section, with 1-1/4" margin and trim frame.
2. Factory baked enamel finish.
3. Make and model per plans.
4. Primer paint and finish paint in accordance with Architectural specifications.

2.5 OUTSIDE AIR INLETS AND EXHAUST/RELIEF AIR OUTLETS

A. Rooftop Intake/Exhaust Hoods

1. Galvanized steel hood.
2. Ribbed panel construction
3. 1/4" mesh bird screen
4. Factory-baked enamel to match roof color.
5. Include curb matching roof construction.
6. Make, model, and size as shown on plans.

2.6 FILTERS

A. Pleated disposable extended area filters with MERV-13 rating.
B. One inch thick, 0.28" maximum initial pressure drop at 500 feet per minute maximum face velocity.
C. Filter media and combustible framing to be U.L. Class 2 rated and approved using California SFM-51.6 test method.
D. All filters to be accessible for replacement using hinged and gasketed access door.
E. Farr 30/30, Eco-Aire E35, or equal.

2.7 CONTROLS

A. See Division 23 00 00.

PART 3 - EXECUTION

3.1 EQUIPMENT SUPPORTS

A. Install all equipment per B-Line/Tolco OSHPD Pre-Approval OPM-0052-13 “Seismic Restraint Systems Guideline” or other OSHPD pre-approved seismic restraint systems.

3.2 TEMPORARY VENTILATION DURING CONSTRUCTION

A. The permanent HVAC system shall only be used during construction if necessary to condition the building or areas of addition/alteration within the required temperature range for material and equipment installation. If the HVAC system is operated during construction use MERV-8 rated return air filters. Replace all filters immediately prior to occupancy or at the conclusion of construction if the building is occupied during an alteration.

3.3 PROTECTION OF DUCTS AND HVAC EQUIPMENT DURING CONSTRUCTION

A. Cover all duct and other related air distribution component openings with tape, plastic, or sheet metal during both construction and/or storage on the construction site as required to reduce the amount of dust, water, and construction debris which could collect within the HVAC system. Openings shall remain covered until final start-up of the HVAC equipment.

3.4 DUCT CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with filters or bypass during cleaning.

3.5 PAINTING

A. Paint all exposed duct and supports in finished area to match adjacent surfaces or as dictated by architect.
B. Paint all exterior exposed flues, louvers, and ducts as directed by architect.
C. Aluminum equipment need not be painted unless specifically noted elsewhere.
D. Paint all unlined ductwork visible through air outlets flat black.

3.6 DUCT BALANCING

A. Balance duct system after building is complete, with all doors and windows closed or under normal traffic. Install clean filters before balancing. Set automatic dampers to minimum outside air position. Adjust until all supply, return, and exhaust air quantities are within 5% of flows shown on the plans. Take pitot tube traverse of main supply and exhaust ducts after final balance to establish total fan air flow and percentage of duct air leakage.
B. Branch with greatest pressure drop (usually the longest duct run) shall have last damper wide open. Change fan RPM to meet field conditions, including changing sheaves and belts, if required. Use a balancing procedure to achieve the lowest possible amperage draw. Use branch volume dampers, splitter dampers, and

extraction dampers to adjust airflows. Individual diffuser and register volume face dampers to be wide open until all total branch flows are approximately balanced.

C. If excess static pressure causes damper noise above NC 25, install a second damper or fixed orifice to reduce static pressure ahead of the noisy damper. Adjust diffusers and registers to achieve proper throw and air distribution into the rooms.

D. Submit air balance report to the Engineer after all balancing is complete. Show actual fan RPM and horsepower, actual individual register and total fan air flows, actual static pressures. Report to be signed by a certified Balance Engineer.

3.7 ACCEPTANCE TESTING

A. Complete all required Certificates of Acceptance indicated on the Building Energy Efficiency Standards (Standards) Certificate(s) of Compliance. All acceptance testing shall be performed by a certified Acceptance Test Technician (ATT) in accordance to the requirements and instructions as described the Reference Nonresidential Appendix NA7 for the applicable Standards.

END OF SECTION 23 30 00

PART 1 - GENERAL

1.01 GENERAL

A. COMMUNICATIONS:

1. Communications and instruction from the Owner to the Contractor are to be through the Construction Manager.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1-specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

A. The work included under this Section consists of providing all labor, materials, supervision, and construction procedures necessary for the installation of the complete electrical systems required by these specifications and/or shown on the drawings of the contract.

B. The Contract Drawings are shown in part diagrammatic intended to convey the scope of work, indicating the intended general arrangement of equipment, conduit, and outlets. Follow the drawings in laying out the work and verify spaces for the installation of the materials and equipment based on the dimensions of actual equipment furnished. Whenever a question exists as to the exact intended location of outlets or equipment, obtain instructions from the Architect/Engineer before proceeding with the work.

1.03 QUALITY ASSURANCE

A. Installers shall have at least 2 years of successful installation experience on projects with electrical installation work similar to that required by the project. All equipment and materials shall be installed in a neat and workmanlike manner and shall be aligned, leveled, and adjusted for satisfactory operation.

1.04 REFERENCES

A. The design, manufacture, testing, and method of installation of all equipment and materials furnished under the requirements of this specification shall conform to all codes, standards and regulations, etc. found in the front end of specifications.

B. The latest adopted edition by the local and state inspection authorities of all standards and specifications listed in front end shall apply.

C. Furthermore, the electrical work shall be in accordance with all applicable National and State Standards, and Local Codes and Building Ordinances. The electrical work shall merit the approval of the enforcing authorities having jurisdiction.

1.05 MATERIALS AND EQUIPMENT

A. Electrical materials and equipment for the entire project shall meet the requirements specified under the Supplementary Conditions Section of this specification.

B. Equipment and fixtures shall be connected to provide circuit continuity in accordance with applicable Codes whether or not each piece of conductor, conduit, or protective device is shown between such items of equipment or fixtures and the point of circuit origin.

C. The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify all connection details.

D. All equipment over 50 pounds shall be provided with adequate lifting means.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 ACCESS TO EQUIPMENT

A. Starters, switches, receptacles, pull boxes, etc. shall be located to provide easy access for operation, repair and maintenance. If the devices listed above are concealed, access doors shall be provided

3.02 SUBMITTALS

A. Operation and Maintenance Manuals: Operation and Maintenance Manuals shall be provided according to Division 1 requirements. In general, during the time of the contract, and before substantial completion of the electrical installation, submit to the Architect/Engineer three (3) copies of descriptive literature, maintenance recommendations (from the equipment manufacturer), data on initial operation, wiring diagrams, performance curves, engineering data and tests, operating procedures, routine maintenance procedures, and parts lists for each item of electrical equipment installed under this contract and submit all manufacturer's guarantees and warranties.

B. Shop Drawings: The Contractor shall furnish shop drawing portfolios and proper transmittal forms for all materials, equipment, and lighting fixtures to be incorporated in the work in accordance with the General Conditions, Supplementary Conditions, and all other applicable Conditions.

1. Shop drawings on component items forming a system or that are interrelated shall be submitted at one time as a single submittal in order to demonstrate that the items have been properly coordinated and will function properly as a system. A notation shall be made on each shop drawing submitted as to the item's specific use, either by a particular type number referenced on the drawings or in the specifications, by a reference to the applicable paragraph of the specifications, or by a description of its specific location. The shop drawings shall be organized and bound into sets with each set collated.

2. The Architect/Engineer shall have the final authority as to whether the equipment or material submitted is equal to the specified item. Proposed substitutions may be rejected for aesthetic reasons if felt necessary or desirable. In the event the proposed substitutions are rejected, the Contractor shall furnish the specified item.

3.03 EXISTING UTILITIES

A. The Contractor shall verify the location of all existing utilities with the Owner and Utility Companies prior to commencing excavation work. The drawings and survey data of the contract documents indicate the available information on the existing power and communication services, and on new services to be provided to the project by utility companies. Accuracy of this information is not assured.

3.04 SMOKE AND SMOKE/FIRE DAMPERS

A. Provide all necessary connections, including power supply circuits (fed from the nearest panelboard of the appropriate voltage) to smoke dampers and smoke/fire dampers so that upon fire alarm conditions or integral smoke detector activation, the dampers close. Coordinate damper and control locations with the mechanical and controls contractors. Refer to the mechanical drawings for damper schedule and locations. Connect to emergency backup power.

3.05 ELECTRICAL-MECHANICAL EXTENT OF WORK

A. The responsibility of work specified under Division 26 is clarified under, Section, 260000. Said Sections are incorporated herein by reference.

3.06 ELECTRICAL-PRODUCT COORDINATION

A. Refer to Division 2 through Division 32 and the electrical drawings for the power characteristics required and available for the operation of each power-consuming item of equipment. Coordinate purchases to ensure uniform interface with every item requiring electrical power

3.07 CUTTING AND PATCHING

A. The Electrical Contractor shall be responsible for all cutting and patching of holes in building construction which are required for the passage of electrical work. Cutting and patching shall conform to the requirements of Division 1 and, if applicable, Division 2 of these specifications.

B. Cutting of structural framing, walls, floors, decks and other members intended to withstand stress is not permitted.

3.08 PAINTING AND FINISHING

A. Painting of electrical work exposed in occupied spaces, except mechanical and electrical machine rooms and maintenance/service spaces; and work exposed on the exterior of the facility is specified and performed under other divisions of these specifications.

B. Factory finishes, shop priming, and special protective coatings are specified in the individual equipment specification sections.

C. Where factory finishes are provided on equipment and no additional field painting is specified, all marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish at the time of final inspection.

3.09 EXCAVATION AND BACKFILING

A. Contractor shall perform all excavation and backfilling necessary to install the required electrical work. Coordinate the work with other excavating and backfilling work in the same area. Except as indicated otherwise, comply with the applicable sections in Division 31 of these specifications, excavation filling and backfilling (for structures) to 5' outside the building line, and exterior utilities sections for beyond 5' from the building line.

B. Landscape work, pavement, flooring and similar exposed finish work that is disturbed or damaged by excavation shall be repaired and restored to their original condition by the Contractor.

3.10 CONDUITS AND SUPPORT, GENERALLY

A. Conduits, except electrical conduits run in floor construction, shall be run parallel with or perpendicular to lines of the building unless otherwise noted on the drawings. Electrical conduits shall not be hung on hangers with any other service, unless specifically approved by the Engineer. Electrical conduits shall be hung above all other service pipes. Hangers on different service lines running close to and parallel with each other shall be in line with each other and parallel with, or perpendicular to, the lines of the building. Exact location of electric outlets, piping, ducts, and the like shall be coordinated to avoid interferences between lighting fixtures, piping, ducts, and similar items.

3.11 ACCESS PANELS

A. Furnish and install panels for access to junction boxes and similar items where no other means of access, such as a readily removable, sectional ceiling is shown or specified.

B. Panels shall not be less than 12-inches by 16-inches in size. Larger panels shall be furnished where required. Panels in tile or other similar patterned ceilings shall have dimensions corresponding to the tile or pattern module.

C. Access panels shall be flush type and of all steel construction, with a No. 16 gauge wall or ceiling frame for masonry or plaster and a No. 14 gauge panel door. Doors shall be secured with concealed hinges and flush locks of either the cylinder type or approved, positive acting, screwdriver operated type. Doors for wall panels may be secured with suitable clips and countersunk screws. Panels shall be painted with a rust-inhibitive primer at the factory. Panels in rated wall shall also be rated.

3.12 INSTALLATION OF EQUIPMENT

A. Install and connect all appliances and equipment as specified and indicated for this project, in accordance with the manufacturers' instructions and recommendations. Furnish and install complete electric connections and devices as recommended by the manufacturer or required for proper operation.

3.13 COORDINATION

A. Coordinate the electrical work with work of the different trades so that:

1. Interferences between mechanical, electrical, architectural, and structural work,

including existing services, will be avoided.
2. Within the limits indicated on the drawings, the maximum practicable space for operation, repair, removal and testing of electrical and other equipment will be provided.
3. Pipe, conduits, ducts, and similar items, shall be kept as close as possible to ceiling, walls, and columns, to take up a minimum amount of space. Pipes, conduits, ducts, and similar items shall be located so that they will not interfere with the intended use of other equipment.

B. Furnish and install, without additional expense to the Owner, all offsets, fittings and similar items necessary in order to accomplish the requirements of coordination.

C. Before any sleeves or inserts are set, or any electrical equipment or foundations are installed, prepare and submit for approval composite coordination drawings for all equipment rooms, and other areas in which work of two or more trades or subcontractors is to be installed and in which the probability of interference exists. Drawings shall show the work of all trades covered, shall be drawn to a scale not smaller than 1/2" = 1'-0", and shall show clearly in both plan and elevation that all work can be installed without interference.

D. Any work installed prior to approval of coordination drawings shall be at the Contractor's risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Owner.

3.14 SINGULAR NUMBER

A. Where any device or part of equipment is herein referred to in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

3.15 WARRANTY

A. Refer to the General Conditions section of this Specification for warranty requirements and information.

3.16 CLOSE OUT AND OPERATION INSTRUCTIONS

A. Sequence operations properly so that all work of this project will not be damaged or endangered. Operate each item of equipment and each system in a test run of appropriate duration to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance.

B. Conduct a full-day walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of electrical equipment and systems. Explain the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, security, safety, efficiency and similar features of the systems.

C. At the time of substantial project completion, turn over the prime responsibility for operation of the electrical equipment and systems to the Owner's operating personnel. Until the time of final acceptance, provide full time operating personnel, who are completely familiar with the work, to consult with and continue training the Owner's personnel.

3.17 SUBSTITUTIONS

A. All proposals shall be based on providing and installing the materials or items of equipment which are hereinafter specified by name and/or manufacturer. Substitutions, for materials or items of equipment specified, will not be allowed, unless approved by Engineer prior to (14 days before) bid date.

B. Refer to Instructions to Bidders for complete requirements for substitutions.

3.18 AS-BUILT DRAWINGS

A. Contractor shall provide the Owner with as-built drawings for all electrical systems as described in these specifications and/or shown on the Drawings

END OF SECTION 26 05 00

ELECTRICAL BASIC MATERIALS AND METHODS SECTION 26 05 01

PART 1 - GENERAL

1.01 GENERAL

A. COMMUNICATIONS:

1. Communications and instruction from the Owner to the Contractor are to be through the Construction Manager.

1.02 DESCRIPTION OF WORK

A. The extent of Basic Materials and Methods is indicated by the drawings and specifications. Basic materials are defined but not limited to cable and conduit seals, outlet boxes, pull boxes, conduit fittings, safety switches, lockout pushbuttons and fuses.

1.03 QUALITY ASSURANCE

A. Manufacturers: All materials shall be new, unused, and un-weathered, and of the quality specified. Materials shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

B. Installer: All equipment and materials shall be installed in a neat and workmanlike manner, shall be complete in both effectiveness and appearance, whether finally concealed or exposed and shall be executed by experienced mechanics.

1.04 REFERENCES

A. The electrical work shall conform to all applicable sections of standards, codes and specifications promulgated by organizations listed below.

1. Occupational Safety and Health Standard, National Consensus Standards and Established Federal Standards

2. California Electrical Code (CEC) 2022

3. National Electric Manufacturer's Association (NEMA)

4. American Society for Testing of Materials (ASTM)

5. Underwriters Laboratories, Inc. Standards (UL)

6. Factory Mutual Engineering Corporation or other Recognized National Laboratories

PART 2 – PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Equipment and Materials Furnished by Others: Certain materials and equipment for this project will be furnished under other divisions. These materials and equipment, which are shown or noted on the plans, will be installed and/or connected under this Division. It shall be incumbent upon this Contractor to become familiar with all of the

materials and equipment that will be furnished under other Divisions, but which will be installed and/or connected under this Division.

B. Cable and Conduit Seals: Seals shall be provided around all conduits and cables which penetrate smoke walls, fire walls, and floors. Nelson Flameseal System shall be used to seal penetrations of electrical cables and conduits.

C. Materials used shall be flameseal putty, ceramic fiber insulation and where rigid support on large oversized openings is required, ceramic fiber board. Board shall be rigid and able to withstand temperatures in excess of 2000 degrees F.

2.02 OUTLET BOXES

A. Outlet Boxes, Pull Boxes and Conduit Fittings: Furnish and install outlet boxes, pull boxes, and conduit fittings as described below. Catalog numbers shown are Appleton Electric Company; Steel City, O.Z. Gedney, and Raco, are equally acceptable.

1.	Lighting Boxes (concealed)	No 40-3/4
2.	Lighting Boxes (concrete)	OCR Series
3.	Lighting Boxes (exposed)	4S-3/4 or 40-3/4
4.	Flush Switches, Receptacles, Telephone and Flush Junction Boxes	No. 4S-3/4 with separate extension plaster rin, M*-250 in masonry construction (*refers to number of devices in the box)
5.	Weatherproof type Switch, Receptacle and Telephone Boxes (exposed)	FS Series w/FS cover and neoprene gasket.
6.	Switch Receptacle and Telephone Boxes (exposed)	$S-3/4 with 8360 or 8370 series raised surface cover

B. Extension and plaster rings shall be installed as required by the CEC.

C. Outlet boxes shall comply with the California Electrical Code in regard to the allowable fill.

2.03 PULL BOXES

A. Pull boxes shall be fabricated of code gauge galvanized sheet metal and shall be sized in accordance with the California Electrical Code requirements or as shown on the drawings. Provide removable cover on the largest access side of the box. In-line conduit pull boxes may be O.Z., Type PBW, or equal. Provide pull boxes at all code required locations, and as needed to aid in cable pulling.

2.04 SAFETY SWITCHES

A. Furnish and install heavy duty type safety switches, having the electrical characteristics, ratings and modifications shown on the drawings. All switches shall have:

1. NEMA 1 general purpose enclosures unless otherwise noted for all interior applications;

2. NEMA 3R rainproof enclosures unless otherwise noted for all exterior applications;

3. Metal nameplates, front cover mounted that contain a permanent record of switch type, catalog number and H.P. ratings with both standard and time delay fuses;

4. Handle that is pad-lockable in "OFF" position;

5. Non-teasible, positive quick-make, quick-break mechanism;

6. UL approval and shall bear the UL label;

7. All fusible switches shall have Class R Fuse rejection clips.

B. Safety switches, as manufactured by the following, will be equally acceptable, but all safety switches furnished by this Contractor shall be the product of one manufacturer.

1. Square D Company

2. General Electric

3. Cutler Hammer

4. Siemens

2.05 FUSES

A. Fuses shall be furnished and installed in each fused switch, and shall be rated as shown on the drawings.

B. Provide fuses according to the following and in accordance with recommendations of manufacturers whose equipment is being protected:

1. Provide UL Class L current limiting time-delay fuses rated 600-volts, 60 Hz, 601 to 6000 amps, with 200,000A RMS symmetrical interrupting current rating for protecting transformers, motors and circuit breakers. (Similar to Buss Low-Peak fuses.)

2. Provide UL Class L current limiting fast-acting fuses rated 600-volts, 60 Hz, 601 to 6000 amps, with 200,000A RMS symmetrical interrupting current rating for protecting service entrances and main feeder circuit breakers. (Similar to Buss Limitron fuses.)

3. Provide UL Class RK1 current limiting, dual-element, time-delay fuses rated 600-volts, 60 Hz, 1/10 to 600 amps, with 200,000A RMS symmetrical interrupting current rating for protecting motors and circuit breakers. (Similar to Buss Low-Peak fuses.)

4. Provide UL Class RK1 current-limiting fuses rated 250-volts, 60 Hz, 1/10 to 600 amps, with 200,000A RMS symmetrical interrupting current for protecting motors and circuit breakers. (Similar to Buss Low-Peak fuses.)

5. Provide UL Class J current-limiting fuses rated 600-volts, 60 Hz, 1 to 600 amps, with 200,000A RMS symmetrical interrupting current rating for protecting circuits with no heavy inrush current where reduced dimension devices are required.

6. Provide UL Class H fuses rated 600-volts, 60 Hz, 1/10 to 600 amps, with 10,000A RMS symmetrical interrupting current rating for protecting general purpose light duty feeders

7. Provide UL Class T fuses rated 600-volts, 60 Hz, 1 to 1,200 amps, with 200,00A RMS symmetrical interrupting current rating for protection of non-motor loads where reduced dimension devices are required.

C. Three spare fuses shall be furnished for each size and type used. Each fused switch shall be provided with a mastic backed label clearly identifying the type and size of fuse required.

PART 3 – EXECUTION

3.01 PRODUCT INSTALLATION GENERAL

A. Except where more stringent requirements are indicated, comply with product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing.

3.02 MOUNTING HEIGHT

A. Mounting heights to the center of the box above finished floor for the items listed below shall be as follows, unless otherwise shown. All other device mounting heights shall be as shown on the drawings. All devices shall be mounted in accordance with ADA (Americans with Disabilities Act) requirements.

1.	Flush tumbler switches	48"
2.	Switches in concrete block	46"
3.	Switches over wainscot	6" above 48" wainscot
4.	Convenience outlets	18" mounted vertically with ground prong slot at bottom
5.	Safety switches	54"
6.	Motor controllers	54"
7.	Panelboards to top	72"
8.	Telephone Outlets	18"
9.	Telephone outlets (pay and wall type)	54" for non-ADA type, 44" for ADA type
10.	Bracket lights (120 volt)	84"
11.	Bracket lights (277 volt)	96"
12	Clock outlets 8' ceiling Clock outlets 9' ceiling	84" 96"
13.	Receptacles above counters	6" above counters mounted (horizontally)-(vertically)
14.	Convenience outlets in mechanical, electrical, janitor and elevator machine rooms.	48"
15.	Telephone panels	72" to top
16.	Exterior W.P. convenience outlets	24" above grade mounted (horizontally) - (vertically)
17.	Capacitors furnished by Mech	36" minimum
18.	Lock-out push button	36" minimum
19.	Fire alarm pull station	48"
20.	Fire alarm horn, bell chime or light	80"
21.	Intercom System Pushbutton Stations	48"

B. Contractor shall check all equipment layouts and verify exact mounting heights.

3.03 CUTTING AND PATCHING FLOORS, WALLS OR CEILINGS

A. Cutting, patching, repairing, and finishing of carpentry work, metal work, or concrete work, etc., which may be required for this work shall be done by craftsmen skilled in their respective trades. When cutting is required, it shall be done in such a manner as not to weaken walls, partitions, or floors. Holes required to be cut in floors must be drilled without breaking out around the holes. Cutting, patching, and painting shall conform to the requirements of the General Conditions section of this Specification.

B. Cutting of structural framing, walls, floors, decks, or other members intended to withstand stress is not permitted

C. Sleeves through floors or walls shall be black iron pipe and shall be flush with finished faces of floors, walls or ceilings. Sleeves shall be sized to accommodate raceways indicated.

D. Use care in piercing water proofing. After the part piercing the waterproofing has been set in place, seal openings, and make absolutely watertight

3.04 SLEEVES

A. Sleeves shall be used to accommodate conduit or tubing where conduit or tubing pass through newly poured concrete walls or slabs.
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B. All sleeves through floors and walls shall be black iron pipe, flush with walls or finished floors; and of sizes to accommodate the raceways shown. Sleeves through outside walls above grade shall be caulked with approved caulking compound. Sleeves shall not be required through on grade slabs.

C. For raceways which enter buildings below grade, install manufactured floor and thruwall seals, similar to Type "FSK" or "WSK" as manufactured by O.Z. Electric Manufacturing Co.

3.05 INSTALLATION METHODS

A. Conductors shall be installed in concealed raceways except as shown otherwise on the drawings or specified to be otherwise in these specifications. Exposed conduits and wires shall be installed parallel or perpendicular to building surfaces. Conduits and wires in the space above ceilings shall be supported adequately and shall not be laid on the top of ceiling systems. Conduits and wires installed above ceilings shall be considered exposed.

B. Electrical conduits shall not be hung on hangers with any other service foreign to the electrical systems, nor shall they be attached to other foreign services.

C. The lighting and power branch circuit conductors shall be installed in separate raceway systems unless specifically shown or noted otherwise.

D. Equipment Bases. Provide concrete equipment bases for all floor mounted equipment furnished under this contract. Concrete bases shall be 3-1/2"-inches high unless noted otherwise and shall extend 3-inches beyond all sides of the unit. Trowel all edges at a 45 degree angle. This work shall be done in accordance with Division 3 of the specifications by the Division 16 Contractor. Bases shall be

provided for switchboards, motor control centers, transformers and all other floor mounted equipment.

E. Outlet Box Locations. Outlet boxes shall be located so they are not placed back-to-back in the same wall, and in metal stud walls, are separated by at least one stud space in order to limit sound transmission from room to room. Outlet boxes installed on opposite sides of fire rated walls shall be spaced at least 24" apart.

3.06 WIRING – NUMBER OF WIRES REQUIRED

A. The number of wires for lighting and receptacle branch circuits are not shown on the drawings. The number of wires in any circuit is determined in accordance with the California Electrical Code, and wiring is provided to perform all functions of the devices being installed. Additionally, wires shall be provided as required by the contract documents, i.e. equipment grounds, etc. Provide the number of wires required for a complete and workable system.

3.07 PROTECTION FROM WEATHER

A. Raceway stub ups shall be capped or otherwise protected from moisture and debris until such time that the conductors are pulled. Conductors shall not be installed in raceways until the building is protected from the weather, all concrete and plastering is completed, and raceways in which moisture has collected have been swabbed or blown out.

3.08 ELECTRICAL ROOM COORDINATION

A. Where a number of electrical panels and/or related electrical items are shown, the Electrical Contractor shall coordinate the physical sizes with his equipment suppliers to ensure that there is adequate space for the items shown to be installed in those areas and that all Code required clearances are maintained.

B. The Contractor shall rearrange the equipment layout to achieve full use of the available space prior to installing conduit stub ups. Where a conflict or rearrangement exists, the Contractor shall submit a proposed revised layout of the area to the Architect.

3.09 NAMEPLATES

A. Nameplates shall be provided for all items such as panelboards, cabinets, motor controllers (starters), safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards and motor control centers, control devices and other significant equipment.

B. Nameplates shall be 1"x 2-1/2" laminated black phenolic resin with a white core with engraved lettering, a minimum of 3/16-inch high. Manufacturers factory installed nameplates shall be acceptable provided all information is furnished.

C. Nameplates shall identify the equipment item that the device is serving and also from where the device is being fed from. Nameplates shall also identify the system voltage of the item of equipment.

3.10 RACEWAY SUPPORTS

A. Raceways shall be securely supported and fastened in place with pipe straps, wall brackets, caddy clips, hangers or trapeze hangers at intervals specified in Section 260533 "RACEWAYS" or:

1. As shown on the drawings.

2. As may be required by special adverse field conditions.

B. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws or welded threaded studs on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine wood screws. Threaded C-clamps shall not be used. Raceways or pipe straps shall not be welded to steel structures. Holes cut in reinforced concrete beams or in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used, and bar hangers may be attached with saddle ties of not less than No. 16 AWG double strand zinc-coated steel wire. No raceway shall be attached to the suspended ceiling construction. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts and insulating bushings.

3.11 BOX SUPPORTS

A. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Plastic expansion shields shall not be used. Threaded studs driven in by powder charge and provided with lockwashers and nuts may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces, cast metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Raceways shall be supported with an approved type fastener not more than 24-inches from the box. Penetration into reinforced concrete beams and into reinforced-concrete joists shall avoid cutting any main reinforcing steel.

END OF SECTION 26 05 01

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this Section.

B. Division 26 "Basic Materials and Methods" sections apply to work of this Section, and is part of each Division 16 section making reference to conductors.

1.02 DESCRIPTION OF WORK

A. Extent of electrical wire and electrical cable work is indicated by drawings and schedules. Types of wire, cable and connectors in this Section include the following:

1. Copper conductors
2. Power-limited circuit cable
3. Service entrance cable
4. Aluminum conductors

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in the manufacture of electric wire and cable products of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical wiring work similar to that required for this project.

1.04 REFERENCES

A. CEC Compliance: Comply with CEC as applicable to construction and installation of electrical wire, cable and connectors.

B. UL Compliance: Comply with UL standards pertaining to electrical wire cable and connectors.

C. UL Labels: Provide electrical wires, cables and connectors which have been UL-listed and labeled.

D. NEMA/ICEA Compliance: Comply with applicable portions of NEMA/Insulated Cable Engineers Association Standards pertaining to materials, construction and testing of electrical wire and cable.

E. ANSI/ASTM: Comply with applicable portions of ANSI/ASTM standards pertaining to construction of electrical wire and cable.

F. IEEE Compliance: Comply with applicable portions of IEEE standards pertaining to electrical wire and cable.

G. NECA Compliance: Comply with NECA's "Standard of Installation."

1.05 SUBMITTALS

A. Submit manufacturer's data on electric wire and cable.

PART 2 – PRODUCTS

2.01 MANUFACTURERS --Subject to compliance with requirements, provide products of one of the following (for each type of wire, cable and connector):

A. WIRE AND CABLE
1. Advance Wire and Cable, Inc.
2. Cerro Wire and Cable, Co.
3. Electrical Conductors, Inc.
4. General Cable Corp.
5. Hitemp Wires, Inc.
6. Rome Cable Corp.
7. Southwire Company
8. The Okonite Company

B. CONNECTORS
1. Amp, Inc.
2. Burndy Corp.
3. Eagle Electric Mfg. Co., Inc.
4. Gould, Inc.
5. Ideal Industries, Inc.
6. Josylyn Mfg. and Supply Co.
7. O-Z/Gedney Co.
8. Pyle National Co.
9. Thomas and Betts Co.

2.02 WIRE, CABLE, AND CONNECTORS

A. General: Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation.

B. WIRE:

1. Conductors shall be 600-volt and shall be copper with insulation of the following types, unless otherwise noted on the drawings or in these specifications. 600-volt aluminum conductors will be considered for conductors feeding switchboards, switchgear, panel boards, motor control centers, and load centers rated above 225 amps. If aluminum is desired a waiver shall be requested from the UNL Project Manager on a project by project basis. Aluminum conductors shall be AA-8000 series, terminated on crimped terminals, and shall meet or exceed Southwire SIMpull product performance:
2. For dry locations, provide Type THHN conductors. Conduit sizes are based on type THHN wire.
3. For damp or wet locations, provide Type THWN conductors.
4. Provide Type THWN conductors for service entrance cabling or feeders direct buried, or installed in underground raceways. Provide Type THWN conductors for branch circuit conductors installed in underground raceways.
5. No wire shall be smaller than No. 12 AWG, except that wiring for signal and pilot control circuits may be No. 14 AWG, and pre-manufactured fixture whips for light fixtures may be No. 14 AWG.
   a. Use preinsulated connectors 3M Company "Scotchlok," or Ideal Industries, Inc. "super nut," for splices and taps in conductors No. 10 AWG and smaller.

All other twist-on connectors must be reviewed by the Architect prior to installation. Use this type of connector for factory-made splices in fixtures or equipment.

b. Pressure indent type connectors must be submitted to the Architect for review.
c. Tape all splices and joints with vinyl plastic tape manufactured by Minnesota Mining and Manufacturing Company. Use sufficient tape to secure insulation strength equal to that of the conductors joined.
d. Keep splices in underground junction boxes to an absolute minimum. Where splices are necessary, use resin pressure splices and resin splicing kits manufactured by the 3M Company, St. Paul, Minnesota, or equal to totally encapsulate the splice. Arrange the splicing kit to minimize the effects of moisture.

6. Connect wire No. 6 AWG and larger to panels and apparatus by means of approved lugs or connectors.
7. Wire No. 12 AWG and No. 10 AWG is allowed to be stranded or solid. All wire No. 8 AWG and larger shall be stranded.
8. Connectors of the porcelain cup type with or without metal inserts shall not be used, including all splices in fixtures which are made in advance by the fixture manufacturer. Splices in wire No. 8 AWG and larger shall be made with approved solderless lugs. If any type of pressure indent type connector is proposed for use on any size conductor, it shall be specifically submitted for approval prior to use.
9. Wire sizes shown are minimum based on code requirements, voltage drop and/or other considerations. Larger sizes may be installed at the Contractor's option to utilize stock size, provided conduit sizes are increased where necessary to conform to the California Electrical Code. Sizes of wires and cables indicated or specified are American Wire Gage (Brown and Sharpe).
10. All feeder and branch circuit wiring shall be color-coded as follows:

PHASE	120/208 VOLT	277/480 VOLT
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

It is acceptable to provide continuously-colored conductors in lieu of black jacketed conductors with colored tape at terminals.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Install electric cables, wires and connectors as indicated in compliance with manufacturer's written instructions, applicable requirements of the CEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.

C. Conductors shall be continuous from outlet to outlet and no splices shall be made except within outlet or junction boxes. Junction boxes may be utilized wherever required.

D. Splicing: No splicing or joints will be permitted in either feeder or branch circuits except at outlet or accessible junction boxes.

E. Wire shall not be installed in raceways until the concrete work and plastering is completed and all conduits in which moisture has collected have been swabbed out. Insulation resistance to ground shall not be less than that approved by CEC. Eliminate splices wherever possible.

F. Use pulling compound or lubricant where necessary. Compound must not deteriorate conductor insulation.

G. Prior to energization, check cable and wire for continuity of circuitry, and for short circuits. Correct malfunctions when detected.

H. Bury a continuous, pre-printed, bright colored plastic ribbon cable marker with each underground cable, regardless of whether conductors are in conduit. Locate each directly over cables 12" below finished grade.

I. Conductor Installation: Install all conductors in a single raceway at one time, insuring that conductors do not cross one another while being pulled into raceway. Leave sufficient cable at all fittings or boxes and prevent conductor kinks. Keep all conductors within the allowable tension and exceeding the minimum bending radius.

J. Conductor Support: Provide conductor supports as required by the code and recommended by the cable manufacturer. Where required, provide cable supports in vertical conduits similar to OZ Type C.M.T., and provide the lower end of conduit with OZ Type KVF ventilators.

K. Conductor Termination: Provide all power and control conductors that terminate on equipment or terminal strips, with solderless lugs or fork and flanged tongue terminals. Provide T and B "sta-kon" tongue terminal. This type conductor termination is not required when the equipment is provided with solderless connectors.

L. Many circuits are shown on the drawings to be provided with dedicated neutral and ground conductors. Carefully review circuiting and the electrical abbreviations and symbols legend and provide the number of conductors indicated.

END OF SECTION 26 05 19

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

B. Division 26 "Basic Materials and Methods" sections apply to work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent of grounding work is indicated by the drawings and is specified herein.

B. Applications of grounding work in this Section include the following:
   1. Underground Metal Piping
   2. Underground Metal Water Piping
   3. Metal Building Frames
   4. Ground Rods
   5. Separately Derived Systems
   6. Service Equipment
   7. Enclosures
   8. Equipment

C. Requirements of this Section apply to electrical grounding work specified elsewhere in these specifications.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods and plate electrodes, whose products have been of satisfactory use in similar service for not less than three years.

B. Installer: Qualified with at least three (3) years' experience on projects with electrical grounding work similar to that required for this project.

1.04 REFERENCES

A. California Electrical Code (CEC): Comply with CEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL listed and labeled.

B. UL Compliance: Comply with applicable requirements of UL Standard Nos. 467 and 869 pertaining to electrical grounding and bonding.

C. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

D. Utility: Grounding shall be done so as to comply with all applicable grounding requirements and rules of the serving utility.

E. National Electric Manufacturer's Association (NEMA)

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's data on grounding systems and accessories.

B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, and ground rods.

PART 2 – PRODUCTS

2.01 Acceptable Manufacturers: Subject to compliance with the requirements, provide grounding products of one of the following:

A. B-Line Systems

B. Burndy Corporation

C. Crouse Hinds

D. Electrical Components Div.; Gould Inc.

E. General Electric Supply Co.

F. Ideal Industries, Inc.

G. Thomas and Betts Corp.

H. Western Electric Co.

2.02 Grounding Systems: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including but not limited to cables/wires, connectors, terminals, ground rods/electrodes, bonding jumper braid, and additional accessories needed for a complete installation. Where more than one type unit meets indicated requirements, selection is installer's option. Where materials or components are not indicated, provide products complying with CEC, UL, IEEE and established industry standards for applications indicated.

2.03 Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to CEC requirements.

2.04 Bonding Jumper Braid: Provide copper braid tape, constructed of 30 gage bare copper wires and properly sized for indicated applications.

2.05 Flexible Jumper Strap: Provide flexible flat conductor, 480 strands of 30 gage bare copper wire; 3/4" wide, 9-1/2" long; 48,250 cmil. Protect braid with copper bolt hole ends with hole sized for 3/8" dia. bolts.

2.06 Bonding Plates, Connectors, Terminals and Clamps: Provide electrical bonding plates, connectors, terminals, lugs and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for indicated applications.

2.07 Ground Rods: Provide steel ground rods with copper welded exterior, 3/4" dia. x 10'.

2.08 Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, and bonding straps as recommended by accessories manufacturers for types of service indicated.

PART 3 – EXECUTION

3.01 GENERAL

A. Inspection: Installer must examine areas and conditions under which electrical grounding connections are to be made and notify the Architect/Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. General: Install electrical ground systems where shown, in accordance with applicable portions of the CEC, with NEMA, and in accordance with recognized industry practices to ensure that products comply with requirements and serve intended functions.

C. Coordinate with other electrical work as necessary to interface installation of electrical grounding systems with other work.

D. Grounding and bonding of electrical installations and specific requirements for systems, circuits and equipment required to be grounded shall be accomplished for temporary and permanent construction.

E. Provide a separate green equipment ground conductor in all electrical raceways to effectively ground all fixtures, panels, receptacles, controls, motors, disconnect switches, exterior lighting standards and noncurrent carrying metal enclosures. The ground wires shall be connected to the building system ground. CEC Table 250-95 shall be used to size the ground conductor if the size is not shown on the drawings.

F. To satisfy the "effective grounding" requirements of the CEC the path to ground from circuits, equipment, and conductor enclosures shall be permanent and continuous and shall have ample carrying capacity to conduct safely any currents liable to be imposed on it, and shall have impedance sufficiently low to limit the potential above ground and to facilitate the operation of the overcurrent devices in the circuit.

G. At the service entrance equipment, bond the utility neutral, building neutral and building ground conductor to a common ground bus (or ground lug). Connect the ground bus to the building domestic cold water pipe with a grounding conductor and an approved clamp and connector. Install the grounding conductor in exposed PVC conduit and make connections readily accessible for inspection. The point of connection to the water service shall be as near the building entrance as possible. Provide a copper wire shunt of the same size as the ground conductor around the water meter and clamp to the water pipe with bronze fittings. Bond the water pipe to the structural steel system of the building and reinforcing bars in footings when such building construction occurs.

H. In addition to the requirements for service entrance grounding listed above, provide a supplemental grounding electrode consisting of driven ground rods (three 10 foot x 3/4 inch copper-clad steel ground rods).

I. Clean the contact surfaces of all ground connections.

J. Where separately derived systems occur, ground the system to a grounding electrode acceptable to the code.

K. Install metallic raceways mechanically and electrically secure at all joints and at all boxes, cabinets, fittings and equipment. At the point of electrical service entrance,

bond all metallic raceways together, with a ground conductor, and connect to the system ground bus. Bond all boxes as specified for equipment.

L. Receptacles: Permanently connect the ground terminal on each receptacle to the green ground conductor.

M. Motors: Connect the ground conductor to the conduit with an approved grounding bushing, and to the metal frame with a bolted, solderless lug.

N. Provide a flexible ground strap (No. 6 AWG) at each flexible duct connection to air handlers, exhaust fans, and supply fans. Install straps to preclude vibration.

O. Provide necessary ground connections to telephone service entrance equipment. Verify requirements with the local telephone company.

P. Provide UFER ground or ground to rebar in existing structural wall or pipes.

END OF SECTION 26 05 26

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

B. Division 26 "Basic Materials and Methods" sections apply to work of this Section.

1.02 DESCRIPTION OF WORK

A. Extent of raceways is indicated by drawings and schedules.

B. Types of raceways in this Section include the following:
1. Electrical metallic tubing.
2. Flexible metal conduit.
3. Intermediate metal conduit.
4. Liquid-tight flexible metal conduit.
5. Rigid metal conduit.
6. Rigid nonmetallic conduit.
7. Surface metal raceways.

1.03 REFERENCES

A. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.

B. UL Compliance and Labeling: Comply with provisions of UL safety standards pertaining to electrical raceway systems; and provide products and components which have been UL-listed and labeled. Each length of raceway shall bear the Underwriters Laboratories label.

C. CEC Compliance: Comply with CEC requirements which are applicable to the construction and installation of raceway systems.

D. NECA Compliance: Comply with NECA's "Standard of Installation".

E. ANSI Compliance: Comply with ANSI Standards pertaining to Conduit.

F. ETL Verification: Comply with ETL PVC-001 for adhesion performance.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of raceway required.

PART 2 – PRODUCTS

2.01 STEEL CONDUIT

A. Steel Conduit: Rigid steel conduit, intermediate metal conduit and steel electrical metallic tubing shall be hot-dipped, galvanized or sherardized as manufactured by Youngstown Sheet and Tube Company, National Electric, General Electric, or equal.

B. Joints: Rain tight non-insulated throat type steel compression fittings (connectors and

couplings) shall be provided for electrical metallic tubing systems. All fittings shall be of the steel type with steel locknuts equal to Appleton 95 Series. In dry locations steel set screw connectors/couplings are acceptable.

C. Expansion Joints: Provide expansion fittings, O.Z. Type AX with bonding jumper for rigid conduit and O.Z. Type TX with bonding jumper for electrical metallic tubing. Where embedded raceways cross building expansion joints, provide combination deflection/expansion fittings, O.Z. Type AXDX, or equal.

2.02 ALUMINUM CONDUIT

A. Aluminum Conduit: Rigid aluminum conduit and elbows shall be extruded from primary 6063 aluminum alloy to a T42 temper. The maximum copper content shall not exceed one-tenth of one percent. A petroleum base lubricant containing powered zinc shall be factory applied to the threads at both ends of the conduit. The interior surfaces of conduit and elbows shall be coated at the factory with silicone or an equally effective lubricant to facilitate fishing and wire pulling. Couplings shall be forged from primary 6063 aluminum alloy, threaded, and chamfered. Rigid aluminum conduit, elbows, and couplings shall be Kaiser KINGFISHER as manufactured by Kaiser Aluminum & Chemical Corporation, Aflex Corporation, Reynolds Metals Company, or equal. Unless otherwise noted or specified, aluminum conduit may only be used for raceways 2 inches in diameter, or larger.

2.03 RIGID NON-METALLIC (PVC) CONDUIT

A. PVC (polyvinyl chloride) Conduit: Heavy wall rigid PVC conduit shall be composed of high impact PVC and shall conform to industry NEMA Standards and to Federal Specification WC-1094. Conduits shall be Carlon Schedule 40 type, or approved equal.

2.04 PVC (polyvinyl chloride) COATED GALVANIZED RIGID CONDUIT

A. PVC Coated Galvanized Rigid Conduit shall conform to UL6, NEMA-RN1, ANSI-C80-1 and ETL PVC-001 with fittings from same manufacturer. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material.

2.05 FLEXIBLE METAL CONDUIT

A. Flexible metal conduit shall conform to UL1. It shall be formed from continuous length of spirally-wound, interlocked zinc-coated strip steel.

2.06 LIQUID-TIGHT, FLEXIBLE METAL CONDUIT

A. Liquid-tight flexible metal conduit shall be constructed of a single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; and coated with an oil-resistant, liquid-tight thermoplastic jacket.

2.07 WIREWAYS

A. General: Provide electrical wireways of types, grades, sizes, weights (wall thicknesses), and number of channels for each type service indicated. Provide complete assembly of wireways including, but not necessarily limited to couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, and other components and accessories as needed for a complete system. Where types and

grades are not indicated, provide proper selection as determined by the Installer to fulfill wiring requirements and comply with applicable provisions of CEC for electrical raceways.

B. Surface Metal Raceways: Provide surface metal raceways of sizes and channels indicated; in compliance with FS W-C-582. Construct of galvanized steel with snap-on covers, with 1/8" mounting screw knockouts in base approximately 8" o.c. Provide fittings indicated which match and mate with raceway. Finish with manufacturer's standard prime coating suitable for painting. Provide all necessary devices as shown on the drawings for a complete installation.

C. Manufacturers: Subject to compliance with requirements, provide surface metal raceways of one of the following:
   1. B-Line Systems, Inc.
   2. Midland-Ross Corporation
   3. Power-Strut Division; Youngstown Sheet and Tube Company
   4. Johnson Plastic Division; Johnson Rubber Company
   5. Square D Company
   6. Versa-Tech Corporation
   7. Walker/Parkersburg Division; Textron, Inc.
   8. Wiremold Company

PART 3 – EXECUTION

3.01 GENERAL

A. Install electric raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of the CEC and NECA's "Standard of Installation" and complying with recognized industry practices.

B. Raceways embedded in concrete or in earth below floor slabs shall be PVC coated rigid metal or schedule 40 PVC conduit. PVC conduit shall be provided with PVC coated rigid metal elbows when the raceway system exits the concrete topping or earth.

C. Electrical metallic tubing shall not be embedded in concrete or installed in earth.

D. Aluminum conduit shall not be embedded in concrete, or installed in earth.

E. Rigid heavy wall Schedule 40 PVC conduit shall be installed in earth and concrete only.

F. PVC coated rigid metal conduit can be installed in earth, concrete and wherever there is a requirement for extra corrosion protection.

G. Raceways in outside walls or in refrigerated areas shall be rigid steel conduit, or intermediate metal conduit.

H. Provide rigid steel conduit or intermediate metal conduit for exposed raceways from floor to eight feet above the floor in mechanical rooms and in areas designated on the plans.

I. Rigid galvanized steel conduit or galvanized intermediate metal conduit shall be used where conduit is exposed to weather.

J. Conduits in hazardous locations shall conform to the California Electrical Code. Rigid

galvanized steel conduit or intermediate metal conduit shall be used in hazardous locations. PVC conduit shall not be used in hazardous areas.

K. Rigid metal, intermediate metal, electric metallic tubing or PVC conduit where allowed in other section 3.1 paragraphs shall be used for feeders and branch circuits.

L. Installers of the PVC-coated galvanized rigid conduit system must be certified by the manufacturer and be able to present a valid, unexpired certified installer card prior to starting installation. All clamping, cutting, threading, bending, and assembly instructions given during the manufacturer's certified installation training should be vigorously followed.

M. Flexible metal conduit may be used to connect light fixtures in accordance with CEC requirements. Provide flexible metal conduit for connections to motors, transformers, generators, and other equipment subject to vibration. Length of flexible conduit shall be a minimum of one foot for conduit diameters up to 1-1/2". A minimum of 3" of flexible conduit shall be added for every 1/2" increase in conduit diameter. Flexible metal conduit installation shall be kept to a minimum in connecting electrical equipment. In no case is flexible metal conduit allowed to be longer than six feet in length without prior UNL project manager approval. Sealtight, flexible conduit shall be used where the flexible conduit may be subject to moist or humid atmosphere, corrosive atmosphere, subject to water spray and subject to dripping oil, grease or water. In no case is sealtight, flexible conduit allowed to be longer than six feet in length without prior UNL project manager approval.

N. Conduits shall be 3/4" diameter, minimum. This minimum applies to all conduit, including conduit to light switch box locations, and other 'last leg' type situations. Raceway sizes shown on the drawing are based on type THHN/THWN conductors.

O. Type Material: Except as noted otherwise all conduit shall be steel.

3.02 INSTALLATION

A. All raceways shall be installed concealed except where shown or noted otherwise.

B. At the Contractor's option, concealed raceways may be embedded in concrete, except as noted otherwise, or installed in furred spaces above ceilings or behind walls.

C. Continuity: Provide metallic raceways continuous from outlet to outlet, and from outlets to cabinets, junction or pull boxes. Enter and secure conduit to all boxes to provide electrical continuity from the point of service to outlets. Provide double locknut and bushing on terminals of metallic conduits.

D. In duct banks a 1/4" diameter nylon rope shall be installed in all empty conduits to facilitate future installation of cabling.

E. Provide accessible "seal-off" fittings for all raceways entering or leaving hazardous areas, entering or leaving refrigerated areas and as otherwise required by the California Electrical Code.

F. Where conduits penetrate the roof seal, they shall be installed in curbs provided for mechanical equipment. When this is not possible, suitable pitch pockets, lead flashing, or approved fittings shall be provided. Details for special conduit installations shall be as shown on the drawings.

G. Reinforced Concrete: No reinforcing steel shall be displaced to accommodate the

installation of raceways and outlet boxes. Outlet boxes shall not be installed in beams or joists. In general, all embedded conduits shall be located in the physical center of the particular section of concrete. Unless otherwise indicated, raceways embedded in reinforced concrete shall conform to the following usual types of conditions. Particular attention is called to the fact that there are many extenuating conditions where the Contractor may be instructed in writing during the course of the project not to place embedded conduits in certain areas, generally due to the possibility of unsightly cracking or for structural reasons. This instruction shall not entitle the Contractor to extra compensation. Any condition not covered by the following usual conditions shall require special clarification.

	Location	Maximum Allowance
1.	Columns	Displacement of 4 percent of plan area of column.
2.	Beams and Joists	Displacement of 1/3 of least dimension, spaced not less than three diameters on center.

H. Furred Spaces: Raceways installed in furred spaces shall be installed in accordance with the requirements of the California Electrical Code. Do not anchor or strap conduits to the ceiling furring channels or attach to furred ceiling hanger wires.

I. Above Suspended Ceilings: Raceways may be attached to an independent suspension system (wire hangers) above drop ceilings if installed in such a manner that the ceiling panels may be removed without interference with the raceway. The independent wire hangers supporting the raceway shall be sized to carry the raceway load, support only the raceway, and shall be secured both above and below the raceway connection point (at both ends). In all cases, raceways shall be securely fastened in place such that both vertical support and horizontal support is provided.

J. Stub Ups: Extend conduit stubs at least one foot above slab or fill, before connection is made to electrical metallic tubing.

K. Exterior Conduits: Install raceways a minimum of 42” below finished grade. Encase service conductors and medium voltage duct banks in concrete. All ducts installed in concrete shall be 4” diameter unless otherwise noted.

L. Provide marking of conduit and junction boxes to indicate which distribution system they are serving. The markings could be colored tape on conduit at or near junction boxes with different colored tapes indicating different distribution systems. Concealed junction boxes shall be legibly marked with a magic marker to indicate the panel and circuit number that junction box serves.
   1. The distribution systems shall be color coded as follows:
      a. 120/208 Volt - Green
      b. 277/480 Volt - Orange

M. Steel Conduit (galvanized rigid steel, IMC or EMT):
   1. Cutting: Cutting shall be done with hand or power hacksaws. All cut ends shall be reamed to remove burrs and sharp edges.
   2. All threaded joints shall be made up wrench-tight and all compression joints shall be made up mechanically secure and snug so as to make continuous current-carrying electrical contact.
   3. All metallic conduits buried or otherwise in contact with earth shall be painted using one heavy continuous coat of asphalt varnish after assembly of conduit and fittings.

4. Expansion joints shall be installed in steel conduit systems in structures as follows expansion joints are specified elsewhere in the specification):
   a. Where conduit run crosses a building expansion joint in unconditioned space(s) or where conditioned spaces fluctuate by more than 40 degrees.
   b. Where shown on the drawings.

N. Threads: Clean all threads of rigid or intermediate metal conduit. Coat all male threads of all steel conduit installed in concrete with red or white lead immediately before being coupled together.

O. Running Threads: Use "Erickson" type couplings in lieu of running threads.

P. Aluminum Conduits:

1. Cutting: Cutting shall be done with hand or power hacksaws. All cut ends shall be reamed to remove burrs and sharp edges.
2. Joints: All joints shall be made up wrench-tight so as to make continuous current-carrying contact. Lubricate all joints before assembly. Use a standard aluminum lubricant recommended by the raceway manufacturer.
3. Wire Pulling: Wire pulling shall be accomplished with round metal tapes, polyethylene ropes or nylon manila ropes.
4. Expansion Joints: Expansion joints shall be installed in structures as follows:

   a. Where conduit run crosses a building expansion joint.
   b. In any conduit run exceeding 75 feet in length.
   c. Where shown on the drawings.

5. Bending: Use hydraulic benders for all sizes of aluminum conduit.
6. Support Spacing: Support conduit, size 2 through 4 inches, a maximum of 7 feet, 6 inches on center. Support conduits 5 inches and larger not less than 5 feet on center.

Q. PVC Conduit:

1. Joints: Conduits shall be joined by using couplings and solvent cement furnished or recommended by the raceway manufacturer. Finished joints shall be secure and watertight.
2. Cutting: Cutting shall be done with hacksaws and ends shall be reamed to remove burrs and sharp edges.
3. Expansion Joints: Expansion joints shall be installed:

   a. Where conduit run crosses a building expansion joint.
   b. As recommended by the manufacturer or as shown on the drawings.

4. Bends for PVC conduit sizes 2" and smaller may be made "hot" in the field. Inside dimension shall be thereby undistorted. For PVC sizes larger than 2", provide only factory bends.

R. PVC Coated Rigid Conduit:

1. Coating: Coating shall not be damaged during the installation of the product.
2. Cutting: Cutting shall be done with hand or power hacksaws. All cut ends shall be reamed to remove burrs and sharp edges.
3. Threading: Conduit shall be threaded by utilizing proper tools recommended by the manufacturer.
4. Joints: All joints shall be made up wrench-tight with the proper tools so as to make

continuous current-carrying contact. Lubricate all joints before assembly. Use a lubricant recommended by the manufacturer.

5. Wire Pulling: Wire pulling shall be accomplished with round metal tapes, polyethylene ropes or nylon manila ropes.
6. Bending: Use hydraulic benders for all sizes of conduit with proper shoes for PVC Coated conduit.
7. Touch-Up: Use touch-up compound in accordance with manufacturer's instructions. For added protection, touch-up compound is to be used around all sleeves in wet locations.

END OF SECTION 26 05 33

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

B. Division 26 "Basic Materials and Methods" sections apply to work of this Section.

1.02 DESCRIPTION OF WORK

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry, but not utilize electrical energy.

B. Types of electrical wiring devices in this Section include the following:
   1. Receptacles
   2. Switches
   3. Wall Plates
   4. Dimmer Controls
   5. Floor Outlets
   6. Underfloor Duct and Fittings

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of wiring devices of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less then 3 years.

B. Installer: Qualified with at least 2 years of successful installation experience on projects with electrical installation work similar to that required for this project.

1.04 REFERENCES

A. CEC Compliance: Comply with CEC as applicable to construction and installation of electrical wiring devices.

B. UL Compliance and Labeling: Provide electrical wiring devices which have been UL listed and labeled.

C. NEMA Compliance: Comply with NEMA standards for general and specific purpose wiring devices.

D. NECA Compliance: Comply with NECA's "Standard of Installation."

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's data on electrical wiring devices.

Part 2 – PRODUCTS

2.01 Manufacturers: Subject to compliance with requirements, provide products of one of the following:

A. Pass and Seymour Corporation

B. Cooper

C. Hubbell, Inc.

D. Leviton, Inc.

E. Crouse Hinds

F. Wiremold

G. Walker Duct

H. Cellco

I. Lutron

2.02 WIRING DEVICES

A. General: Where shown on the drawings, furnish and install wiring devices indicated by the appropriate symbols. Wiring devices shall be products of Pass and Seymour Corporation, or equal. Catalog numbers shown below are P & S hard use specification grade. Similar devices manufactured by Hubbell or Leviton shall be equally acceptable.

B. Switches: Branch circuit switches shall be flush tumbler (rocker) type as follows:
   1. Single Pole 20AC1 Series - Gray
   2. Two Pole 20AC2 Series - Gray
   3. Three-Way 20AC3 Series - Gray
   4. Four-Way 20AC4 Series - Gray
   5. Single Pole SW With Pilot 20-AC1-RPL Series
   6. Switches for emergency systems shall be as shown above, but red in color.
   7. Wall Mounted Line Voltage PIR type Occupancy Sensing Switches: Watt Stopper type WA-200 – 120/277 – Ivory with time delay set at 15 minutes
   8. Ceiling Mounted Line Voltage Ultrasonic Occupancy Sensing Switches: Watt Stopper type WT-1105 – Ivory with time delay set at 15 minutes with a Watt Stopper B120E-P power pack. Mount power pack above accessible ceiling. Provide all necessary wiring between power pack and occupancy sensor.
   9. Wall Mounted Line Voltage Dual Technology Occupancy Sensing Switches: Watt Stopper type DT-200 – Ivory with time delay set at 15 minutes with a Watt Stopper B120E-P power pack. Mount power pack above the accessible ceiling. Provide all necessary wiring between power pack and occupancy sensor.

2.02 RECEPTACLES

A. All receptacles shall be side and back wired, self-grounding of the type indicated on the drawings, or as follows. Catalog numbers shown below are Pass & Seymour specification grade unless otherwise indicated. Similar devices manufactured by Hubbell or Leviton shall be equally acceptable:

1.	Duplex Convenience Receptacles 20A-125V (Grounding Type)	5362 Series-Gray
2.	Weatherproof Duplex Receptacles 20A-125V (Grounding Type)	5362 WP Series-Gray with Weatherproof F.S. Plate
3.	Duplex GFI Receptacle 20A-125V	2091 Gray
4.	Weatherproof Duplex GFI Receptacle 20A-125V	2091 with 4511 (horizontal) or 4512 (vertical) Weatherproof Wall Plate
5.	Clock Hanger Outlet	S3733-SS
6.	Hospital Grade Receptacle 20A-125V	8300 Gray for Normal Power and 8300 Red for Emergency Power
7.	Hospital Grade GFI Receptacle 20A-125V	2091-HG Gray for Normal Power and 2091-HG Red for Emergency Power
8.	Safety Receptacle	SG-62H Gray for Normal and SG-62H Red for Emergency
9.	Emergency Duplex Receptacle 20A-125V	8300 Red
10.	Isolated Ground Receptacles 20A-125V, Ground Wire shall be routed back to main switchboard ground or separately derived system ground in ccordance with CEC requirements	IG6300 with Orange Cover Plate

B. Receptacles on emergency power shall be red in color. Coverplates for emergency outlets in these areas shall be engraved with panel and circuit no. designation per CEC. Engraving shall be 1/8" high, block style letters, with red filler on front side of coverplates.

2.03 PLATES

A. Furnish and install wall plates for all wiring devices. Plates for flush devices shall be Pass and Seymour "RP" Series high impact thermoplastic, and shall be gray in color. Oversize plates are not acceptable. Weatherproof switch plates shall be Crouse Hinds DS185 type. Where switches and/or receptacles are shown adjacent to each other, provide a common cover plate for each group of devices.

B. Furnish and install wall plates for all wiring devices. Plates shall be Pass and Seymour Type 302 stainless steel. Oversize plates are not acceptable. Weatherproof switch plates shall be Crouse Hinds DS185 type. Where switches and or receptacles are shown adjacent to each other, provide common plate for each group of devices.

2.04 MULTI-OUTLET SURFACE ASSEMBLIES

A. Provide two piece surface metal raceway assemblies manufactured by the Wiremold Company or Walker Parkersburg Products, complete including fittings, devices, end closures, conduit entrance fittings, elbows, and boxes. Except where specified otherwise on the drawings, provide Wiremold G-4000 Series base cover and divider and provide accessory devices as noted on the drawings.

2.05 FLOOR OUTLETS

A. Flush Mounted Floor Boxes and Floor Outlets: Provide Steel City No. 664 box, No. 664-CST cover, one 20A, 125V duplex receptacle, one 664RP receptacle faceplate, and one 664BP blank faceplate for each flush mounted floor convenience outlet. When carpet is indicated on the finish schedule, supply each floor box or outlet with an appropriate carpet flange.

Poke-Thru Service Fittings: Provide Steel City poke-thru service fittings or approved equal complete with a FPT-400 series fire rated insert suitable for the distribution of power, communications, and data wiring. Provide FPT-400 series service fitting heads with faceplate types as noted on the drawings, or as required to meet specified project needs.

2.06 UNDERFLOOR DUCT AND FITTINGS

A. This Contractor shall furnish and install an underfloor duct system as shown on the plans, complete with all junction boxes, end caps, elbows, conduit adapters, supports, anchors, covers, flanges and other necessary components for a complete and workable installation.

B. The system shall consist of No. 2 power duct and No. 4 communications duct with inserts 24" on center. Duct shall be manufactured by Walker/Parkersburg, Cellco or approved equal.

C. Power duct and comm./computer duct shall be aligned with 1-inch spacing between parallel duct runs using duct supports spaced at 5 foot intervals and as recommended by the manufacturer. Top of inserts shall be made watertight with sealing compound.

D. Provide service fittings where shown on the plans. Prior to installation verify service fitting locations with the Owner.

E. Devices and cover plates shall be similar to those specified for floor outlets.

2.07 Where devices are installed on exposed fittings or boxes, the plates shall be galvanized and of a type designed to fit the box. Blank covers shall be installed on all boxes without devices or fixtures, of same type as installed on devices in the room or area.

2.08 Test wiring devices to ensure electrical continuity of grounding connections and proper polarity.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install wiring devices as indicated in compliance with manufacturer's written instructions, applicable requirements of the CEC and NECA's "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices and other work.

C. Testing: Test wiring devices for electrical continuity and proper polarity of connections. Test wiring devices to demonstrate compliance with requirements.

D. All outlets shall be located as shown on the drawings, except that where practicable, outlets shall be located in center of panels or trim or otherwise symmetrically located to conform with existing structural layout. Outlets incorrectly installed shall be corrected. Damaged items or damaged finishes shall be repaired or replaced at no expense to the Owner.

E. Outlets shall be set plumb or horizontal and shall extend to the finished surface of the walls, ceiling or floor, as the case may be, without projecting beyond the same.

F. Receptacles, switches, etc., shown on wood trim, cases or other fixtures shall be installed symmetrically; and, where necessary, shall be set with the long dimensions of the plate horizontal, or ganged in tandem.

G. Where dimmer switches are shown adjacent to standard switches, both shall be installed in separate back boxes with adequate space between so that neither cover plate requires cutting.

H. Where devices are shown near wall openings, coordinate location if corner guards are to be installed so that cover plates do not require cutting.

I. Where devices are shown mounted adjacent to one another on the drawings, provide multi-gang faceplates to cover all devices.

END OF SECTION 26 27 26

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, general provisions of the Subcontract, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Lighting fixture supports.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer’s product data sheets for each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions, materials, and finishes.
2. Lamp quantity and type.
3. Voltage, input watts.
4. Accessories.
5. Photographic image of luminaire.
6. Manufacturer's data sheets for each ballast including ballast type, power factor, input voltage, input watts, and ballast factor.
7. Energy-efficiency data.
8. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.

9. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.
4. Ceiling-mounted projectors.
5. Structural members to which suspension systems for lighting fixtures will be attached.
6. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Drivers: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Light Emitting Diodes (LEDs):

1. All LEDs shall be from the same manufacturer.
2. All LEDs shall be +/- 200 K of each other.

B. Drivers:

1. From the same manufacturer throughout and in accordance with ANSI C82.2, Public Law 100-357, and UL 935 and 1029.
2. Occupancy Sensors shall be certified for operation with the specific drivers utilized in controlled lighting fixtures.

C. Cords: UL 62.

D. Lamp Holders and Starters: UL 496, 542, and 879.

E. Luminaires:

1. Typical Installations: UL 676, 1570, 1571, and 1572.
2. Photometric Data: Certified by an independent testing laboratory.
3. In accordance with State of California energy regulations.

F. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

G. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.

I. Comply with California Electrical Code.

1.9 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

A. Manufacturer's warranty that the painted reflector finish will not yellow, darken, peel, crack, or develop surface deterioration that may reduce source image reflectance.

1. Duration: [1] year from date of final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Luminaires: Refer to the lighting fixture schedule on the drawings. Proposed substitutions of luminaires for those specified will be judged on the basis of equal or better efficiency, appearance, quality of construction, and photometric data.

B. Drivers:
1. LED Dimming Type: Advance (a division of Philips), General Electric, Osram Sylvania Quicktronic, Universal Lighting Technologies, or equal.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Materials and Fabrication

1. Metal Parts: Free of burrs and sharp corners and edges.

2. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
3. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
4. Provide fastening devices of a positive locking type which do not require special tools to apply or remove them. Do not use tie wires in place of fastening devices.
5. Attach reflectors to housings by means of safety chains to prevent reflectors from falling. No part of the chain shall be visible after installation.
6. Luminaires installed in air plenums shall be enclosed and gasketed.
7. Luminaires shall be completely factory assembled, wired, and equipped with necessary lampholders, ballasts, wiring, shielding, reflectors, channels, lenses, and other parts necessary to complete the luminaire installation.
8. Luminaire hardware shall be concealed. Weld exposed metal at joints, fill with weld material, grind smooth, and make free from light leaks. Gasket incandescent luminaires with overlapping trim. Weld ballast support studs, socket saddle studs, and reflector support studs to luminaire body; self-threading screws are not acceptable. Ventilate ballast compartments and firmly secure ballast to conducting metal surface. Luminaires shall be designed for bottom relamping, unless otherwise noted.
9. Construct luminaires with a minimum number of joints. Unexposed joints shall be welded, screwed, or bolted; soldered joints are not acceptable. Do not use self-tapping methods or rivets for fastening removable parts used to gain access to electrical components requiring service or replacement, or for fastening electrical components or their supports.
10. Cast or extruded parts of luminaires shall be close grained and free from imperfections or discolorations, rigid, true to pattern, of ample weight and thickness, and properly fitted, filed, ground, and buffed to provide finished surfaces and joints free of imperfections.
11. Housings for luminaires shall be designed to make electrical components easily accessible and replaceable, without removing the luminaire body from its mounting.

C. Finishes

1. Luminaire finishes shall provide a durable, wear-resistant surface. Surfaces shall be chemically cleaned and pretreated with corrosion-inhibiting (phosphating) material to assure positive paint adhesion.

    a. Exposed metal surfaces (brass, bronze, aluminum, and like materials) and finished castings (except chromium-plated or stainless-steel parts) shall have an even top coat of high-grade methacrylate lacquer or transparent epoxy.
    b. Zinc-plate or hot-dip zinc galvanize the following after completion of all forming, welding, and drilling operations:

        1) Sheet-steel housings
        2) Iron and steel parts not phosphated or used in exterior applications

2. Screws, bolts, nuts, and other fastening or latching hardware shall have corrosion-resistant finish.
3. Provide luminaires with a high-temperature, baked-enamel coating unless noted otherwise in LLNS-selected color and finish. Refer to subpart "Reflectors" in this Section for specific reflector finish requirements.

D. Reflectors

1. Aluminum Reflectors:

   a. Fabricate reflectors and reflecting cones or baffles from aluminum reflector sheet, minimum 0.057 inches thick.
   b. Material shall be free of tooling marks, spinning lines, and marks or indentation caused by riveting or other assembly techniques.
   c. No rivets, springs, or other hardware shall be visible after installation.

2. Painted Reflectors:

   a. Painted reflectors shall be formed before application of primer and paint.
   b. Reflectors and reflector bodies shall receive a white electrostatically applied and baked polyester or polyurethane powder finish (powder coat) with not less than 90% laboratory certified reflectance.
   c. Average reflectance shall be determined by averaging the reflectance values at 5 randomly selected points on the reflector surface. Average value shall be at least 95% of the value stated in independent testing laboratory data.

E. Lenses, Faceplates, And Trims

1. Plastic lenses shall be of UV stabilized virgin methyl methacrylate, unless otherwise indicated. Polystyrene lenses are not acceptable. Lenses shall have high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
3. Glass lenses shall be of annealed crystal glass unless otherwise indicated.
4. Lenses, louvers, and other light diffusing components shall be contained in frames.
5. Lenses shall be removable but positively held within the frames so that hinging or other motion of the frame will not cause the diffusing component to drop out.
6. Faceplates on incandescent recessed luminaires shall open for access to the interior of the luminaire, serve as a ceiling trim, and be positively held to the luminaire body by adjustable means that permit the faceplate to be drawn up to the ceiling as tight as necessary to ensure complete contact of faceplate with the finished ceiling.
7. Provide ceiling trims for rectangular recessed luminaires with mitered corners, continuously welded and smoothed before shop finishing. Lapping of trim metal is not acceptable.

F. Luminaire Wiring

1. Wiring channels and wireways shall be free from projections and rough or sharp edges. Provide bushings at points or edges over which conductors pass.
2. Where utilized as raceways, luminaires shall be suitable for use as raceways. Provide feed through splice boxes where necessary.
3. All luminaires shall have a suitable interior means of attaching the grounding wire to the luminaire enclosure.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USE ONLY" and include specific lamp type.
b. ANSI driver type (M98, M57, etc.) for LED luminaires.
c. CCT and CRI for all luminaires.

H. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 DRIVERS, GENERAL REQUIREMENTS

A. Suitable for the electrical characteristics of the supply circuits to which they are to be connected and suitable for operating the specified type and quantity of lamps.

B. Where installed outdoors or in a nonheated environment such as walk in freezers, cold food handling areas, or outside air plenums, ballasts shall be capable of lamp starting at ambient temperatures down to 20-degrees F.

C. Luminaires controlled by dimmers shall be provided with dimming type ballasts

D. Single-lamp ballasts for long fluorescent lamps shall be kept to a minimum and shall only be used for the last odd lamp in a room or space.

2.4 DRIVERS FOR LEDs

A. Description: Electronically 0-10V dimming driver, designed for type and quantity of lamps indicated. Drivers shall be designed for full light output:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.

8. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Provide installation and supporting hardware including stems, plates, plaster frames, hangers, and similar items, for support of luminaires for the ceiling construction in which they shall be installed. Provide plaster frames made of nonferrous metal, or of steel that has been suitably rustproofed after fabrication.

B. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

C. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

D. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

E. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordinate luminaire locations indicated on the drawings are general and approximate. Coordinate luminaire placement with installation of other equipment such as ducts, pipes, conduit, and structural elements, including required clearances. Bring conflicts to LLNS's attention and verify exact location of luminaires before proceeding with work.

B. Verify ceiling construction and furnish appropriate luminaire mounting supports, hardware, trim, and accessories for each luminaire.

C. By beginning the work of this section, the Subcontractor warrants it has examined and verified that the existing conditions are in accordance with the provisions of preceding paragraphs of subpart 3.1.

3.2 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by LLNS, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Install reflector cones, aperture plates, lenses, diffusers, louvers, and decorative elements of luminaires after completion of wet work, plastering, painting, and general cleanup in the area of the luminaires.

D. Install luminaires free of light leaks, warps, dents, or other irregularities. Light leaks are not acceptable.

E. Finish visible hanging devices to match the luminaire finish, unless otherwise noted. Suspended fixtures shall hang level and aligned when installed in rows.

F. Provide fire rated enclosures around recessed luminaires installed in fire rated ceilings.

G. Connect recessed luminaires to boxes with flexible conduit and fixture wire in accordance with Section 260533 “Raceway and Boxes for Electrical Systems” and Section 260519 “Low-Voltage Electrical Power Cables and Conductors”.

H. Install equipment so that components requiring access for service and maintenance are readily accessible.

3.3 SUPPORTS AND ATTACHMENTS

A. Provide attachment devices, brackets, plaster rings, saddle hanger, and tie bars as required, made of formed, rolled, or cast-metal shapes with the requisite rigidity and strength to maintain continuous alignment and support of installed luminaires.

B. Luminaires mounted in suspended ceilings shall be attached to the main runners of the ceiling system with appropriate mounting hardware. Provide independent splayed bracing wires and hanger wires at each corner of luminaire to structure above.

C. Provide at least two supports for single luminaires. Luminaries more than 2 feet wide shall be supported with at least four hangers per luminaire. Where luminaires are continuously mounted in rows, provide supports at maximum intervals of 8 feet; closer, if necessary to prevent visible deflection.

D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 ADJUSTMENT AND CLEANING

A. Adjustment:

1. Provide final focusing and adjusting of lighting equipment under LLNS supervision.
2. Replace burnt out luminaires and noisy or defective drivers.

B. Cleaning: Immediately prior to occupancy, clean reflectors, reflector cones, aperture plates, lenses, trim rings, faceplates, louvers, lamps, and decorative elements.

END OF SECTION 26 51 00