SAN RAFAEL CITY SCHOOLS
310 NOVA ALBION WAY, SAN RAFAEL, CA 94903

ADDENDUM NO. 1
TO
BRAUN CENTER AT OLD GALLINAS PHASE 1 PROJECT
BID NO. 25-01

ADDENDUM DATE: FEBURARY 7, 2025

This Addendum provides for clarifications and responses to Requests for Information inquiries received as well as additional project information.

Additional Project information:

1. **Scope of Work:** Changes in scope of work to remove data (electrical will remain in contract).

2. **Specifications:** Attached.

3. **Pre-bid Conference:** A map of the sign-in location is attached.

Request for information:

Question No. 1: Can you please advise if this project and the black box project are summer projects?

Response: The Braun Center at Old Gallinas Phase 1 Project is scheduled to commence on March 26, 2025, and be completed by May 26, 2025.

END OF ADDENDUM NO. 1

BRAUN CENTER

NO PARKING

PARK HERE

AREA OF WORK

Legend
- 7-Eleven
- Feature 1
- Las Gallinas baseball field - Gallinas Valley?
- Old Gallinas Children's Center

Sweetie Pie Daycare
Marin County Appliance Repair by Hi-Tech
Stevens Way
Las Gallinas baseball field - Gallinas Valley...
Lowell Ave
WildCare
Cushing Ave
HRT Tennis Academy
Old Gallinas Children's Center
Old Gallinas Children's Center
N San Pedro Rd
Golden Benefits Senior Services
Northview Ct
Oakcrest Dr
Alterpop
N
200 ft
Google Earth

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected site elements.
2. Salvage of existing items to be reinstalled.

B. Related Requirements:

1. Section 01 11 00 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
3. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures.
4. Section 31 10 00 "Site Preparation and Plant Protection" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
4. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

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

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing buildings.

B. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

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

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove site utility systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. 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 starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Protect items from damage during transport and storage.
3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove. Existing first floor slabs of some buildings are structural slabs, not slabs-on- grade. Do no cut or demo slab unless so detailed on the DSA-approved drawings.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 11 00 CONCRETE FORMING &

ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Shoring, bracing, and anchoring.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Sections 03 20 00 and 03 30 00: Concrete Reinforcing and Cast-in-Place Concrete

1.2 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.3 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Concrete Institute (ACI)
Corps of Engineers
U. S. Department of Commerce Product Standard (PS)
Western Wood Products Association (WWPA)
West Coast Lumber Inspection Bureau (WCLIB)

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Form ties.
3. Spreaders.
4. Waterstops.
5. Form-release agent.

B. Samples: Submit samples of form ties, spreaders, and waterstops.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 REGULATORY REQUIREMENTS

A. Except as modified by the requirements specified herein or the details on the drawings, formwork shall conform to the 2022 California Building Code (CBC) Title 24 Part 2, Chapter 19A - Concrete.

B. CalGreen Requirements: Form coatings shall comply with environmental requirements of 2022 California Building Code (CBC) Title 24 Part 11.

1. The quantity of volatile organic compounds (VOC) used in coating products shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Carry out the engineering and construction of all formwork, shoring, and bracing, by and under the direction of the Contractor. The Contractor shall be held responsible for the engineering, construction, maintenance, and safety of all formwork during the entire construction period.

B. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

C. Design formwork for the loads and lateral pressures outlined in Part 3, Section 102, of ACI 347R-14, and lateral forces as specified by the CBC Title 24 Part 2.

2.2 FORM-FACING MATERIALS

A. Forms for Unexposed Concrete: Form concrete surfaces that will not be exposed in the finished structure with plywood, lumber, metal or other acceptable material.

1. Lumber: Standard or better grade Douglas fir, meeting the requirements of WCLIB "Standard No. 17, Grading Rules for West Coast Lumber" or WWPA "Western Lumber Grading Rules 2011". Use boards that are surfaced on at least 2 edges and one side for a tight fit.

2. Plywood: B-B Plyform, Class I, Exterior grade meeting the requirements of PS 1-09, 5/8-inch minimum thickness for 12-inch stud spacing and 3/4-inch minimum thickness for 16-inch stud spacing.

B. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

1. Where an as-cast surface finish is indicated, provide High Density Overlay Plyform Class I Exterior plywood meeting the requirements of PS 1-09.

2. Where sacked, rubbed or sandblasted surface finish is indicated, provide B-B Plyform Class I Exterior plywood meeting the requirements of PS 1-09.

C. Form Liners: Form architectural finish concrete surfaces with PVC or ABS plastic, fiberglass reinforced plastic or elastomeric urethane form liners of face design indicated.

2.1 WATERSTOPS

A. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: As indicated.
2. Dimensions: 4 inches by 3/16 inch thick; nontapered.

2.2 RELATED MATERIALS

A. Framing, Studding and Bracing: "Standard" or "Construction" grade Douglas fir, rough or S4S, meeting the requirements of WCLIB "Standard No. 17, Grading Rules for West Coast Lumber" or WWPA "Western Lumber Grading Rules 2018".

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.
3. Coatings containing mineral oils or other nondrying ingredients will not be permitted.

C. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1-inch of concrete face. Inner tie rod shall be left in concrete when forms are removed. Wire ties or wood spreaders will not be permitted.

D. Nails: Common wire, steel.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes. Camber formwork where necessary to compensate for anticipated deflections due to fresh concrete and construction loads.

D. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
2. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

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

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

F. Construct forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and the like, for easy removal.

G. Do not use rust-stained steel form-facing material.

H. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips.
2. Use strike-off templates or compacting-type screeds.

I. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

J. Chamfer exterior corners and edges of permanently exposed concrete 3/4-inch, unless otherwise indicated. Provide molding in forms for all chamfering required.

K. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

L. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

M. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings.

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

N. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

O. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

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

Q. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

1. Thoroughly clean forms and coat with specified form coating before each use.
2. Do not reuse forms for exposed construction which cannot be reconditioned to "like new" condition.

R. Earth Forms: Earth forms may be used for footings only where the soil is firm and stable and the concrete will not be exposed to view. Where earth forms are to be used, excavations shall be cut neat and accurately to size for placing of concrete directly against the excavation. Except for bottom of footings, allow for one-inch additional concrete beyond the dimensions or profiles shown on the drawings. Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from sloughing. Form sides of footings where earth sloughs more than 6-inches. Earth forms shall be tamped firm and cleaned of all debris and loose material before depositing concrete.

S. Wood Forms: Construct forms of sound material to the correct shape and dimensions, mortar tight, and of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of exact shape under imposed loads. They shall be so constructed that they may be easily removed without damage to the concrete. Before concrete is placed in forms, carefully verify the

horizontal and vertical position of the form and correct inaccuracies. Complete wedging and bracing in advance of placing of concrete.

T. Framing bracing, supporting members, and centering shall be of ample size and strength to safely carry, without deflection, dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent bulging or sagging of forms. Concrete out of line, level, or plumb will be cause for rejection of the whole construction affected.

U. Tolerances: Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of ACI 117-10.

V. Chamfered Corners: Chamfer exposed corners 3/4-inch, unless otherwise indicated. Provide molding in forms for all chamfering required.

W. Form Ties: Use ties of sufficient strength and in sufficient quantities to prevent spreading of the forms. Place ties at least 1 inch away from the finished surface of the concrete.

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

Y. Joints: Install construction joints, isolation joints, shrinkage control joints and expansion joints as approved. Coordinate location of construction joints, particularly those exposed to view at walls and columns, in advance of concrete placement.

Z. Inspection: Before placing of concrete, and after placement of reinforcing steel in the forms, provide notification so that proper inspection can be made. Make such notification at least 2 working days in advance of placing concrete.

AA. Rejection of Defective Work: Any movement or bellying of forms during construction or variations in excess of the tolerances specified will be considered just cause for the removal of such forms and, in addition, the concrete construction so affected. Reconstruct forms, place new concrete and required reinforcing steel at no additional cost to the Owner.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediate prior to concrete placement.

B. Embedded Piping and Rough Hardware:

1. Coordinate with other trades who are required to fasten materials to formwork, or who are required to insert piping, boxes, bolts, anchors, inserts, or other rough hardware, within the forms.

2. Locate conduits or pipes so as not to reduce the strength of the construction, and in no case place in a slab less than 4-inches thick except for local offsets. Do not bury conduit in a concrete slab with an outside diameter greater than 30 percent of the thickness of the slab, and do not place conduit under slab reinforcing steel, except for slab mesh. Place conduits parallel to roof slab span.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 03 30 00 "Cast-In-Place Concrete."
4. Secure waterstops in correct position at 12 inches on center.
5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.

    a. Miter corners, intersections, and directional changes in waterstops.
    b. Align center bulbs.

6. Clean waterstops immediately prior to placement of concrete.
7. Support and protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

D. When shores and other vertical supports are so arranged that the form facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as specified or permitted.

1. The shores and supports shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

E. Whenever the formwork is removed during the curing period, cure the exposed concrete by one of the methods specified in Section 03 30 00.

F. Construction loads exceeding the design loads shall not be imposed on any member unless it is properly shored and braced.

G. Use softwood wedges to release form faces from concrete. Do not pry with metal tool.

3.5 SHORING AND RESHORING INSTALLATION

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

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

B. When reshoring is permitted or required the operations shall be planned in advance and shall be subject to review.

C. Perform reshoring for the purpose of early form removal so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no live loads shall be permitted on the new construction. Tighten reshores to carry their required loads but do not over tighten so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

D. Floors supporting shores under wet concrete shall have at least one-half the load capacity of the shores above and shall be distributed in approximately the same pattern as those above. These reshores shall remain in place until the freshly-placed concrete has reached 75 percent of its specified 28-day strength, unless otherwise specified or permitted.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Sections 03 11 00 and 03 30 00: Concrete Forming & Accessories and Cast-in-Place Concrete

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Concrete Institute (ACI)
American Society for Testing and Materials (ASTM International)
Concrete Reinforcing Steel Institute (CRSI)
American Welding Society (AWS) American
Concrete Institute (ACI)

1.3 ACTION SUBMITTALS

A. Product Data: Submit mill affidavits, stating the grades and physical and chemical properties of the reinforcing steel, and conformance with ASTM Specifications, before delivery of the steel to the project site.

B. Steel Reinforcement Shop Drawings: Comply with ACI SP-066:

1. Placing Drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Architect.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

1.6 REGULATORY REQUIREMENTS

A. Except as modified by the requirements specified herein or the details on the drawings, reinforcing steel shall conform to the 2022 California Building Code (CBC) Title 24 Part 2, Chapter 19A - Concrete.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver reinforcement bundled and tagged to identify placement and certify testing.

B. Transport reinforcing steel to the construction site, store and cover in a manner that will ensure that no damage occurs to it from moisture, dirt, grease, or other cause that might impair bond to concrete. Store a sufficient supply of approved reinforcing steel on the construction site at all times to ensure that there will be no delay of the construction. Maintain identification of steel after bundles are broken.

1.8 COORDINATION

A. Review architectural, structural, mechanical, and electrical drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed for #4 bars and larger; Grade 40 for #3 bars and smaller.

B. Low-Alloy Steel Reinforcing Bars for bars to be welded: ASTM A706/A706M, deformed.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Welding Electrodes: AWS A5.1-04, grade E70XX for welding grade 40 reinforcing steel, and AWS A5.5-06 E90XX for welding grade 60 reinforcing steel.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

C. Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain or Galvanized.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement in accordance with the details indicated. Where specific details are not indicated or noted, comply with the applicable requirements of CRSI's "Manual of Standard Practice," CBC Title 24 Part 2, Chapter 19A; IBC Standard 19-1; and ACI SP-66-04.

B. Bend, cut, and place bars accurately, as indicated. Bend bars cold; heating of bars will not be permitted. Do not bend or straighten bars in any manner that will injure the material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. General: Comply with applicable requirements of CCR Title 24 Part 2, ACI 315, and CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

C. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging.

   1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
   2. Lap edges and ends of adjoining sheets at least one mesh spacing.
   3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
   4. Lace overlaps with wire.

D. Reinforcing Supports: Support bars and welded wire fabric larger than 8-gage on metal chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. Support legs of accessories in forms without embedding in form surface. Space chairs and accessories in conformance with CRSI's "Recommended Practice for Placing Bar Supports". No wood will be permitted inside forms. Precast concrete cubes may be used to support reinforcing for footings and slabs on grade.

E. Placing and Tying: Set reinforcing in place, space, and securely tie at splices and at crossing points and intersections in the position indicated, or as directed. Point ends of wire away from forms.

F. Spacing: Space bars as indicated. Where not indicated, the clear spacing for main longitudinal column reinforcement shall be not less than 1.5 times the nominal bar diameter, or 1-1/2 inches, or 1-1/3 times the maximum size aggregate, whichever is greater. For other parallel bars, where spacing is not indicated, the minimum clear spacing shall not be less than the nominal bar diameter, or one inch, or 1-1/3 times the maximum size aggregate, whichever is less. The clear distance limitations above also apply between the bars being spliced at a contact lap splice and adjacent bars.

G. Splices: Except for temperature bars in slabs and horizontal wall reinforcing, no splicing will be allowed for reinforcing bars unless detailed locations are indicated, or approval is given. Stagger lapped splices for horizontal wall reinforcing and slab temperature bars by the required minimum lap splice length. Wherever possible, stagger splices of adjacent bars.

H. Dowels: Securely tie dowels in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, add a No. 3 minimum to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted. Protect dowels extended for future construction from weather exposure. Compliance with safety law requirements for extended dowels is required.

I. Cleaning: At time of concrete placement, clean reinforcement free of coatings that would impair bond to concrete, otherwise clean reinforcing by sandblasting as required.

J. Welding: Welding of reinforcing steel will not be permitted except as specifically approved or detailed. Welding shall comply with IBC Standard 19-2 and AWS D1.4 using low hydrogen electrodes. Before welding, determine weldability of reinforcing bars by a laboratory chemical analysis.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement welding.

C. Notify the District Inspector at least 2 working days ahead of each concrete pour and do not place any concrete until all reinforcing steel has been installed and approved by the Inspector. Complete all reinforcing in every way by the end of the working day before concrete placing. Testing and inspections are specified in Section 01 45 00.

3.6 DEFECTIVE WORK

A. The following reinforcing steel construction will be considered defective and removed and replaced at no additional cost to the Owner.

1. Bars with kinks or bends not indicated.
2. Bars damaged by bending or straightening.
3. Bars heated for bending.
4. Reinforcement not placed in accordance with the drawings or specifications.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 03 11 00 “Concrete Forming” for concrete formwork.
2. Section 03 20 00 “Concrete Reinforcing” for steel reinforcing bars and welded-wire reinforcement.
3. Section 07 26 16 “Below Grade Vapor Barrier”.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. Water/Cement Ratio (W/C Ratio): The ratio by weight of water to cementitious materials.

1.3 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Concrete Institute (ACI)
American Society for Testing and Materials (ASTM International)

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Portland cement.
2. Aggregates.
3. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

4. Curing materials.
5. Joint fillers.
6. Sealer.
7. Chemical hardener.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Cellulose reinforcing fiber (where designated for concrete floors to receive polished concrete finish).
10. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
11. Intended placement method.
12. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

E. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

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

B. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Except as modified by the requirements specified herein or the details indicated, concrete construction shall conform to the 2022 California Building Code (CBC) Title 24 Part 2 Chapter 19A - Concrete.

2. CalGreen Requirements: Materials shall comply with environmental requirements of 2022 California Building Code (CBC) Title 24 Part 11.

a. The quantity of volatile organic compounds (VOC) used in materials shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

B. Installer Qualifications: A qualified installer who employs Project personnel qualified as a ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

C. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
2. Obtain aggregate from single source.
3. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: Conform to ASTM C150, Type I or II. The cement used in the work shall correspond to that on which the selection of concrete proportions was based.

2. Fly Ash: ASTM C618, Class F.

3. Where aggregates contain reactive substances, low alkali cement shall be used in all concrete. Low alkali cement shall not contain more than 0.6 percent total alkali when calculated as sodium oxide as determined by the method given in ASTM C114.

C. Pozzolan: ASTM C618, Type F.
1. Limit use of pozzolan to not more than 15 percent of cement content by weight.
2. Polished Concrete Finishing Areas: Maximum of 5% replacement for Portland cement.

D. Normal Weight Aggregates: ASTM C33 coarse aggregate or better, graded. Provide aggregates from a single source. Comply with CCR Title 24 Part 2, Sec. 1903A.5.

1. Alkali-Silica Reaction: Comply with the following:
   a. Use ASTM C227 to determine alkali reactivity of the aggregates as specified therein, the alkali reactivity shall be "innocuous" as determined by ASTM C289.

2. Coarse Aggregate: Clean, hard, crushed rock or washed gravel, free from organic materials or soft or friable materials, containing not more than 2 percent by weight of shale or cherty material and not more than 15 percent by weight of elongated fragments.

3. Maximum Coarse-Aggregate Size: As indicated on Structural Drawings.

4. Fine Aggregate: Washed clean, uniformly screen graded, and containing not more than 2 percent by weight of deleterious materials such as shale, schist, alkali, clay lumps, earth, loam, mica or similar materials. Uniformly grade fine aggregate from fine to coarse.

E. Lightweight Aggregates: ASTM C330; 1/2-inch nominal maximum aggregate size.

F. Admixtures: ACI-318, 26.4.1.4. Admixture shall be subject to acceptance by the Architect and Division of the State Architect (DSA) as to type and amount used. Admixtures shall not contain chlorides.

1. Air-Entraining Admixture: ASTM C260. Acceptable products, or equal:

   BASF Corporation; MasterAir Series Cormix, Inc.; Air-Tite Euclid Chemical Co.; Air-Mix W.R. Grace & Co.; Darex AEA Sika Corp.; AER

2. Water Reducing Admixture: ASTM C494, Type A. Acceptable products, or equal:

   Cormix, Inc.; PSI N Euclid Chemical Co.; Eucon WR 75 W.R. Grace & Co.; WRDA
   BASF Corporation; MasterPozzolith Series or MasterPolyheed Series
   Sika Corp.; Plastocrete 161

3. Retarding Admixture: ASTM C494, Type B. Acceptable products, or equal:

   BASF Corporation; MasterSet R Series or MasterSet DELVO Series

4. Accelerating Admixture: ASTM C494, Type C. Acceptable products, or equal:

   BASF Corporation; MasterSet AC 534 or MasterSet FP 20.

5. Water Reducing and Retarding Admixture: ASTM C494, Type D. Acceptable products, or equal:

   BASF Corporation; MasterSet R Series or MasterSet DELVO Series.

6. Water Reducing and Accelerating Admixture: ASTM C494, Type E. Acceptable products, or equal:

   Cormix, Inc.; Gilco Accelerator
   Euclid Chemical Co.; Accelguard 90
   W.R. Grace & Co.; Duraset
   BASF Corporation; MasterSet FP 20.

7. High Range Water Reducing Admixture: ASTM C494, Type F. Acceptable products, or equal:

Cormix, Inc.; PSI Super
Euclid Chemical Co.; Eucon 37
W.R. Grace & Co.; Daracem
BASF Corporation; MasterRheobuild 1000, MasterGlenium Series or PS 1466. Sika Corp.; Sikament 300

8. Workability-Retaining Admixture: ASTM C494, Type S. Shall retain concrete workability without affecting time of setting or early-age strength development. Acceptable products, or equal:

   BASF Corporation; MasterSure Z 60.

10. Corrosion-Inhibiting Admixture: Shall be a nominal 30 percent solution of calcium nitrite or an amine/ester-based organic corrosion-inhibiting admixture. Acceptable products, or equal:

    BASF Corporation; MasterLife CI 30 or MasterLife CI 222.

11. Shrinkage-Reducing Admixture: ASTM C494, Type S. Acceptable products, or equal:

    BASF Corporation; MasterLife SRA 20 or MasterLife CRA 007.

G. Water Used in Mixing Concrete: ASTM C94/C94M, potable, clean and free from deleterious amounts of acid, alkalis, organic or other materials.

2.3 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

B. Curing Compound: Types as follows subject to the limitations specified elsewhere in this Section:

1. Non-film Forming Type: Clear, water-based solution that penetrates below the concrete surface to react with free lime to seal, harden and dust proof concrete surfaces. When tested in accordance with ASTM C156, compound shall restrict the loss of water to not more than 0.55 kg per square meter. Acceptable products, or equal: BASF; Sonosil Burke Corp.; Res-X Silicate Dayton-Superior; Day-Chem Sil-Cure (J13) Euclid Chemical Co.; Cure & Hard W. R. Meadows; Med-Cure Nox Crete, Inc.; Bro-Cure.
2. Dissipating Resin Type: Water based, resin compound containing no wax, paraffin, gum or oil, designed to cure fresh concrete and complying with ASTM C309, Type I-D, Class B. Acceptable products, or equal: BASF; Sonocure Burke Corp.; Aqua Resin Cure Euclid Chemical Co.; Kurez VOX W. R. Meadows; 1100 Clear Nox-Crete, Inc.; Resin Cure E Symons Corp.; Resi-Chem Clear Cure.
3. Pigmented Type: Water based blend of pure waxes, polymers, additives, and alkali resistant pigments as recommended by the

manufacturer of the coloring admixture. When tested in accordance with ASTM C156, compound shall restrict the loss of water to not more than 0.55 kg per square meter. Acceptable products, or equal:

L.M. Scofield Co.;
Lithochrome Colorwax, Water
Base Admixtures, Inc.;
Colorfull Cure-Sealer

4. Curing Sealer: Water based acrylic resin compound containing not less than 12 percent solids, designed to cure, seal and dustproof concrete floors, complying with ASTM C309, Type I, Class B. Acceptable products, or equal:

BASF; Kure-N-Seal WB
Burke Corp.; Spartan Cote WB
Dayton-Superior; Safe Cure & Seal (J-18) Euclid
Chemical Co.; Aqua-Cure VOX
W. R. Meadows; Vocomp-20
Nox-Crete, Inc.;
Cure & Seal
1200E Symons
Corp.; Cure &
Seal 12%
Emulsion

2.4 RELATED MATERIALS

A. Expansion and Isolation Joint Filler: Premolded, of sizes and thicknesses indicated, meeting the requirements of ASTM D8139.

1. Source: Nomaflex by Nomaco, Inc.
2. Description: ASTM D8139, asphalt-free, semi-rigid, closed-cell polypropylene foam.
3. Thickness: 1/2 inch.

B. Expansion Joint Sealing Compound: Expansion joint sealant and backer rod is specified in Section 07 92 00.

C. Below Grade Vapor Barrier: As specified in Section 07 26 16.

D. Abrasive Aggregate: Factory graded and packaged fused aluminum oxide grits or crushed emery containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Material shall be rust-proof, non-glazing and unaffected by freezing, moisture and cleaning materials.

E. Drilled Anchors: Basis-of-Design Product:

Hilti; Kwik-Bolt TZ-2 Expansion Anchors (ICC Report No. ESR-4266)

F. Epoxy Adhesive Anchoring System: Basis-of-Design Product:

Hilti HIT-RE 500 V3 Safe Set System with Hilti Hollow Drill Bit and Vacuum with HAS- E Threaded Rod, per ICC ESR-3814).
The HIT-RE 500 V3 adhesive anchoring system is an injectable two-component epoxy adhesive. The two components are kept separate by means of a dual-cylinder foil pack

attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

G. Powder Actuated Fasteners: Basis-of-Design Product:

Hilti; X-S13 THP Powder Actuated Fasteners (ICC Report No. ESR-1752)

H. Concrete Screw Fasteners: Basis-of-Design Product:

Simpson Strong Tie; Titen Turbo Screw Fasteners (IAPMO UES ER #712)

2.5 REPAIR MATERIALS

A. Leveling Compound: Cementitious, single component, non-shrink, self-leveling underlayment for concrete floors, meeting ASTM C109 testing requirements of 4,000 psi. Acceptable products, or equal:

Ardex; V-800 BASF; Sonoflow
Burke Corp.; Flo-Tru
Dayton-Superior; LeveLayer II Euclid Chemical Co.; Flo-Top
Symons Corp.; Floor Top USG; 4500 series

B. Cementitious Patching Material:

Sika USA: SikaRepair 222 Cementitious Patching Material

2.6 CONCRETE MIXTURES, GENERAL

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

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

B. Concrete Proportions and Properties:

1. Minimum Concrete Strengths at 28 Days: As indicated.

2. Maximum Slumps: As indicated, or 4-inches for toppings on metal deck, 4-inches for slabs, footings and other horizontal members, 4-inches for walls, columns and other vertical members.

3. Maximum Water-to-Cement Ratios: As indicated.

4. Maximum Size Aggregate: In no case shall the maximum aggregate size used exceed one fifth of a member's thickness, one third of the depth of slabs, nor three fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. In columns and piers it shall not exceed 2/3 of the clear distance between reinforcement. In addition, it shall never exceed the size indicated for the following:

    a. Slabs 6 inches and less in thickness: 1-inch.
    b. Walls less than 8 inches in thickness: 1-inch.
    c. Toppings over Steel Pan Stair Systems, and Metal Deck: 3/8-inch.

5. Admixtures: Admixtures shall be added in accordance with the manufacturer's instruction.

    a. High range water reducing accelerating admixtures may be used, at the Contractor's option, to improve workability and finishing of low slump concrete mixes and to produce flowable concrete for pumping. Dosages shall be determined by the manufacturer after testing of cements and aggregates to be used.

    b. Water reducing admixtures may be used, at the Contractor's option, to improve workability and finishing of low slump concrete mixes.

    c. Water reducing, accelerating admixtures may be used, at the Contractor's option, to achieve early strength for earlier form removal.

    d. Air entraining admixture may be used, at the Contractor's option, to improve workability of low slump concrete mixes.

C. Grout: One part portland cement and 2 parts fine aggregate, by volume. Grout shall be of a consistency suitable for the intended purpose and shall be used immediately after mixing. Grout used under minor bearing plates shall be "drypack" and shall be rammed into place. Small quantities of grout may be mixed by hand, but grout requiring 1/2 sack of cement, or more, per batch shall be machine mixed.

2.7 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for structural slab on grade and exterior door infill.

1. Exposure Class: ACI 318; F0, S0, W0, C0.
2. Minimum Compressive Strength: 3000 psi at 28 days.
3. Slump Limit: 4 inches.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2. Use ready mixed concrete, mixed and transported in accordance with ASTM C94.

3. Retempering: Mix concrete only in quantities for immediate use. Discard concrete which has set, do not retemper.

4. Indiscriminate addition of water to increase slump is prohibited. When concrete arrives at the project with slump below that suitable for placing, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. Incorporate the water by additional mixing equal to at least half of the total mixing required. Accompany addition of water above that permitted by the limitation of water-cement ratio by a quantity of cement sufficient to maintain the proper water-cement ratio. Obtain approval.

5. In the event concrete is mixed at a central batching plant, the delivery shall be arranged so that intervals between batches are kept at a minimum, and in any event not more than 30 minutes. Trucks shall be in first class condition and kept in constant rotation during delivery. No water shall be added during transit or at the job without specific instructions from the civil engineer responsible for the mix design. Concrete shall be placed within 90 minutes after addition of water and admixtures.

2.9 SOURCE QUALITY CONTROL

A. General: Submit mill tests and manufacturer's certification of compliance with ASTM Specifications to the Inspector in lieu of testing of cement and aggregate analysis.

B. Mix Designs:

1. Mix designs shall be made by the contractor’s concrete supplier under the supervision of a California Registered Civil Engineer, who shall determine mix proportions to fulfill the specified requirements for strength, aggregate size and workability of concrete, and such designs shall be used in proportioning all structural concrete. Mix designs shall bear the signature and seal of the California Registered Engineer. Two copies of the mix designs shall be filed with the Architect for record purposes only, not for review or approval.

2. Make mix designs in accordance with ACI 318 Sec. 26.4.2. The Owner in accordance with Section 01 45 00 will pay costs for mix

design.

3. Cover and clear distances between reinforcing bars shown on the drawings shall be considered in determining the aggregate size for mix designs, which may result in an aggregate size smaller than the maximum aggregate size stipulated elsewhere in this specification.

4. A list specifying the intended usage of each mix design shall be clearly shown as part of the designs.

5. The maximum water-cement ratio for concrete intended for use in interior slabs-on- grade shall be 0.45.

6. Mix designs shall be reviewed and approved by the Owner's Testing Laboratory for compliance with the contract documents, with "NO EXCEPTIONS TAKEN".

C. Owner's Testing Laboratory shall provide continuous inspection at concrete batch plant, unless the requirements of CCR, T24 Sec. 1705A.3.3 are met.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.3 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions. Refer to Section 07 26 16 "Below Grade Vapor Barrier."

3.4 JOINTS

A. Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

2. Place joints perpendicular to main reinforcement.

a. Continue reinforcement across construction joints unless otherwise indicated.
b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

4. Locate joints for slabs in the middle third of spans.

5. Locate horizontal joints in walls and columns at underside of floors and slabs, and at top of footings or floor slabs.

6. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated.

2. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify the Owner's Inspector and DSA at least 2 working days in advance of the placing of any concrete.

C. Geotechnical Engineer shall inspect soil bottoms for footings and slabs before placing concrete.

D. Before placing concrete, forms shall be thoroughly inspected. Remove wood chips, dirt, etc., take out temporary bracing and cleats, box openings for pipes, etc., secure forms in their correct position and make tight, secure reinforcement, anchors, and embedded items in their proper places. Concrete which may be on the forms or reinforcement, and which is set and dry, shall be cleaned off and the forms and steel washed off before proceeding. Remove water and all foreign matter from forms and excavations.

E. Subgrade Preparation: Before concrete floor slabs on grade are poured, place vapor barrier over prepared subgrade, lapping all joints not less than 4-inches. Seal all joints and punctures in vapor barriers with pressure sensitive tape.

F. Surface Preparation: Before new concrete is deposited against hardened concrete, and before masonry is placed on concrete, remove all incrustations and laitance from forms, reinforcing, and surface of hardened concrete. If the surface mortar and laitance of the first concrete pour has not been completely removed by water blasting, the hardened concrete surface shall receive a sandblast treatment exposing the coarse aggregate, to 1/4-inch amplitude. Surfaces that are to receive drypack shall also be prepared as herein specified.

G. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed

the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

H. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

I. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

J. Handling and Depositing:

1. Concreting, once started, shall be carried on as a continuous operation until the section of approved size and shape is completed.

2. Handle concrete as rapidly as practicable from the mixer to the place of final deposit by methods that prevent the separation or loss of ingredients. Deposit concrete as neatly as practicable, in its final position to avoid rehandling or flowing.

3. Concrete shall not be dropped freely where reinforcing will cause segregation, nor shall it be dropped freely more than 4-feet. Concrete shall be deposited to maintain a plastic surface approximately horizontal.

4. Do not deposit concrete that has partially hardened in the work. Concrete shall not be retempered nor used after having stood 15 minutes after leaving the truck or mixer.

K. Vibrating and Compacting:

1. Thoroughly consolidate all concrete and compact by suitable means during the operation of placing and depositing. Thoroughly work all concrete around reinforcement, embedded items, and into the corners of the forms. Concrete against forms shall be thoroughly vibrated. Use internal vibrators under experienced supervision and keep out of contact with reinforcement and wood forms.

2. Vibrate close to the forms but do not continue at one spot to the extent that large areas of grout are formed or the heavier aggregates are caused to settle. Take care not to disturb concrete that has taken its initial set.

L. Flatwork:

1. Set edge forms and intermediate screed strips accurately to produce the designed elevations and contours in the finished surface, and sufficiently strong to support vibrating bridge screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. Align concrete surface to the contours of screed strips by the use of strike-off templates or approved compacting type screeds.

2. When the formwork is cambered, set screeds to a like camber to maintain the proper concrete thickness.

3. Locate and detail joints in slabs on grade as indicated.

4. Thoroughly consolidate concrete slabs. Use internal vibration along the bulkheads of slabs on grade. Obtain consolidation of slabs and floors with vibrating bridge screeds, roller pipe screeds, or other approved means. Concrete to be consolidated shall be as dry as practical and the surfaces thereof shall not be manipulated before the finishing operations.

3.6 FINISHING FORMED SURFACES

A. General: Provide sacked or rubbed finishes where indicated. Provide sacked finish where no other finish is indicated. As-cast finish not acceptable.

B. As-Cast Surface Finishes: Not Used.

C. Smooth-Formed Finish:

1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
2. Repair and patch tie holes and defects.
3. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
4. Apply to concrete surfaces to receive a rubbed finish.

D. Sacked Finish:

1. Remove fins, rough spots, stains and hardened mortar by carefully rubbing with a fine abrasive stone to a smooth even surface.
2. Remove excess form sealer by carefully scrubbing surface with 5 to 10 percent solution of muriatic acid.
3. Fill holes or irregular surfaces.
4. Apply a slurry proportioned one part cement to 1-1/2 parts sand, passing a No. 16 sieve, by damp loose volume, mixed with sufficient water to form a grout having the consistency of thick paint.
5. Before applying slurry to surfaces, dampen concrete sufficiently to prevent water absorption.
6. Spread slurry over surfaces with a clean sponge rubber float to completely fill holes and imperfections.
7. Float surface vigorously, and while slurry is still plastic remove excess grout.
8. Allow to dry then rub with burlap to completely remove dry grout so that no visible grout film remains.
9. Complete the entire cleaning operation for any area the day it is started.

E. Smooth-Rubbed Finish:

1. Perform no later than one day after form removal.
2. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
3. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.

F. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface

   with power-driven floats or by hand floating if area is small or inaccessible to power- driven floats.
2. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish, subfloors for ceramic and quarry tile, and for interior stair treads and landings.

   a. Tolerances for floors indicated to receive thin set ceramic tile applications shall not exceed 1/8-inch in 12-feet.
   b. Tolerances for all other floors shall not exceed 1/4-inch in 12-feet.
   c. Finish floors that do not meet specified tolerances shall be leveled to within the specified tolerances using a leveling compound.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to interior concrete finish floors exposed to view, and subfloors for resilient flooring and carpet.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
8. Apply Section 03 35 00 “Concrete Finishing Aid” to improving finishing and surface consistency.

   a. Slabs on Ground:

      1) For Slabs with Carpet: Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
      2) For Slabs with Thin Floor Coverings: Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.
      3) For Polished Concrete Floors: Refer to Section 03 35 43 “Polished Concrete Finishing” for F_F and F_L tolerances.

   b. Suspended Slabs:

      1) For Slabs with Carpet: Specified overall values of

flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.

2) For Slabs with Thin Floor Coverings: Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.

3) For Polished Concrete Floors: Refer to Section 03 35 43 “Polished Concrete Finishing” for F_F and F_L tolerances.

D. Edge and Joint Finish: Use standard tools to produce rounded edge corners and intermediate line scoring.

E. Mark-Off Lines: Form mark-off lines with curved edging tool, neat and true to line, uniform throughout. Conform to markings indicated.

F. Finishes for exterior concrete paving construction are specified in Section 32 13 13.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: As indicated.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inchcenters around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.

c. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.9 CONCRETE CURING

A. Protect freshly deposited concrete from premature drying and excessively hot or cold temperatures,

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
b. Continuous Sprinkling: Maintain concrete surface continuously wet.
c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

a. Polished Concrete Floors, Resilient Flooring, and All Floor Finishes:
1) Reflective Curing Blanket: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

2) Lap edges and ends of absorptive cover not less than 12-inches.

3) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

OR

b. Polished Concrete Floors, Resilient Flooring, and All Floor Finishes:

1) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. All Exposed Concrete: Curing and sealing compound is usually for floors and slabs and may act as a permanent surface finish.

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 JOINT FILLING

A. Expansion Joints:

1. General: Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
   a. Defer joint filling until concrete has aged at least one month.
   b. Do not fill joints until construction traffic has permanently ceased.
2. Position filler against forms, adjacent concrete slabs, and other construction.
3. Pre-score top edge or place expansion joint void-cap over filler. Install filler with top edge at or slightly below final concrete surface.
4. After concrete has cured apply joint sealant flush with concrete surfaces.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Any concrete which is not formed as shown on the drawings, or for any reason is out of alignment, or is not true, or is not plumb or level, or is not in plane, or shows a defective surface, or is otherwise not in true and continuous form or is structurally defective, shall be considered as not conforming with the intent of this specification.

D. Remove such concrete from the job and replace with new work, at no extra cost to the Owner, unless Architect grants permission to patch defective area in accordance with the following procedures. Do not consider permission to patch any such area as a waiver of Architect's right to require complete removal of defective work if patching does not, in his opinion, satisfactorily produce or restore required quality and appearance of surface. Defects impairing strength of concrete will require special repairs or removal as directed by the Architect.

E. Patching Appearance Defects:

1. Inspection: After removing entire formwork assemblies, inspect concrete surfaces and patch tie holes, pour joints, voids, stone pockets, and such other defective areas as are permitted by Architect to be patched.

2. Procedure: Where necessary, chip away defective areas to depth of not less than 1- inch with edges perpendicular to surface, with no feather edges. Wet area to be patched and a space at least 6-inches wide entirely surrounding it, to prevent absorption of water from patching mortar. Place grout of equal parts portland cement and sand with sufficient water to produce a brushing consistency. Brush well into surface, and then follow immediately with patching mortar.

3. Use patching mortar of same material and of approximately same proportions as used for concrete, except omit coarse aggregate, and do not mix richer than 1 part cement to 3 parts sand. Use as little mixing water as is consistent with requirements of handling and placing.

4. Compact mortar into place and screed off so as to leave patch slightly higher than surrounding surface. Then leave patch undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. Finish the patch in such a manner as to match adjoining surface, after striking off the patch with a straightedge spanning the patch and held parallel to direction of form marks.

F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare testing and inspection reports. Owner's testing and inspecting agency to provide tests and inspections in accordance with CCR, T24, Sec. 1705A.3 and Table 1705A.3; and Sec. 1910A.

1. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
2. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31/C31M and ASTM C39/C39M, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.

3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. of concrete or fraction thereof, or not less than once for each 2,000 square feet of surface area for slabs or walls, of each concrete mixture placed each day, per ACI 318 Sec 26.12.2.1 and 2022 CBC 1905A.1.17.

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

2. Slump: ASTM C 143/C 143M;

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M:

    a. One test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M.

a. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
b. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days
c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

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

9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is ≤ 5000 psi.

10. Test results shall be reported in writing to Architect, IOR, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests:

    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
        1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.

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

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

E. Measure floor and slab flatness and levelness in accordance with

ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.14 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

3.15 DEFECTIVE WORK

A. Remove and replace defective concrete construction at no cost to Owner.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Plywood backing panels.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. RIS: Redwood Inspection Service.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.3 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the stone facing only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

APA-The Engineered Wood Association (APA)
American Society for Testing and Materials (ASTM International) American Wood-Preservers' Association (AWPA)
Redwood Inspection Service (RIS)
U.S. Department of Commerce Product Standard (PS) West Coast Lumber Inspection Bureau (WCLIB) Western Wood Products Association (WWPA) Redwood Inspection Service (RIS)

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Expansion anchors.
6. Metal framing anchors.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Requirements of Regulatory Agencies:

1. Rough carpentry shall conform to the 2022 California Building Code (CBC) Title 24 Part 2, Chapter 23 - Wood.

2. Framing anchors and powder driven fasteners shall be furnished and installed in accordance with the manufacturer's current ICC Evaluation Services Report.

C. Grade Marks:

1. Identify each piece of structural lumber, including timbers 4” by 4” in size and larger, by the official grade mark of WCLIB, or WWPA. Provide qualified lumber grader at the site to stamp members that are not mill stamped.

2. Identify plywood by the official grade mark of APA.

3. Identify pressure preservative treated lumber and plywood with the official grade mark of an independent Testing Agency operating under the overview of the ALSC. Grade stamp shall state retention; statements on grade stamp such as "or to refusal" are not permitted.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in an undamaged condition.

B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raised above the ground and out of contact with other damp or wet surfaces.

C. Stack lumber and plywood and provide for air circulation within and around the stacks and under temporary coverings.

D. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.

1.8 PROJECT CONDITIONS

A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailers where indicated or as required for integration of work of other trades into the structure.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber:

1. Untreated Lumber: Maximum 19 percent except 25 percent for timbers 5” by 5” in size or larger.

2. Treated Lumber: Maximum 19 percent, except 23 percent for timbers 5" by 5" in size or larger, after pressure treatment.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Manufacturers:
1. Hoover Treated Wood Products, Inc.; www.frtw.com; Exterior Fire-X® Fire Retardant Treated Wood.
2. Lonza Wood Protection, Inc.; www.dricon.com; FRX® Fire Retardant Treated Wood.
3. Substitutions: Section 01 25 1`3 – Product Options and Substitutions.

B. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

D. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

E. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

F. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.

C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; WCLIB, or WWPA.
4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels for mounting electrical, data or telephone equipment: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, 3/4-inch nominal thickness unless otherwise indicated.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M, or of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

Hilti, Inc.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC58 for mechanical anchors in masonry and concrete; and ICC-ES AC193 or ICC-ES AC308 for adhesivie anchors in masonry and concrete; as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Simpson Strong-Tie Company Inc.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Use for exterior locations and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Water-Resistive Barrier: As specified in Section 07 25 00.

B. Self-Adhering Flashings: As specified in Section 07 25 00.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches on center.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches on center with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in 2022California Building Code.
2. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 41 00 ARCHITECTURAL

WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Products Installed But Not Supplied Under This Section:

~~1. Horizontal Sliding Visual Display Units are supplied under Section 10 11 00 and installed under Section 06 41 16.~~

D. Related Sections:

1. Section 05 50 00 “Metal Fabrications” for steel angle support for cantilevered countertops.
2. Section 06 10 53 “Miscellaneous Rough Carpentry” for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Iron and Steel Institute (AISI)
American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM International)
National Electrical Manufacturers' Association (NEMA)
Scientific Equipment and Furniture Association:
1. SEFA 3 – Work Surfaces.
U.S. Department of Commerce (DOC)
Woodwork Institute:
1. WI – *North American Architectural Woodwork Standards 3.1*

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Before framing is completed, hold a meeting of the contractor, the casework manufacturer, casework installer and the framing contractor.

1. Review the locations of backing required for casework installation as shown on the casework shop drawings.
2. Review the method of attachment of the backing to the wall system a shown on the architectural drawings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product**,** including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

B. Shop Drawings:

1. Submit Shop Drawings showing list of materials and hardware, sizes, sections, elevations and details of construction and assembly as required by Woodwork Institute *North American Architectural Woodwork Standards 3.1*, Section 1 – Submittals.

2. Indicate grounds, backing, blocking, sleepers and other items required for the installation of cabinet work which are to be furnished and installed as part of the structure.

3. Affix the Woodwork Institute Certified Compliance Program label to the first page of the Shop Drawings, certifying that the cabinets will be manufactured in accordance with the Woodwork Institute grade specified.

C. Samples for Initial Selection:

1. Plastic Laminate: Submit samples of each type of plastic laminate, including complete color and pattern range and surface finish.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material, and specified edge material applied to one edge.

2. Exposed Cabinet Hardware: Submit one unit of each type and finish. Approved samples may be used in the work.

E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. It is preferable, but not mandatory, that Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products.

C. Regulatory Requirements: Wall hung cabinets and floor supported cabinets over 5 feet high shall be braced and anchored in accordance with the 2022 California Building Code (CBC) Title 24 Part 2.

D. Manufacturing Standards:

1. Cabinets: Manufacture plastic laminate faced cabinet work in accordance with Woodwork Institute *North American Architectural Woodwork Standards 3.1*, latest edition, Section 10, Casework - Laminated Plastic, Custom Grade, except as modified herein.
2. Plastic Laminate Countertops: Manufacture plastic laminate countertops in accordance with Woodwork Institute *North American Architectural Woodwork Standards 3.1*, latest edition, Section 11, Countertops - Laminated Plastic, Custom Grade.

E. Certified Compliance:

1. Before delivery to the job site, the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
2. Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.
3. At completion of installation, the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
4. All fees charged by the Woodwork Institute for its Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.

F. Reinspection: In case of a dispute concerning quality of the casework, a reinspection of the casework by a representative of Woodwork Institute shall be conducted at no additional cost to the Owner.

G. Certified Seismic Installation Program:

1. Before walls are closed up provide a written Woodwork Institute Certified Seismic Installation Program report confirming that backing is provided in all locations required for casework installation or identifying those locations where backing is missing or improperly located.

2. On completion of installation provide a Woodwork Institute Certified Seismic Installation Program Certificate, identifying the work covered and certifying that installation meets the requirements of the WI CSIP attachment details and schedules.

3. All fees charged by the Woodwork Institute for their Certified Seismic Installation Program are the responsibility of the millwork installer and shall be included in their bid. Certification is a prerequisite for final acceptance. For further information, visit www.woodworkinstitute.com.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

B. Do not deliver materials until project construction is ready for installation. Provide a clean storage area as required by Woodwork Institute *North American Architectural Woodwork Standards 3.1*, Section 2 – Care and Storage.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "*North American Architectural Woodwork Standards*" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
1. Provide labels and certificates from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

B. Grade: *North American Architectural Wood Standard*s Custom Grade.

C. Type of Construction: *North American Architectural Wood Standards* Construction Type A - Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

2.2 MATERIALS

A. Plastic Laminate: Meet the requirements of NEMA LD3.

1. Horizontal Surfaces: NEMA GP 50 high pressure plastic laminate, nominal 0.050-inch thick, except where postforming type is required provide NEMA PF-42, nominal 0.042-inch thick, conforming to Woodwork Institute *Architectural Woodwork Standards*, Section 4, Article 4.4.7, and Section 10, Article 10.4.5.
2. Vertical Surfaces: NEMA GP-28, nominal 0.028-inch thick.
3. Cabinet Liners: Comply with Woodwork Institute *North American Architectural Woodwork Standards*, Section 10 for Grade specified.
4. Backing Sheets: Comply with Woodwork Institute *North American Architectural Woodwork Standards*, Section 10 for Grade specified.
5. Surface Finish: Satin finish.
6. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   a. As selected by Architect from laminate manufacturer's full range in the following categories:
      1) Solid colors: Satin or matte finish.
      2) Wood grains: Satin or matte finish.
      3) Patterns: Satin or matte finish.
   b. Vertical Surfaces: TBD.
   c. Horizontal Surfaces: TBD.
7. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
8. Acceptable manufacturers or equal:

   Formica
   Corporation
   Micarta Div.
   Nevamar Corporation
   Wilsonart International, Inc.

B. Core: Combination Core Plywood.

1. Basis of Design Product: Raw, 2 Step ArmorCore® “Blank” panels by States Industries LLC; www.StatesInd.com; or ClassicCore® by Columbia Forest Products.
   a. Description: ArmorCore panels combine the low weight and high strength advantages of veneer cored panels with the superior flatness and higher density of Medium Density Fiberboard. ArmorCore panels are stiffer, lighter, and stronger than composition panels of equivalent thickness, yet the MDF crossbands match the best composition surface characteristics.
   b. Performance Specifications:
      1) MOE: 630,200 lb/in^2
      2) MOR: 4,922 lb/in^2
      3) Screw holding, face: 324 lbf.
      4) Screw holding, edge: 271 lbf.
      5) Weight: 2,656 lbs per MSF of 3/4"
      6) Thickness tolerance: +0; -3/64”
   c. Panel thickness: As shown on drawings.

C. Lumber: In accordance with the North American Architectural Woodwork Standards Grade specified for the product being fabricated. Moisture Content: 6% to 12% for boards up to 2-inch nominal thickness, and shall not exceed 19% for thicker pieces.

D. Hardboard: Meet or exceed Commercial Standard CS-251 and Fed. Spec. LLL-B-00810, tempered, 1/4-inch thick, smooth both sides. Pre-finish exposed surfaces in color to match cabinet interior, pre-finish opposite surface with neutral color balance coating.

E. Visible Edges, Exposed and Semi-Exposed: 3mm purified PVC edge bands of size to suit material thickness. Colors of the specified manufacturer if shown on the color legend in the plans shall govern. If the Contractor wishes to substitute for the manufacturer’s color already specifically called out in the plans, the substitution is subject to rejection if it does not match the required condition, per the Architect’s judgement. In the event the Architect rejects it, the specified color and the manufacturer called out in the color legend shall be provided. Hot melt apply to edges of cabinet ends, shelves, doors, and drawer fronts.

F. Stainless Steel: AISI 18-8, Type 302 or 304 with a No. 4 satin finish.

2.30 HARDWARE

A. Hinges: Woodwork Institute Grade 1 as approved for schools and hospitals. Acceptable products or equal:

Rockford Process Control; No. 376 or No. 456

B. Pulls: Surface mounted “U” shaped aluminum, US 28 finish. Acceptable products or equal:

Builders Brass Works; 9054
Quality Hardware; No. 812

C. Catches:

1. Doors Without Locks: Magnetic type with aluminum case. Acceptable products or equal:
   Amerock; #9765

Epco; No. EP591

2. Inactive Leaf of Pairs of Doors With Locks: Elbow catch. Acceptable products or equal:
   Amerock; No. B238-14A
   Ives 2A-92

D. Drawer Slides: Full extension type with no deflection, with rolling balls, steel rollers and self-lubricating bearings. For drawers 18-inches wide and less, provide slides with 100-pound capacity. For drawers over 18-inches in width provide slides with 150-pound capacity. Provide drawer slides that have mechanical stops designed to prevent accidental removal of the drawer. Acceptable manufacturers or equal:

   Accuride
   Grant Hardware Company
   Knape & Vogt

E. File Drawer Slides: Heavy duty, full extension, 3-section slide, 1/2-inch slide space, 150-pound load capacity. Acceptable manufacturers or equal:

   Accuride
   Grant Hardware Company
   Knape & Vogt

F. File Drawer Track and Follower: Acceptable product or equal:

   K&V 476T ZC and K&V 476F ZC

G. Shelf Rests for Bored Hole Shelf Support System: BHMA A156.9, B04013; plastic locking shelf support, 1/4" pin length. Acceptable product or equal:

   K&V 339 Series for 3/4" shelves; 340 Series for 1" shelves.

H. Door and Drawer Locks:

1. General: Deadbolt locks from Olympus Lock, Inc.; www.olympus-lock.com
2. Door and Drawer Locks:
   a. Cabinet Doors: Olympus Lock 500DR (Door), with 56-1 bar strike; or Corbin Cabinet Lock 0737 (Door).
   b. Drawers: Olympus 600DW (Drawer) with 12-3 angle strike; or Corbin Cabinet Lock 0738 (Drawer).
   c. Local Distributor Contact: JSwis Sales, Inc. 559-260-0331.
   d. Cabinet locks are easily rekeyable via set screw cylinder release mechanism. All locks to include: Pin tumbler design with working cylinder slides and forwardly removable cylinders for rekeying without totally disassembling lock body. Furnish 2 keys per lock and bar or slotted strikes as required. Provide spacers as required for flush fit with outside face of casework material. Locks shall be capable of being keyed alike, keyed different and/or master keyed per supplied schedule. Locks will have passed ANSI A156.11 Grade 1 cycle testing.
3. Cam locks shall be easily rekeyable pin tumbler with working top slide and retainer staple.
4. Provide locks on all doors and drawers.

5. Locks for doors and drawers shall be keyed alike for each room and master keyed to comply with the Owner's keying system. Purchase master keyed cylinders from the hardware supplier specified in Section 08 71 00.
6. Metal Strike Plates: Provide cabinet door and drawer locks with metal strike plates to protect against particleboard rip out.

I. Label Holders: Acceptable product or equal:

Knape & Vogt; No. K010

J. Countertop Grommets: Acceptable product or equal:

Hafele; HA 429.99.735

K. Screws: Straight shank double thread particleboard screws.

2.31 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.32 FABRICATION

A. Grade: *NAAWS* Custom Grade.

B. Fabricate cabinets to dimensions, profiles, and details indicated.

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

E. Cabinets: Fabricate cabinets to meet Woodwork Institute *North American Architectural Woodwork Standards 3.1,* Construction Type A - Frameless, Style 1 - Flush overlay. Provide finished end panels of either applied panels or integral members on exposed ends of cabinets. Close gaps at walls with filler panels not to exceed 3-inches wide.

1. Semi-Exposed Surfaces: Finish semi-exposed surfaces of open cabinets or behind glass doors to match exposed surfaces.

2. Cabinet interiors (other than semi-exposed surfaces) including faces of shelving therein, and interior door faces: Finish with cabinet liner as specified herein, color as selected by the Architect.

F. Drawer Boxes: Provide with subfronts and applied finish fronts securely fastened, with square corners, edges finished with plastic laminate or 3mm purified PVC. Provide drawers with metal slides as specified.

G. Doors: Flush overlay type, hinged to swing flat against the face of adjoining cabinet or the side of cabinet, with square corners, and edges finished with plastic laminate or 3mm purified PVC. Notch door or cabinet ends, or divisions to receive hinge.

H. Door and Drawer Fronts: Vertical grade plastic laminate covered. Core material shall be as specified in paragraph 2.2.B. Finish exposed edges with plastic laminate or 3mm purified PVC, color as selected by the Architect, hot-melt applied.

I. Shelves: Comply with Woodwork Institute *North Americ*an *Architectural Woodwork Standards 3.1* and Technical Bulletin 435 for 50 pound per square foot load test.

J. Toe Kick Base:

1. Typical Cabinets: Furnished and installed under Section 09 65 13.

K. Countertops and Splashes:

1. Plastic Laminate Countertops: Custom Grade in accordance with Woodwork Institute *North American Architectural Woodwork Standards 3.1,* Section 11, plastic laminate covered, including square butt top, exposed edges and ends self-edged. Core material: As specified in paragraph 2.2.B.
2. Front edges: Self Edgeband with Narrow Build Up.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Verify that mechanical, electrical, plumbing, and other building components affecting work in this section are in place and ready.

3.2 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.3 INSTALLATION, GENERAL

A. General: Install work as specified in Woodwork Institute *North American Architectural Woodwork Standards* and provide a Woodwork Institute Certified Compliance Certificate for installation as specified herein.

B. Grade: Install cabinets to comply with same grade as item to be installed.

C. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

D. Install cabinets plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged at finished cuts.

F. Secure to ground, stripping, blocking with countersunk, concealed fasteners. Install without distortion so that doors and drawers fit openings and are accurately aligned.

G. Base Cabinets: Set cabinets straight, plumb, and level. Adjust sub-tops within 1/16-inch of a single plane. Fasten each individual cabinet to floor at toe space, with fasteners spaced 24-inches on center. Bolt continuous cabinets together. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

1. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16-inch.

H. Wall Cabinets: Securely fasten to solid supporting material, not plaster, lath, or gypsum board. Anchor, adjust, and align wall cabinets as specified for base cabinets.
1. Reinforcement of stud walls to support wall-mounted cabinets specified in appropriate section, but responsibility for accurate location and sizing of reinforcement shall be coordinated with applicable trade.

I. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturers.

J. Install finish hardware after all finish work has been completed. Inspect drilling operations for surface splinters or delamination. Pieces bearing such imperfections will be rejected.

3.4 INSTALLATION OF TOPS

A. Field Jointing: Where practicable, make in same manner as factory jointing using doweled, splines, adhesives, and fasteners recommended by manufacturer. Locate field joints as shown on accepted shop drawings; factory prepared so there is no project site processing of top and edge surfaces.

B. Fastening: Use concealed clamping devices for field joints located within 6-inches of front, at back edges and at intervals not exceeding 24-inches. Tighten in accordance with manufacturer's instructions to exert a constant, heavy clamping pressure at joints. Secure tops to cabinets with "Z" type fasteners or equal, using 2 or more fasteners at each front, end, and back.

C. Workmanship: Abut tops and edge surfaces in one true plane, with internal supports placed to prevent any deflection. Provide flush hairline joints in top units using clamping devices. At joints in epoxy tops, use manufacturer's recommended adhesives and holding devices to

provide joint widths not more than 1/16-inch wide at any location, completely filled and flush with abutting edges.

1. After installation, carefully dress joints smooth, remove surface scratches, clean and polish entire surface.
2. Provide holes and cutouts as required for mechanical and electrical work.
3. Provide scribe moldings for closures at junctures of top, curb and splash with walls as recommended by manufacturer for materials involved. Use chemical resistant, permanently elastic sealing compound where recommended by manufacturer.

D. Plastic Laminate Countertops:

1. Where no splash occurs, scribe the back edge of the counter top to the wall.
2. Secure joints in the counter tops with draw bolts, sized and spaced as recommended by Woodwork Institute for Custom Grade counter tops.
3. Apply adhesive using cold-press method and a pressure of not less than 30 psi.

E. Coordinate work with Divisions 22, 23 and 26 for Plumbing, Mechanical, and Electrical work to be integrated into casework.

3.5 FIELD QUALITY CONTROL

A. Provide Woodwork Institute Certified Seismic Installation Program inspection reports and certification as required in Part 1 of this Section.

3.6 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi exposed surfaces.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sealant work, except as otherwise specified, required to weatherproof the buildings, and including interior sealant work. This section contains requirements pertaining to all weather and interior sealant work throughout the project and becomes a part of each and every section calling for sealant and calking, unless otherwise specified, as though written in full in each section.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 07 84 43 “Joint Firestopping” for sealants for joint firestopping systems.
2. Section 08 80 00 “Glazing” for sealants for glazing work.
3. Section 09 29 00 “Gypsum Board” for sealing perimeter systems.

1.2 REFERENCES

A. The editions of ASTM International Standards referenced herein apply to the work only to the extent specified by the reference thereto. Refer to Section 01 42 19 for information concerning availability and use of references.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint sealant product. Submit copies of manufacturer's specifications, recommendations and installation instructions for each type of sealant and related material required.

B. Samples: Submit samples indicating the color range available for each sealant material intended for installation in locations exposed to view. Materials installed before approval of color will be subject to removal and replacement with approved material.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

1. Include manufacturer's letter of certification, or certified test reports indicating that each material complies with the requirements specified herein and is suitable for the applications indicated.

2. Include manufacturer's letter of certification indicating that sealants, primers and cleaners comply with regulations controlling use of volatile organic compounds.

B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Obtain joint sealants from a single manufacturer for each different product required. Obtain elastomeric sealants only from manufacturers who will, if required by the Architect, send a qualified technical representative to the Project site to advise the installer of proper procedures and precautions for the use of these materials.

B. Installer's Qualifications: Employ a firm having a minimum of 5 years successful experience in the application of the types of materials required.

C. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in sealants, primers and cleaners shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealants to the Project site in unopened containers, labeled with the manufacturer's name, brand designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi component materials.

B. Store sealants in an area where they will not be subject to temperatures above 100 degrees F or below 40 degrees F. Do not store materials that have exceeded the manufacturer's recommended shelf life.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

D. Warrant work under this section against moisture penetration for a period of 5 years from the date of "Substantial Completion". The written warranty shall include materials and labor required to repair leaks that develop. The warranty shall be signed by the sealant manufacturer, the sealant installer and the Contractor.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

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

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SEALANT MATERIALS

A. Type A Sealant: Multiple component, self-leveling polyurethane based sealant meeting the requirements of ASTM C920, Type M, Grade P, Class 25. Acceptable products or equal:

Pecora Corp.; Urexpan NR-200
Sika Corp.; Sikaflex-2c-SL
Sonneborn Building Products; Sonolastic SL 2
Tremco, Inc.; Vulkem 445 SSL

B. Type B Sealant: Single or multiple component, nonsag polyurethane based sealant meeting the requirements of ASTM C920, Type S or M, Grade NS, Class 25. Do not use

single component sealants when excessive movement is expected within the curing time of the sealant. Acceptable products or equal:

BASF MasterSeal NP 1 or NP 2
Pecora Corp.; Dynatrol I or II
Sika Corp; Sikaflex 1a or 2c-NS Ez-Mix
Tremco; Dymonic FC or Dymeric 240 FC

C. Type C Sealant: Butyl rubber based sealant meeting the requirements of ASTM C920, Type S, Grade NS, Class 7.5. Acceptable products or equal:

Adco Seal; No. B-100
Pecora Corp.; BC-158
PTI Sealants; PTI 757
Tremco; Butyl Sealant

D. Type D Sealant: Latex acrylic based sealant meeting the requirements of ASTM C834. Acceptable products or equal:

Pecora Corp.; AC-20
Sonneborn Building Products;
Sonolac Tremco; Acrylic Latex 834

E. Type E Sealant: Medium modulus silicone sealant meeting the requirements of ASTM C920, Type S, Grade NS, Class 50. Acceptable products or equal:

Dow Corning Corp.; No. 795
Momentive; Silpruf SCS
2000 Sika Corp; SikaSil 295
Tremco, Inc.; Spectrem 2

F. Type F Sealant: Narrow joint seam sealant meeting the requirements of AAMA 803.3-1976 and formulated for sealing joints 3/16-inch or smaller in width. Acceptable product or equal:

PTI Sealants; PTI 200

G. Type G Sealant: Multiple component, nonsag polysulfide or polyurethane based sealant meeting the requirements of ASTM C920, Type M, Grade NS, Class 25, Use I, recommended by the manufacturer for continuously submerged joints. Acceptable products or equal:

L.M. Scofield Co.; Lithoseal Watercalk-3G
Sika Corp.; Sikaflex 2c NS Ez-Mix Tremco,
Inc. Dymeric 240 FC

H. Acoustical Sealant: Sealant shall be one of the following types at the Contractor's option:

1. Polyvinyl chloride foam tape with pressure sensitive tape on one side 3/4-inch wide by the thickness required to accommodate unevenness of substrates and completely fill openings between partition framing and building floors and concrete or masonry wall. Acceptable products or equal:

Norton Co.; Norseal V730
Series Arlon; Series 6A

2. Permanently resilient compound manufactured specifically for acoustical applications. Acceptable products or equal:

Ohio Sealants; Sound Calk (solvent type) Pecora Corp.; BA-98
Tremco; Acoustical Sealant

2.3 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin, or Type O (open-cell material), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Profile: Round in shape, with diameter never less than 30 percent greater than width of joint.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the joint surfaces, backing, and anchorages of units forming sealant rabbet, and the conditions under which the sealant work is to be performed for conditions that would adversely affect the performance of the sealant.

B. Do not proceed with the sealant work until unsatisfactory conditions have been corrected. Start of sealant work constitutes acceptance of conditions.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Unglazed surfaces of ceramic tile.
    c. Portland-Cement Plaster.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 JOINT DIMENSIONS

A. Butyl Base Type Sealant: Minimum joint width of 1/4-inch, and the depth of 3 times the width of the joint, with the maximum depth 3/4-inch.

B. Silicone Rubber Sealant: Minimum joint width of 1/4-inch, and depth of approximately one-half the width, but in no case less than 1/4-inch. Other width-to-depth ratios as follows:

JOINT WIDTH:	JOINT DEPTH:	
<u>For Nonporous Surfaces</u>:	<u>Minimum</u>	<u>Maximum</u>
1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/2 of width	Equal to width

Over 1/2"	Not Permitted	
<u>For Porous Surfaces</u>		
1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/4"	Equal to width
1/2" to 1"	1/2"	Equal to width
Over 1"	Not Permitted	

C. Acrylic and Polyurethane: Minimum joint width of 1/4-inch, and depth equal to width, but in no case deeper than 1/2-inch. Other width-to-depth ratios as follows:

JOINT WIDTH:	JOINT DEPTH:	
<u>For Nonporous Surfaces</u>:	<u>Minimum</u>	<u>Maximum</u>
1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	Equal to width	Equal to width
Over 1/2" to 1" maximum	1/2"	1/2"
<u>For Porous Surfaces</u>		
1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/4"	Equal to width
1/2" to 1"	1/2"	1/2"
Over 1"	Not Permitted	

3.4 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide flush joint profile unless otherwise indicated, according to Figure 8B in ASTM C 1193. Rounded off finishing will not be allowed.

G. Seal around all openings in exterior walls, and other locations indicated or required for waterproofing the buildings. Seal all other joints as herein specified, indicated, and required to properly complete the buildings.

H. Apply sealants using specified materials and proper tools. Prepare surfaces (cleaning, etc.) and apply sealant as specified herein and in accordance with the manufacturer's printed instruction and recommendations.

I. Do not use sealants when they become too jelled to be discharged in a continuous flow from the gun. Modification of sealants by addition of liquids, solvents, or powders will not be permitted.

J. Apply sealants with guns having proper size nozzles. Use sufficient pressure to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where the use of the gun is impracticable, use suitable hand tools.

K. Neatly point sealed joints on flush surfaces with beading tool, and internal corners with eaving tool. Remove excess material. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Complete sealing before final coats of paint are applied.

3.5 MISCELLANEOUS JOINT SEALING WORK

A. The entire extent of sealing work is not necessarily fully or individually described herein. Provide sealing wherever required to prevent light leakage as well as moisture leakage. Refer to drawings for conditions and related parts of the work.

3.6 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.7 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.8 JOINT-SEALANT APPLICATION SCHEDULE

A. Type A Sealant: Use for all joints in exterior and interior concrete and ceramic and quarry tile floors and paved surfaces subject to foot traffic.

B. Type B Sealant: Use for all vertical joints in masonry, plaster, and concrete, exposed on the exterior of the building and for sealing around metal door, window and louver frames penetrating these surfaces.

C. Type C Sealant: Use for interior wall penetrations for pipe or conduit that will be concealed by escutcheons or other trim or plates and for lap joints in sheet metal work.

D. Type D Sealant: Use for joints, voids, and penetrations in interior surfaces exposed to view and requiring painting.

E. Type E Sealant: Use for all joints in contact with organically coated aluminum and for joints between precast and tilt-up concrete panels.

F. Type F Sealant: Use for all narrow joints in aluminum storefront and curtain wall framing where joints are mechanically restricted from movement.

G. Type G Sealant: Use for joints between window frames and other materials, and at other exterior joints for which no other sealant is indicated.

H. Acoustical Sealant: Use to seal all perimeter joints around sound retardant partitions and around electrical boxes and other penetrations in these partitions.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel frames.
2. Exterior standard steel doors and frames.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 08 14 16 “Flush Wood Doors”.
2. Section 08 34 73.13 "Metal Sound Control Door Assemblies" for packaged, acoustically rated hollow-metal door and frame assemblies.
3. Section 08 71 00 “Door Hardware” for door hardware for hollow-metal doors.
4. Section 08 80 00 “Glass” for glazing for hollow metal doors and frames.
5. Section 09 91 00 “Painting” for field applied finish.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI) ASTM
International (ASTM)
National Fire Protection Association (NFPA)
National Association of Architectural Metal Manufacturers (NAAMM) Steel
Door Institute (SDI)

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.

C. Coordinate work with frame opening construction, door and hardware installation.

D. Sequence installation to accommodate required door hardware.

E. Verify field dimensions for factory assembled frames prior to fabrication.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

C. Templates: Secure templates from finish hardware supplier for specified hardware and mounting locations.

D. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Provide doors and frames meeting the requirements of either SDI A250.8 or NAAMM HMMA 861 for standard sizes and designs.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic or canvas shelters that create a humidity chamber. If the wrapper on the door becomes wet, remove the wrapper immediately.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Mark or tag each door and frame with the appropriate opening identification symbol.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace hollow metal doors and frames that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Acceptable manufacturers or equal:

Amweld Building Products, Inc.; www.blackmountaindoor.com Ceco Corp.; www.cecodoor.com
Curries Company; www.curries.com; an Assa Abloy Group company. Door Components; www.doorcomponents.com
Forderer Cornice Works; www.fordererdoors.com
Republic Builders Products Corporation; www.republicdoor.com Steelcraft Manufacturing Co.; www.steelcraft.com
Titan Metal Products; www.titanmetalinc.com
Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.2 INTERIOR STANDARD STEEL FRAMES

A. Construct hollow-metal frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.

2. Frames:

a. Materials: ASTM A1008, uncoated, steel sheet, minimum thickness of 16 gauge (0.053 inch).
b. Construction: Full profile welded, grind welds smooth.

3. Exposed Finish: Prime.

2.3 EXTERIOR STANDARD HOLLOW-METAL DOORS AND FRAMES

A. Construct hollow metal doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: ASTM A653, metallic-coated steel sheet, minimum thickness of 16 gauge (0.053 inch), with minimum A60 coating.
d. Edge Construction: Model 2, Seamless; and Model 3, Stile and Rail.
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Kraft-paper honeycomb.

3. Frames:

a. Materials: ASTM A653, Metallic-coated steel sheet, minimum thickness of 14 gauge (0.067 inch), with minimum A60 coating.
b. Construction: Face welded, grind welds smooth.
c. Face Frame Dimension: 2 inches typical.

4. Exposed Finish: Prime.

2.4 STILE AND RAIL GLAZED DOORS

A. Basis-of-Design Product: Steelcraft Manufacturing Company; A14-Series Full Glass Entrance Doors.

B. Fabricate doors in accordance with either ANSI A250.8 or NAAMM HMMA 861 for stile and rail construction. Provide doors with nominal 7 inch wide vertical stiles, nominal 7-1/2" intermediate rail, and nominal 8" top rail and nominal 12-inch high bottom rail. Fabricate stiles and rails with corners mitered, reinforced with channels, welded, and ground smooth.

C. Hardware preparations and reinforcements are in accordance with ANSI A250.6. Locations are in accordance with ANSI/DHI A115 unless otherwise stated.

D. Fabricate exterior doors of 0.064-inch (16-gage) hot-dip galvanized steel.

E. Core: Kraft-paper honeycomb.

F. Vertical Edge Seams: Model 2, Seamless. Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges with visible edge seams, or a one piece full height 14 gauge channel. Apply a continuous bead of structural epoxy in the internal vertical connection.

G. Hinge Preparation: As specified in paragraph 2.7.E.

H. Top and Bottom Channel: As specified in paragraph 2.7.B.

I. Glass Trim: Flush mounted steel trim for 1” Insulated Glass.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, suiteable for performance level indicated.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor. Form floor anchors from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
2. Top Edge Closures: Close top edges of doors with 14 gauge inverted galvannealed channel, except provide 24 gage galvannealed top cap at exterior doors.
3. Bottom Edge Closures: Close bottom edges of doors with 14 gauge galvannealed channel with end closures of same material as face sheets.
4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
3. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

    b. Compression Type: Not less than two anchors in each frame.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6, SDI A250.8, and BHMA A156.115 for preparation of hollow-metal work for hardware, except provide 8-gage minimum hinge reinforcement for exterior doors.

F. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Field Finish: Field finish painting is specified in Section 09 91 00.

2.9 GLAZING

A. Vision Frames for Glass Lites: Provide glazed openings with not lighter than 0.040-inch (20-gage) galvanized steel vision frames, factory primed. Frames shall be nonremovable on exterior or corridor side of door. Glass and glazing materials and methods are specified in Section 08 80 00. Acceptable products, or equal:

Anemostat Door Products; www.anemostat.com; LoPro-G Metal Vision Frame

1. Aesthetics: Tight mitered corners, beveled glass stop and low profile, provide a clean tapered look.

B. Glazing for Door Lites: Glass and glazing materials and methods are specified in Section 08 80 00.

2.10 CLEARANCES

A. Provide doors and frames with clearances in accordance with SDI A250.8 or NAAMM HMMA 861.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    b. Install frames with removable stops located on secure side of opening.
    c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with ponstinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces. Solidly fill space between frames and concrete/masonry with mineral-fiber insulation.
5. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches on center and not more than 2 inches on center from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or

damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 08 12 13 “Hollow Metal Frames”.
2. Section 08 71 00 “Door Hardware”.
3. Section 08 80 00 “Glazing” for glass view panels in flush wood doors.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI) ASTM
International (ASTM)
Window and Door Manufacturers Association (WDMA)
National Fire Protection Association (NFPA) Woodwork
Institute (WI)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Submit catalog cuts or other data indicating thickness, details of stile, rail and core construction of doors, louvers, type of adhesive, face veneer species and grade, and specifications for factory finishing.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples: Submit samples of wood veneers indicated or specified to receive a factory applied transparent finish, showing color range and grain of veneers. Submit factory finishes applied to actual door face materials, approximately 8” by 10”. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finish work.

1. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificate: WI Certified Compliance Program certificates.

1.5 QUALITY ASSURANCE

A. Certification: Before delivery to the project site, issue a WI Certified Compliance Certificate indicating that the wood doors furnished fully meet requirements of the grade specified.

1. After completion issue a WI Certified Compliance Certificate for Installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer’s written instructions.

B. Delivery: Seal all four edges of doors before shipment. Package factory finished doors individually in plastic bags or cardboard cartons. Deliver doors to the site after plaster and concrete are dry and the building has reached the average prevailing relative humidity of the locality.

C. Mark each door on top rail with opening number used on Shop Drawings. Include manufacturer’s order number and date of manufacture.

D. Storage and Handling: Store doors in an area where there will be no great variation in temperature or humidity. Stack doors flat on 2" by 4" lumber laid 12-inches from ends and across the center. To protect surfaces, provide plywood or cardboard under the bottom door and over the top of the stack. Do not drag doors across one another.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

B. Furnish to the Owner a written warranty against defects in workmanship and materials including delamination in any degree, warp or twist of 1/4-inch or more in any 3'-6" by 7'-0" section of a door, telegraphing of any part of core assembly through face veneer to cause surface variation of 1/100-inch or more in a 3-inch span, defects which impair and affect performance of the door. Replacement under this warranty shall include hanging, installation of hardware and finishing. The warranty shall be signed by the door manufacturer and the Contractor.

C. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Acceptable manufacturers or equal:

Algoma Hardwoods, Inc.; www.algomahardwoods.com
Eggers Industries; www.eggersindustries.com
Oregon Door; www.oregondoor.com
Oshkosh Architectural Door Company; www.oshkoshdoor.com Marshfield DoorSystems; www.marshfielddoors.com
VT Industries, Inc.; www.vtindustries.com
Substitutions: Section 01 25 13 – Product Options and Substitutions.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2 as required to meet WDMA Performance Duty level specified without added blocking.

D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: Select White Maple; selected for uniform color and grain.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Exposed Vertical Edges: Manufacturer's standard, and as required by WDMA I.S. 1A-2013 for construction grade specified.
7. Core: Particleboard or Structural composite lumber.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
9. Adhesives: Type as required to meet performance criteria of WDMA T.M.-6 duty level.

B. Door Thickness: 1-3/4 inches thick unless otherwise indicated.

2.1 LITE FRAMES AND LOUVERS

A. Metal Frames for Lite Openings: Provide glazed openings with not lighter than 0.0359-inch (20-gage) hot or cold rolled steel glazing stops. Stops shall be nonremovable on exterior or corridor side of door, custom color as selected by the Architect. Glass and glazing materials and methods are specified in Section 08 80 00. Acceptable products, or equal:

Anemostat Door Products; www.anemostat.com; LoPro-G

B. Glass and Glazing: Specified in Section 08 80 00.

C. Louvers: Provide fixed louvers consisting of louver blades formed of not lighter than 22 gage cold rolled steel, with welded 18 gage steel frames, custom color as selected by the Architect. Acceptable product, or equal:

Anemostat Door Products; www.anemostat.com; AFDL Inverted Y Non-Vision Louver

1. Aesthetics: Tight mitered corners, no visible welds, countersunk mounting holes and corridor side of frame free of fasteners make for a clean, streamlined appearance.

2.2 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Lite Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00.

3. Louvers: Factory install louvers in prepared openings.

2.3 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises, or as required by the manufacturer's warranty.

B. Factory finish doors.

C. Use only coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Transparent Finish:

1. Grade: Custom.
2. Finish: WI's "North American Architectural Woodwork Standards", System 11, catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware".

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Provide inspection of installed Work through WI's Certified Compliance Program, certifying that wood doors, including installation, comply with requirements of WI's "North American Architectural Woodwork Standards" for the specified grade.
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door.

B. To prevent stile failure, ensure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.

C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:
1. Door Hardware, including electric hardware.
2. Storefront and Entrance door hardware.
3. Power supplies for electric hardware.
4. Thresholds, gasketing and weather-stripping.
5. 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.
2. Division 8: Section - Wood Doors.
3. Division 8: Section - Aluminum Storefront
4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.3 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

A. 2023 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. DHI – Door and Hardware Institute

D. NFPA - National Fire Protection Association.
1. NFPA 80 - Fire Doors and Other Opening Protectives
2. NFPA 105 - Smoke and Draft Control Door Assemblies

E. UL - Underwriters Laboratories.
1. UL 10C - Fire Tests of Door Assemblies
2. UL 305 - Panic Hardware

F. WHI - Warnock Hersey Incorporated

G. SDI - Steel Door Institute

1.4 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 six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
1. Include a Cover Sheet with;
   a. Job Name, location, telephone number.
   b. Architects name, location and telephone number.
   c. 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. Manufacturers' names and abbreviations for all materials.
   c. Explanation of abbreviations, symbols, and codes used in the schedule.
   d. Mounting locations for hardware.
   e. Clarification statements or questions.
   f. Catalog cuts and manufacturer’s technical data and instructions.
3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)						
			(a) 1 Single Door #1 - Exterior from Corridor 101		(b) 90°	(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 4.5 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. 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.

F. Furnish as-built/as-installed schedule with close-out documents, including manufacturers’ installation and adjustment and maintenance information.

G. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.5 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. To maintain the integrity of patented key systems provide a letter of authorization from the specified manufacturer indicating that supplier has authorization to purchase the key system directly from the manufacturer.
   3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
   1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.6 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers’ original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.7 WARRANTY

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

1. Locksets: Ten (10) years.
2. Closers: Thirty (30) years.
3. Exit devices: Three (3) years.
4. All other hardware: Two (2) years.

1.8 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.

1.9 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

2.1 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	None - Owner Standard
Locks, Latches & Cylinders	Schlage	None - Owner Standard
Exit Devices	Von Duprin	None - Owner Standard
Closers	LCN	None - Owner Standard
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.2 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 42" wide: 4-1/2" inches.
2) Doors 43" to 48" wide: 5 inches.

b. Width: Sufficient to clear frame and trim when door swings 180 degrees.

c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

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 Allegion 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. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
   a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
   b. Offset lever pull – minimum 1,600 foot pounds without gaining access
   c. Vertical lever impact – minimum 100 impacts without gaining access
2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Provide wired electrified options as scheduled in the hardware sets.
    a. 12 through 24 volt DC operating capability, auto-detecting
    b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
    c. 0.230A (230mA) maximum current draw
    d. 0.010A (10mA) holding current
    e. Modular / "plug in" request to exit switch
12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

D. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
11. Furnish glass bead kits for vision lites where required.
12. All Exit Devices to be sex-bolted to the doors.

13. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.

E. 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 shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

F. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

G. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
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.

H. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

I. Thresholds: As Scheduled and per details.
   1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
   2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
   3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
   4. Thresholds shall comply with CBC Section 11B-404.2.5.

J. Seals: Provide silicone gasket at all rated and exterior doors.
   1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
   2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
   3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on “S” labeled Positive Pressure door assemblies.

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

L. Silencers: 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.

2.3 KEYING

A. Furnish all cylinders in the Schlage supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
   1. Provide Primus Level 3, EF keyway, 0-bitted permanent cylinders for keying by District

B. Furnish construction keying for doors requiring locking during construction. For FSIC systems provide 23-030-ICX Full Size Construction Cores
   1. For FSIC systems provide ten 48-101-ICX Construction Keys
   2. For FSIC systems provide two 48-056-ICX Control Keys (const.)
   3. For FSIC systems provide two control keys for installing the permanent cores

C. Furnish mechanical keys as follows:
   1. Furnish 2 uncut key blanks per lock/cylinder

D. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

2.4 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.

2.1 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

3.1 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.3 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.

3.4 HARDWARE LOCATIONS

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

3.5 FIELD QUALITY CONTROL

A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.6 SCHEDULE

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

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

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

Manufacturers Abbreviations (Mfr.)

IVE	=	Ives	Hinges, Kick Plates, Door Stops & Silencers
LCN	=	LCN	Door Closers

SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

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GROUP NO. 01

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	VANDL OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Non-load-bearing steel framing systems for interior partitions, interior ceilings, and interior soffits.
2. Suspension and furring systems for interior ceilings and soffits.
3. Suspension and furring systems for exterior soffits.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; and ceiling joists.
2. Section 09 51 13 “Acoustical Panel Ceilings” for suspension systems for acoustical ceilings.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International
American Iron and Steel Institute (AISI) ASCE
CBC Section 2506.2.1 - Other Materials. Steel Stud
Manufacturers Association (SSMA) Steel Framing
Industry Association (SFIA) Technical Services
Information Bureau (TSIB)
Western Wall and Ceiling Contractors Association (WWCCA)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Submit framing manufacturer's literature, showing tabulation of structural properties, load capacities, dimensions, metal gages and type of coating for all framing and furring members.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For deflection/drift tracks, firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 REGULATORY REQUIREMENTS

A. Support framing for walls and ceilings shall conform to the 2022 California Building Code (CBC) Title 24 Part 2, Chapter 25 - Gypsum Board and Plaster. Support framing for fire resistive walls, partitions and ceilings shall also conform to CBC Title 24 Part 2 Chapter 7 - Fire-Resistance-Rated Construction, and which are listed in the current UL "Fire Resistance Directory".

B. Furnish and install wall framing and powder driven fasteners in accordance with the framing and fastener manufacturer's current ICC Evaluation Reports.

1.6 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association, Certified Steel Stud Association, or the Steel Framing Industry Association.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site and store them in adequately ventilated dry locations. If it is necessary to store materials outside, stack them off the ground on a platform and fully protect them from the weather.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 MANUFACTURERS

A. Acceptable manufacturers or equal:

Angeles Metal Systems Allied
American Studco, Inc.
CEMCO (California Expanded Metal Products Co.)

ClarkDietrich Building Systems
SCAFCO Steel Stud Company. Steel Construction Systems.
Steel Network, Inc. (The)
Unimast, Inc.
Western Metal Lath Co.

B. Acceptable Products: Products shall be fabricated in accordance with the SFIA (ICC-ES ESR 2457), and SSMA (ICC ESR-3064P).

2.3 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Hot-dip Zinc Coated Steel: ASTM A653, designation G60.

C. Carbon Steel: ASTM A568. Provide framing components with electro-galvanized finish, conforming to ASTM A633, Type RS or shop-applied red-oxide, zinc chromate or other similar primer.

D. Powder Driven Fasteners: Types and sizes indicated on the structural drawings. Acceptable manufacturers or equal:

Hilti Corp.; ICC Report ESR-2269

E. Screws: No. 8 by 3/8 inch cadmium or zinc coated TEKS screws with pan heads.

F. Concrete inserts, expansion anchors, powder driven fasteners, flange clips, and bolts for attachment of hanger wires to overhead construction shall have a rated capacity equal to that of the hanger wire.

G. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper.

2.4 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

C. Steel Studs and Tracks: Fabricate framing members in accordance with ASTM C645 from hot dip zinc coated steel.

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide the following:

1. Slotted Top Tracks: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from vertical deflection of structure above and lateral building drift between floors; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    1. 16 ga. thick, to ASTM A653/A653M, Grade 50 with a minimum yield point of 50,000 psi.
    2. Length: 10'-0".
    3. 2-1/2 inch down-standing legs with 1/4 inch wide by 1-1/2 inch high slots spaced at 1 inch on center.

2. Products: Subject to compliance with requirements, provide one of the following:
    a. CEMCO; California Expanded Metal Products Co.; EST Exterior Slotted Track.
    b. ClarkDietrich Building Systems; MaxTrack2D™ Slotted Deflection and drift Track.
    c. Steel Network, Inc. (The): DriftTrack® DTSL.

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. CEMCO; California Expanded Metal Products Co.; FAS Track.
    b. ClarkDietrich Building Systems; BlazeFrame DSLO, MaxTrak, or SLP-TRK Slotted Deflection Track.
    c. Sliptrack Systems; SLP-TRK Slotted Deflection Track.
    d. Steel Network, Inc. (The): VertiTrack VT.

F. Flat Strap and Backing Plates: Galvanized steel, not lighter than 0.0635-inch (16-gage), of proper size to accommodate fastenings.

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Steel Thickness: 0.0296 inch.
2. Depth: 7/8 inch.

2.5 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58, or AC308 as appropriate for the substrate.

a. Uses: Securing hangers to structure.
b. Type: Torque-controlled, expansion anchor, torque-controlled, adhesive anchor, or adhesive anchor.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 or Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.

E. Furring Channels (Furring Members):

1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base-Steel Thickness: 0.0296 inch.

F. Provide galvanized channels for exterior locations.

2.6 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes**,** with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 1-5/8 inches.
3. Section Properties: As indicated.

2.7 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 1-5/8 inches, unless otherwise indicated.
3. Section Properties: As indicated.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to

terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install slotted tracks in strict accordance with manufacturer's instructions and referenced regulation requirements, to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

    a. Secure studs to slotted top track with #8 wafer-head screws. Maintain minimum deflection gap of 0.5 inch between top of stud and top of slotted track. Limit vertical movement to 1 inch, plus or minus 1/2 inch.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated. Set runners in two beads of acoustical sealant or two strips of acoustical tape as specified in Section 07 92 00.

6. Reinforce and stiffen partitions with 3/4-inch (or larger as necessary) steel channels placed horizontally not more than 4'-6" apart. Wire-tie or bolt stiffeners to inside surfaces of studs.

E. Direct Furring:

1. Screw to wood framing.

2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.

2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers and compression posts used for support, as indicated.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 CEILING AND SOFFIT JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches, unless otherwise indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

1. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 CLEAN-UP AND PROTECTION

A. Perform clean-up of the premises as specified in Section 01 77 00.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum sheathing.
3. Accessories.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 07 21 00 “Thermal Insulation” for acoustical insulation.
2. Section 07 84 13 “Penetration Firestopping” for penetration identification signage on gypsum board partitions.
3. Section 07 84 43 “Joint Firestopping” for joint identification signage on gypsum board partitions.
4. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
5. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
6. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.
7. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing" for glass-mat, water-resistant gypsum substrate boards.
8. Section 09 91 00 "Painting" for coordination of gypsum board finish levels with specified paint systems.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM) Gypsum
Association (GA)
Technical Services Information Bureau (TSIB); formerly Western Lath/ Plaster/ Drywall/ Industries Association (WLPDIA)
Western Wall and Ceiling Contractors Association (WWCCA)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Certificates: Submit manufacturer's certification that products meet or exceed requirements of the referenced specifications.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

A. Gypsum Board Construction: Meet the requirements of the 2022 California Building Code (CBC) Title 24 Part 2, Chapter 25 - Gypsum Board and Plaster.

B. Regulatory Requirements: The quantity of volatile organic compounds (VOC) used in adhesives and sealants shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District, and South Coast Air Quality Management District.

C. Mockups: Build mockups of at least 16 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

   a. Each level of gypsum board finish indicated for use in exposed locations on walls and ceilings.
   b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver gypsum board and accessories in the manufacturer's original unopened containers, bundles or rolls bearing the manufacturer's name and brand designation.

B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

C. Store flammable adhesives away from fire, sparks and smoking areas.

D. Handle gypsum board to prevent damage to edges, ends, and surfaces.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not apply gypsum board until insulation, pipes, conduits, ducts, vents, supports and other items that will be concealed by the gypsum board have been inspected, tested and approved by the governing authorities and unsatisfactory conditions have been corrected.

C. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

D. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistive Construction: Meet the requirements of CBC Title 24 Part 2 Chapter 7 - Fire and Smoke Protection Features and Chapter 8 - Interior Finishes.

1. Fire-Resistance-Rated Assemblies: Provide fire-resistance rated assemblies identical to those in Chapter 7 of the CBC Title 24 Part 2 or in listing of other testing agencies acceptable to the State Fire Marshal.

2. Fire Performance Characteristics: Provide finish materials meeting requirements of Chapter 8 Section 803 of the CBC Title 24 Part 2 and that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal, indicating the following fire performance characteristics tested in accordance with ASTM E84.

a. Flame Spread: Not more than 25.
b. Smoke Developed: Not more than 50.

B. Fire Resistive Gypsum Board: Bear the Underwriter's Laboratories Inc. (UL) label or label of another organization acceptable to the State Fire Marshal.

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

D. Regulatory Requirements: Per CBC Sec. 703.7, provide marking and identification for fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions, or any other wall required to have protected openings or penetrations. Marking and identification shall be effectively and permanently identified with signs or stenciling.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide in maximum 4 foot widths and maximum lengths available that will minimize joints in each area and that correspond with support system indicated.

2.3 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
Georgia-Pacific Gypsum LLC: www.gp.com
Continental Building Products, LLC.; www.continental-bp.com CertainTeed Corporation; www.certainteed.com
National Gypsum Company; Gold Bond Building Products Division; www.nationalgypsum.com
USG Corporation; www.usg.com
PABCO Gypsum; www.pabcogypsum.com

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396**:** 5/8 in. thick unless otherwise shown or specified, with tapered edges and either rounded or beveled returns for prefilling. Where fire resistive ratings are shown use thickness required to comply with assembly fire testing of gypsum board partitions for fire rating required.

1. Acceptable products:

a. USG Corporation Sheetrock Brand EcoSmart Firecode X panels; or equal.

1) As compared to the net use of fresh water value of 1.329 m^3/1000 ft^2 in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a 25% or greater reduction in net use of fresh water value or a net use of fresh water value less than or equal to 1.0 m^3/1000 ft^2 for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.

2) As compared to the global warming potential value of 317.4 kg CO_2-eq./1000 ft^2 in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a 21% or greater reduction in global warming potential or a global warming potential value of less than or equal to 232 kg CO_2-eq./1000 ft^2 for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.

3) As compared to the primary energy from non-renewable resources value of 5,291 MJ/1000ft^2 in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a primary energy from non-renewable resources value less than or equal to 3,986 MJ/1000 ft^2 for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.

b. G-P Gypsum Corp.; or equal.
c. National Gypsum Company; or equal.
d. CertainTeed Corporation; or equal.

B. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396, 5/8 in. thick “Type X” unless otherwise shown or specified, with tapered edges and either rounded or beveled returns for

prefilling. Where fire resistive ratings are shown use thickness required to comply with assembly fire testing of gypsum board partitions for fire rating required.

1. Acceptable products:

    a. United States Gypsum Co.; Sheetrock Brand EcoSmart Mold Tough Firecode X Panels, or equal.

        1) Wallboard uses a manufacturing process with a net use of fresh water value less than or equal to 1.35 m^3/1000 ft^2 for wallboard manufactured west of the Mississippi River as listed per Product Category Rules for North American Gypsum Boards.
        2) Wallboard uses a manufacturing process with a global warming potential value of less than or equal to 268 kg CO_2-eq./1000 ft^2 for wallboard manufactured west of the Mississippi River as listed per Product Category Rules for North American Gypsum Boards.

    b. CertainTeed Gypsum; M2Tech® gypsum board, or equal.
    c. G-P Gypsum Corp.; Mold-Guard Gypsum Board, or equal.
    d. National Gypsum Company; Gold Bond Brand XP Fire-Shield Gypsum Board, or equal.

C. Impact-Resistant Gypsum Board: ASTM C1396 gypsum board, tested according to ASTM C1629.

1. Core: 5/8 inch, Type X.
2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 to Level 3 requirements.
3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 to Level 3 requirements.
5. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 to Level 3 requirements according to test in Annex A1.
6. Long Edges: Tapered.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
4. Acceptable products or equal:
   CertainTeed Corporation; AirRenew Extreme Impact
   G-P Gypsum Corp.; DensArmor Plus
   National Gypsum Company; Gold Bond Hi-Impact Wallboard
   United States Gypsum Co.; Sheetrock Brand VHI

2.1 EXTERIOR GYPSUM SHEATHING

A. Glass-Mat Gypsum Sheathing Board: ASTM C1177, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Core: Mold-resistant, 1/2 inch.
2. Acceptable products or equal:
   G-P Gypsum Corp.; Dens-Glass Gold.
   National Gypsum Company; Gold Bond, e(2)XP.
   USG Corporation.; Securerock Glass Mat Sheathing.
   CertainTeed Corporation; GlasRoc Sheathing.

2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Paper-faced galvanized-steel sheet.

2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.
g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized-steel sheet.

2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.

4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound; drying-type, all-purpose compound; or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Exterior Applications:

1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Acceptable products or equal:
   a. OSI® F38 Drywall and Panel Adhesive; www.ositough.com
   b. Liquid Nails DWP Drywall Construction Adhesive; www.liquidnails.com
   c. Franklin International; Titebond Professional Drywall Adhesive; www.titebond.com

C. Screws: Conform to the standards specified below for attaching gypsum board to the various substrates listed.

1. Steel Drill Screws for Metal Framing, 20-Gage and Heavier: ASTM C954.

2. Steel Drill Screws for Metal Framing and Furring, 25-Gage: ASTM C1002, Type S.

3. Wood Framing: ASTM C1002, Type W.

4. Gypsum Backing Board: ASTM C1002, Type G.

D. Nails for Attaching Gypsum Board to Wood Framing: ASTM C514.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

F. Resilient Channels: As specified in Section 09 22 16.

G. Acoustical Sealant: As specified in Section 07 92 00.

H. Thermal Insulation: As specified in Section 07 21 00 “Thermal Insulation”.

I. Sound Attenuation Blankets: As specified in Section 07 21 00 “Thermal Insulation”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine framing to ensure that corners and framing are plumb, true and solid and that framing members are properly spaced. Edges and ends of board shall have solid bearing.

C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. General: Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Use fire retardant, moisture- and mold-resistant gypsum board on walls within toilet rooms, and elsewhere as indicated.

2. Use fire retardant backing board or fire retardant gypsum board for base layer for 2 layer applications.

3. Use proprietary, special fire-resistive gypsum board where indicated or required to achieve specific fire-resistance-rated assembly.

4. Use impact-resistant gypsum board where indicated.

5. Use fire retardant gypsum board in all locations not otherwise indicated or specified.

B. Fastening: Locate fasteners not less than 3/8-inch or more than 1/2-inch from edges and ends of gypsum board. Drive fasteners perpendicular to the gypsum board surface with heads set slightly below the gypsum board surface for finish layers and even with the surface for base layers. Attach gypsum board starting from the center of each panel and proceeding toward the outer edges. Fasten gypsum board in place with screws over metal framing and with nails or screws over wood framing.

C. STC-Rated Assemblies: Where sound rated partitions are indicated, seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Acoustical sealant specified in Section 07 92 00. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

D. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

E. Nonrated Single Layer Construction:

1. Apply gypsum board with the long dimension at right angles to ceiling framing and at right angles or parallel to wall framing members. Use maximum-length panels to minimize end joints.

2. Apply ceiling panels before wall/partition board application to the greatest extent possible.

3. Attach gypsum board with screws spaced 12-inches on center for ceilings and walls. Use 1-inch long screws for metal framing and furring.

F. Nonrated Double Layer Construction: Provide one of the following methods at the Contractor's option.

1. Mechanically Fastened Face Layer: Apply base layer with the long dimension at right angles to the framing members. Attach the base layer with screws spaced 24-inches on center. Use 1-inch long screws for metal framing. Apply face layer with long dimension at right angles to the base layer. Attach the face layer with screws 24-inches on center. Use 1-5/8 inch long screws.

2. Adhesive Applied Face Layer: Apply base layer with the long dimension at right angles to the framing members. Attach the base layer with screws of sizes and spacings as specified for single layer construction. Apply the face layer with long dimension perpendicular to the base layer. Laminate the face layer to the base layer with all-purpose joint compound applied to the back of the panel with a notched spreader. Hold the face layer in position until adequate bond is achieved using temporary fasteners or bracing. Remove temporary fasteners or bracing and fill all holes with joint compound as specified herein.

G. Rated Fire Resistive Partitions: Install and fasten gypsum board in accordance with CBC

H. Edge Sealing: Cut edges, utility holes, and joints of water resistant gypsum board shall be treated with the gypsum board manufacturer's recommended waterproof sealant before installation.

I. Tolerances: Gypsum board surfaces shall have a maximum variation of 1/8-inch in 10-feet when a straight edge is laid on the surface in any direction and no measurable variation in any 2-foot direction.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

K. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on the drawings. If no control joints are indicated, provide joints according to ACTM C 840 to ensure that unbroken wall surfaces are limited to 30-feet in length and unbroken ceiling surfaces are limited to 2500 square feet or 50-feet in either direction.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use where indicated at vertical and horizontal outside corners and angles.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where panels terminate against adjacent materials.
4. U-Bead: Use at exposed panel edges where indicated.
5. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Attach corner and edge trim and control joints with screws spaced not more than 9-inches on center. Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Tape and finish joints, corners, fastener heads, and other imperfections in accordance with the manufacturer's specifications and recommendations to provide a smooth finish.

E. Reinforce joints, wall and ceiling angles, and inside vertical corners with tape embedded in joint compound. Finish joints with not less than 2 applications of joint compound, allowing each application to dry thoroughly and sanding between coats as required.

F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840.

1. Level 1: Provide for ceiling plenum areas and concealed areas, and surfaces receiving fabric-covered tackboard paneling, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies. Where Level 1 gypsum board finish is indicated or specified, apply embedding coat of joint compound. Remove excess joint compound.

2. Level 2: Provide for gypsum board substrates for FRP paneling and other panel application. Where Level 2 gypsum board finish is indicated or specified, apply embedding coat of joint compound for first coat and an additional coat of joint compound over all joints angles, fastener heads and accessories. Remove excess joint compound.

3. Level 3: Not used.

4. Level 4: Provide for gypsum board surfaces that will be exposed to view unless otherwise indicated. Where Level 4 gypsum board finish is indicated or specified, embed tape in finishing compound plus 2 separate coats applied over joints, inside angles, fastener heads, and accessories using ready-mixed, drying type, all-purpose taping compound. Feather out third coat approximately 6-inches from center of joint. After drying, sand or otherwise treat each coat and after last coat of the compound to provide a smooth even surface.

5. Level 5: Provide for gypsum board surfaces indicated to receive non-textured finish and semi-gloss enamels. Where Level 5 gypsum board finish is indicated or specified, embed tape in finishing compound plus 2 separate coats applied over joints, inside angles, fastener heads, and accessories using ready-mixed, drying type, all-purpose taping compound, plus a thin skim coat of joint compound over the entire gypsum board surface. After drying, lightly sand or otherwise treat the surface of the compound to provide a smooth even surface free of porosity or other surface variations.

G. Treat external corners, edges, and ends with metal beads and edge trim. Finish with 3 coats of joint compound and feather out between 8-inches and 10-inches from the nose.

H. The final application of compound and sanding shall leave all gypsum board surfaces uniformly smooth and in condition to receive specified finish.

3.7 REPAIR, CLEAN-UP AND PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

D. Repair fastener pops by driving a new fastener approximately 1-1/2 inches from the fastener pop and reset the popped fastener. When face paper is punctured, drive a new fastener approximately 1-1/2 inches from the defective fastener. Fill damaged surfaces with compound.

E. Upon completion of the work, remove from adjacent surfaces, overspray, splatter and daubs of taping and finish compound and textured finishes. Remove tools, equipment, unused material and cuttings and leave the work in a clean orderly manner.

END OF SECTION

SECTION 09 30 00

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain floor tile.
2. Porcelain glazed wall tile,
3. Tile backing panels.
4. Waterproofing membrane.
5. Setting materials and grout materials.
6. Related accessories.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI) ASTM
International (ASTM)
Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, indicating compliance with applicable standards.

1. Mortar and grout manufacturer's technical data sheets indicating suitability for the installation specified and compliance with applicable standards.
2. Sealant joint manufacturer's product and technical data.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples: Where colors and patterns are not specified, submit one set of samples of each type of tile specified showing the manufacturer's full range of standard colors and patterns for final selection. Where colors and patterns are specified, submit 2 samples of each color type and shape of tile and trim.

1. Marble Thresholds in 6-inch lengths.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each type of tile issued by tile manufacturer and signed by the installer, only available after the material has shipped from the manufacturer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size installed.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Requirements for Physically Disabled: Provide ceramic tile flooring meeting the slip resistant requirements of 2 0 1 6 2 California Building Code (CBC) Title 24 Part 2; and 2010 ADA Standards for Accessible Design.

B. Floor tile shall have a coefficient of friction equal to, or greater than, 0.6 in accordance with ASTM C1028.

C. Installer Qualifications: Employ a firm having a minimum of 5 years successful experience in the installation of ceramic tile and who has specialized in the installation of ceramic tile similar to that required for this Project.

1. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical floor tile installation, minimum 50 square feet.
2. Build mockup of typical wall tile installation, minimum 50 square feet.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

B. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during and after installation.

C. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

D. Maintain minimum and maximum temperature limits as recommended by manufacturers.

E. Protect adjacent surfaces during progress of the work in this section.

F. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Acceptable manufacturers or equal:

Crossville Inc.; www.crossvilleinc.com
Dal-Tile International; www.daltile.com
Substitutions: Section 01 25 13 – Product Options and Substitutions.

B. Source Limitations for Tile: Obtain tile of each type from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with “Standard/First Grade” requirements per ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

A. Ceramic Tile: "Standard" grade units meeting the requirements of ANSI A137.1. Deliver tile in sealed cartons, identified with a Master Grade Certificate, on standard form of the Tile Council of North America, certifying grades, type and qualities of tile furnished.

B. Floor Tile: Unglazed porcelain tile shall be standard/first grade quality as manufactured by Crossville Inc., Crossville, Tennessee, and shall conform to the requirements of ANSI A137.1 - 2012.

1. Size: Porcelain and ceramic tile shall be manufactured to specific size after firing and shall be nominal 12” x 12”. All measurements are in inches unless otherwise specified.
2. Basis-of-Design Product: Porcelain tile shall be Cross-Colors® Solids Porcelain Stone®; and Cross-Colors® Mingles Porcelain Stone®.
3. Thickness: Porcelain tile shall be manufactured to specific thickness after firing and shall be nominal 5/16”.
4. Colors: As selected by Architect.

5. Surface Texture: Cross-Slate® (CS): The Cross-Slate finish combines the rustic and textured feel of slate with the through-body color and durability of Porcelain Stone®. Through-body color, unglazed structured surface, and a variety of sizes provide a strong commercial value where enhanced traction is needed for high traffic interior and exterior spaces. Cross-Slate is recommended for interior floors and walls as well as exterior walls and exterior walking surfaces in both residential and commercial environments.
6. Product Test Data:
    a. Water Absorption (ASTM C373): <0.10%.
    b. Breaking Strength (ASTM C648): 350-420 lbs.
    c. Bond Strength (ASTM C482): >200 psi.
    d. DCOF Dynamic Coefficient of Friction (ANSI 137.1-2013): 0.50 - 0.60 wet.
7. According to availability, provide matching trim shapes such as bullnose, corners, borders and cove base when specified.
8. Environmental Properties: ANSI 138.1 Green Squared Certified.
9. Trim Units: Provide all trim necessary to produce coved bases where shown, and rounded internal and external corners. Provide trim matching floor tile in color and texture.

C. Wall Tile: Glazed porcelain tile shall be standard/first grade quality as manufactured by Crossville Inc., Crossville, Tennessee, and shall conform to the requirements of ANSI A137.1 - 2012.

1. Size: Porcelain and ceramic tile shall be manufactured to specific size after firing and shall be nominal 6” x 6”. All measurements are in inches unless otherwise specified.
2. Basis-of-Design Product: Porcelain tile shall be Cross-Colors® Solids Porcelain Stone®; and Cross-Colors® Mingles Porcelain Stone®.
3. Thickness: Porcelain tile shall be manufactured to specific thickness after firing and shall be nominal 5/16”.
4. Colors: As selected by Architect.
5. Surface Texture: Unpolished ® (UPS).
6. Product Test Data:
    a. Water Absorption (ASTM C373): <0.10%.
    b. Breaking Strength (ASTM C648): 350-420 lbs.
    c. Bond Strength (ASTM C482): >200 psi.
    d. DCOF Dynamic Coefficient of Friction (ANSI 137.1-2013): 0.50 - 0.60 wet.
7. According to availability, provide matching trim shapes such as bullnose, corners, borders and cove base when specified.
8. Trim Units: Provide all trim necessary to produce bullnosed wainscot caps, and rounded internal and external corners. Provide trim matching wall tile in color and texture.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining. Beveled faces; profile as shown on drawings.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: Comply with ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints. Concrete glass fiber reinforced, 7/16-inch to 1/2-inch thick prefabricated panel, consisting of aggregate and portland cement reinforced with vinyl-coated woven glass-fiber mesh embedded in both surfaces. Acceptable products or equal:

Custom Building Products; Wonderboard® Backerboard
Georgia-Pacific Gypsum LLC; DensShield® Tile Backer
Modulars, Inc.; Wonder-Board
USG Corporation; DUROCK Cement Board

1. Glass Fiber Tape: Coated glass fiber tape 2-inches wide as recommended by glass mesh mortar units.

2.6 WATERPROOFING MEMBRANE

A. Waterproofing Membrane: Fluid-applied membrane, liquid-latex rubber or elastomeric polymer. Complying with ANSI A118.10: Where indicated on the Drawings, and elsewhere as required for waterproofing tile assembly as specified in ANSI A108.13.

Custom Building Products RedGard® Waterproofing and Crack Prevention Membrane – Liquid Applied Membrane.

2.7 SETTING MATERIALS

A. Installation Material Manufacturers:

1. Custom® Building Products; www.custombuildingproducts.com
2. MAPEI Corporation; www.mapei.com
3. Laticrete International: www.laticrete.com
4. Quikrete; www.quikrete.com

B. Premixed Mortar Setting Bed: Where indicated on the Drawings, as required for mortar bed as the substrate for tile work; work to conform to ANSI A108.1.

1. Thick Bed Bedding Mortar, by Custom Building Products. Pre-blended underlayment specifically designed to float a mortar bed for ceramic tile. It is easy to mix and use, eliminating the need for site mixing of sand and cement. Thick Bed Bedding Mortar's 3:1 mix ratio provides a high-strength surface ideal for tiling commercial installations.
   a. Complies with ANSI A108.1, ASTM C109, and ASTM C627.

C. Latex Portland Cement Mortar (Thinset): ANSI A118.4 / A118.15. Provide acrylic type latex for exterior applications.

Custom Building Products
MAPEI, Keralastic System, consisting of Kerabond, dry-set mortar and keralastic latex admixture.

D. Cementitious Tile Adhesives: ANSI A118.4 / A118.11: Polymer-Enhanced Mortars: Where indicated on the Drawings, and elsewhere as required for setting tile as specified by ANSI A108.5 or A108.12, Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar, over substrates prepared accordingly.

1. For use at Walls: Custom Building Products MegaLite® Crack Prevention Mortar or ProLite Fortified Mortar. With Shear Bond Strengths greater than 650 psi, per ANSI A118.4 and A118.15 Section 5.2.4. For wall assemblies where maximum strength is desired.

2. For use at Floors: For Crack Prevention due to Movement in Substrate: Custom Building Products MegaLite® Crack Prevention Mortar. With Shear Bond Strengths greater than 650 psi, per ANSI A118.4 and A118.15 Section 5.2.4. To minimize crack propagation from the substrate through the tile assembly, from cracks up to 1/8” wide.

E. Water: Fresh, clean and potable, and free from such amounts of mineral and organic substances as would adversely affect the hardening of cement mortar.

F. Reinforcing Wire Fabric: ASTM A185 or ASTM A497, 2 by 2 inch fabric, 16/16 wire, 3 by 3 inch fabric, 13/13 wire or 1.5 by 2 inch fabric, 16/13 wire.

2.8 GROUT MATERIALS

A. Grout: Chemical Resistant, Acrylic and Silicone Resin Based, Single Component Grouting Material, Formulated for Stain Resistance, Meeting Performance Characteristics of ANSI A118.3 and A118.7, for grout joints from 1/16” inch to 1/2” inch in width:

Custom Building Products, FusionPro™ Single Component Grout, High Performance Grout. No mixing is required and is stain resistant. Available in 24 Colors.

B. Elastomeric Joint Caulk: Provide where indicated on the Drawings, and elsewhere as required at joints between floors and walls and at joints between tile and dissimilar materials.

Custom Building Products Commercial 100% Silicone Caulk. Conforms to ASTM C 920 for movement joints in heavy traffic areas and ASTM C 794.

2.9 MISCELLANEOUS MATERIALS

A. Tile and Grout Cleaner: Acceptable products, or equal:

Aqua Mix, Inc.; Heavy Duty Tile & Grout Cleaner
Custom Building Products; Concentrated Tile & Grout Cleaner

B. Tile and Grout Sealer: Acceptable products, or equal:

Aqua Mix, Inc.; Sealers Choice Gold Penetrating Sealer Custom Building Products; SurfaceGard Grout and Tile Sealer

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

1. Remove protrusions, bumps and ridges by grinding or chipping.

2. Repair, fill, and level cracks, holes, depressions and rough or chipped areas in substrate using patching material recommended by setting materials manufacturer.

3. Slab to have light broom finish when tile is installed by thin-set method.

4. Before tiling, verify that all surfaces to be tiled are structurally sound true to plane, and fall within maximum variations shown below: Ensure that the substrate is within the following tolerances:
   a. Horizontal surfaces (floors): Maximum variation in substrate shall not exceed 1/4" in ten feet from required plane, depending on substrate.
   b. Vertical surfaces (walls): Maximum variation in substrate shall not exceed 1/4" in ten feet from the required plane, depending on substrate.
   c. Report all unacceptable surfaces to the Architect in writing, and do not tile such surfaces until they are leveled enough to meet above requirements.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE BACKING PANEL INSTALLATION

A. General: Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

B. Install horizontally, with end joints over framing members. Secure to each framing member with screws spaced not more than 8-inches on center and not closer than 3/8-inch from the edge. Install screw heads flush with the surface of the board.

C. Joint Treatment: Fill all horizontal and vertical joints and corners with dry-set portland cement, or latex-portland cement mortar. Apply glass fiber tape over joints and corners and embed with same mortar.

3.4 INSTALLATION OF WATERPROOF MEMBRANE

A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproof membrane to cure and verify by testing that is watertight before installing tile or setting materials over it.

3.5 INSTALLATION OF CERAMIC TILE

A. Manufacturers' Instructions: Perform work in compliance with standard accepted installation guidelines, Crossville Porcelain Stone/USA instructions and setting materials manufacturers' instructions.

B. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.

2. For thin set adhesive mortar application use following technique:
   a. With the flat side of trowel, key mortar into substrate.
   b. Using the appropriate size trowel, comb mortar in one direction with notched side of the trowel.
   c. Set tile with a sliding motion, perpendicular to the mortar ridges.
   d. Obtain as near 100% coverage as possible of mortar to tile.
   e. Mortar coverage shall be no less than 85% and shall be sufficiently distributed to give full support under all corners and edges of the tile.
   f. Note: 95-100% coverage is mandatory for wet and exterior areas. Periodically, remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.

C. Apply setting material in accordance with manufacturer's directions and install tile before mortar has started initial cure. For thin set mortar application, use a notch trowel that will achieve the recommended coverage of mortar after tiles have been installed. Reference standard coverage information and follow manufacturer's recommendations for trowel size when using mortar.

D. Do not spread more material than can be covered within 10 to 15 minutes. If "skinning" occurs, remove mortar and spread fresh material. Spread mortar with notches running in one direction that shall be perpendicular to the pressing, pushing and pulling of tile during placement.

E. Place tile in fresh mortar, press, push and pull the tile slightly to achieve as near 100% coverage and contact of tile with setting material and substrate as possible. The coverage shall be no less than 85% and be sufficiently distributed to give full support of the tile. Make sure that all corners and edges are well supported with mortar. Leave no hollow corners or edges. NOTE: 95-100% coverage is mandatory for wet or exterior areas. A skim coat (“back-butter”) of mortar can be placed onto the entire back of the tile using a trowel in order to assist in optimum adhesion and coverage of the mortar being used.

F. Ensure there is a minimum 1/8" of mortar between tile and substrate after proper bedding. Installer must periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications. If coverage is found to be insufficient, use a larger size notch trowel.

G. Use a beating block and hammer or rubber mallet so that faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.

H. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

I. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

J. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

K. Where accent tile differs in thickness from field tile, vary setting-bed thicknesses so that tiles are flush.

L. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

M. Provide tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints smooth and even, without voids, cracks, or excess mortar or grout. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: 3/16 to 1/4 inch.

N. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

O. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. Do not extend waterproofing membrane under thresholds set in dry-set portland cement or latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing membrane with elastomeric sealant.

P. Cut and drill without marring the tile. Rub cuts smooth with a fine abrasive stone. Set no cut edge against fixtures, cabinets, or other tile without a joint at least 1/16-inch wide. Whenever possible, turn cut edges away from the adjoining wall. Fit tile around electric outlets, plumbing pipes, fixtures and fittings close enough to permit standard plates and collars to overlap the tile.

Q. Keep tile dry while in packages. Take precautions to prevent staining of tiles before they are set. Do not install stained tile.

R. Grouting:

1. Apply grout in accordance with ANSI A108.10, A108.6, A108.8, A108.9-2010 correlating to grout type chosen and manufacturer's recommendations.

2. Mix grout material in strict accordance with manufacturer's directions.

3. Force a maximum of grout into all joints. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps.

4. Grout joints full and integral with setting bed. Before grout sets, strike or tool the joints of cushion edge tile to depth of cushion, filling gaps; and with square-edged tile, fill joints flush with their surface.

5. Before grouting entire area do a test area to ensure there will be no permanent staining or discoloration of the tile and to verify that the grout is easily removed from the surface. If necessary, pre-coat exposed surfaces of tile with a grout release as recommended by the manufacturer, as this will facilitate removal of the grout.

6. Cure all setting and grouting materials in accordance with manufacturer's recommendations.

3.6 EXPANSION JOINTS

A. Expansion and Control Joints: Provide expansion and control joints in tile work where indicated. Where joint locations are not indicated, provide joints spacing in accordance with TCNA Handbook Detail EJ171. Submit plan showing location of joints for approval. Construct joints in accordance with TCNA Handbook Detail EJ171 and as follows:

1. Before grouting, keep joints open and clean by stuffing with paper or other material to prevent filling with dirt, grout, or mortar.

2. After tile is grouted and completely dry, remove paper or other temporary filler material; brush joints clean and fill with back-up material, or bond breaker tape, and sealant as specified in Section 07 92 00.

3.7 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. Tile and Grout Sealer: Apply sealer to grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer from tile faces by wiping with soft cloth.

3.8 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation at 1st Floor Restrooms: TCNA Method F112 and ANSI A108.1B; cement mortar bed (thickset) bonded to concrete.
   a. Ceramic Tile Type: As specified in paragraph 2.3.B.
   b. Mortar Bed: As specified in paragraph 2.7.B.
   c. Bond Coat for Cured-Bed Method: Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar, as specified in paragraph 2.7.D.2
   d. Grout: As specified in paragraph 2.8.A.

2. Ceramic Tile Installation at 2nd Floor Restrooms: TCNA Method F115A; thinset mortar, epoxy grout.
   a. Ceramic Tile Type: As specified in paragraph 2.3.B.
   b. Thinset Mortar, as specified in paragraph 2.7.D.2.
   c. Grout: As specified in paragraph 2.8.A.

B. Interior Wall Installations, Metal Studs:

1. Ceramic Tile Installation: TCNA Method W244C and ANSI A108.5; thinset mortar on cementitious backer units.
   a. Ceramic Tile Type: As specified in paragraph 2.3.C.
   b. Thinset Mortar: Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar as specified in paragraph 2.7.D.1.
   c. Grout: As specified in paragraph 2.8.A.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL PANEL

CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)
Acoustical Insulation Manufacturer's Association (AIMA) Ceilings &
Interior Systems Construction Association (CISCA)
General Services Administration Federal Specifications (Fed. Spec.)

1.3 ACTION SUBMITTALS

A. Product Data:

1. Submit manufacturer's catalog cuts, specifications, and other data for each component of the acoustical ceiling systems as necessary to demonstrate compliance with these specifications.

B. Samples: Submit the following samples for review:

1. 12-inch long samples of main tees, cross tees and perimeter molding.

2. 6" by 6" samples of each type of acoustical units to be used in the work.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.5 CLOSOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size units equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed and concealed component equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical units, suspension-system components, and accessories to Project site in original, unopened packages bearing the manufacturer's name, brand designation, and label verifying compliance with these specifications. Store materials in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent continuously from 24 hours before installation until 24 hours after completion of work.

1.9 SCHEDULING

A. Wet operations such as plastering, concrete and masonry work shall be completed and dry before installation of acoustical ceilings. Mechanical, electrical and other work above the ceiling line shall be completed and approved before start of acoustical ceiling installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace acoustical panel ceilings that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance Requirements: Furnish and install suspension systems in accordance with the suspension system manufacturer's current ICC Evaluation Services

Report and 2022 California Building Code (CBC), Title 24 Part 2; CBC Title 24 Part 2, Chapter 25.

B. Surface Burning Characteristics: Provide finish materials meeting requirements of Chapter 8 Section 803 of the 2022 CBC Title 24 Part 2 and that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal, indicating the following fire performance characteristics tested in accordance with ASTM E84.

a. Flame Spread Index: Not more than 25.
b. Smoke Developed Index: Not more than 50.

2.2 ACOUSTICAL PANELS

A. General:

1. Low-Emitting Materials: Acoustical ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2. Acoustical Materials: ASTM E1264, with features as specified below. Furnish each type specified from one manufacturer, with the color and texture identical throughout.
   a. Acoustical materials shall contain a minimum of 30 percent of recycled materials.

B. Basis-of-Design Product for ACP-1: Subject to compliance with requirements, provide stone wool panels, “Rockfon Sonar®” by Rockfon®, or comparable product by one of the following:

Armstrong World Industries, Inc.
CertainTeed Corporation.
United States Gypsum Company.
Substitutions: Section 01 25 13 – Product Options and Substitutions.

1. Stone wool panels, “Rockfon Sonar®” by Rockfon® with the following characteristics:
2. ASTM E1264 Classification: Type XX – Stone wool base with membrane-faced overlay, Pattern G.
3. Finish: Factory painted glass scrim surface.
4. Edges: Square.
5. Size: 24” x 24” and 24” x 48”
6. Thickness: 1”.
7. NRC: 0.95.
8. CAC: 22.
9. AC: 190.
10. Fire Class: Class A.
11. Fire Performance:
    a. UL 723 (ASTM E84) Flame Spread Index: 0.
    b. UL 723 (ASTM E84) Smoke Developed Index: 5.
12. Light Reflectance: 0.88.
13. Recycled Content: Up to 40%.
14. R Value (BTU Units): 2.6 to 3.5.

2.3 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:

1. Chicago Metallic, Heavy Duty Non-Fire Rated Double Web Suspension System manufactured by Rockfon; 200 main runners; 1200 series cross runners.
2. Armstrong; Prelude XL HD 7301 main runners and cross runners.
3. USG Interiors, LLC; USG DONN® Brand DXW™ 1-1/2" Acoustical Suspension System.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and ASTM E580 Section 5.1, and designated by type, structural classification, and finish indicated.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.
6. Main Runners and Cross Tees: Double web type of cold rolled steel with protective coating and with painted steel caps. Width of exposed faces shall be 15/16-inch.
7. Intersections and Connections: Provide intersections and connections capable of withstanding a mean ultimate test load of not less than 180 pounds in compression and tension, per ASTM E580 Section 5.1.2.
8. Finish: Finish all exposed metal parts with a baked-on vinyl finish, matte white color.

2.4 ACCESSORIES

A. Hanger Wires: Class 1 zinc coated (galvanized) carbon steel conforming to ASTM A641. Wire shall be #12 gage (0.106" diameter) with soft temper and minimum tensile strength = 70 ksi. The maximum allowable (ASD) tension load for wire meeting this specification is 350 pounds.

B. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

C. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

D. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

E. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

F. Main Beam Splice Clip: Manufacturer's standard splice clip to reinforce main beam carrier where it is cut to make transition at top and bottom of sloped ceilings.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

PART 3 - EXECUTION

1.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

1.3 INSTALLATION OF CEILING SYSTEMS

A. Comply with ASTM C636, Section 5.2 of ASTM E580, and manufacturer’s written instructions.

B. Place units as indicated on the drawings. Install with joints true and straight and junctures with ceilings, walls and openings neat and tight. Completed work shall present a smooth plane and level surface, free from uneveness, edge or corner offsets, cupping, scratches and other imperfections.

C. Perform all cutting required for fixtures, pipes and other work passing through acoustical tile and panels. Neatly and tightly fit units to such work and adjoining work. Fit border units neatly and tightly against abutting surfaces. Replace loose and damaged tiles and panels when directed. Touch-up all damaged finishes. Leave all surfaces clean and free from marking and other disfigurement.

D. #12 gage hanger wires may be used for up to and including a 4 foot by 4 foot grid spacing and shall be attached to main runners. Splices in hanger wires shall develop 50 percent of the wire allowable load.

E. Hanger Wires: Space hanger wires as specified for each type of suspension system. Provide each hanger wire in one piece without splices.

1. Anchor each wire to the structure above by one of the means on the drawings. Bend hanger wires directly across the bulb of the main runner and tight against the connection device at supporting construction, then wrap the wire around itself in 3 tight wraps within 3 inches.

2. Provide #12-gage hanger wires at the ends of all main and cross runners within 8 inches from the support or within 1/4 of the length of the end tee, whichever is least, for the perimeter of the ceiling area. Perimeter wires are not required when the length of the end tee is 8 inches or less.

3. Provide trapeze or other supplementary support members at obstructions to maintain hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb shall have counter-sloping wires.

4. Ceiling grid members shall be attached to 2 adjacent walls per ASTM E580, Section 5.2.3. Ceiling grid members shall be at least 3/4-inch clear of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free, with a minimum of 3/4-inch clear at wall.

5. The width of the perimeter supporting closure angle shall be not less than two inches. Use of perimeter angles with smaller widths in conjunction with proprietary perimeter clips may be acceptable

6. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral spreading. A metal strut or a #16-gage wire with a positive mechanical connection to the runner may be used and placed within 8 inches of the wall. Where the perpendicular distance from the wall to the first parallel runner is 8 inches or less, the stabilizer or #16 gage wire is not required.

F. Install wall molding at the perimeter of the defined areas. Attach wall moldings to the wall at not more than 16-inches on center. On two adjacent walls attach each runner to the wall molding with a pop rivet. At opposite walls, provide metal struts or 16-gage wire with mechanical connection to the runner to prevent runners from spreading. Miter all corners of wall molding.

G. Level the ceiling to within 1/8-inch in 10-feet in any direction.

1.4 LATERAL FORCE BRACING ASSEMBLY INSTALLATION

A. Lateral force bracing assemblies consisting of a compression strut and four #12 gage splayed bracing wires oriented 90 degrees from each other are required for all ceiling areas.

1. Exception: Lateral force bracing may be omitted for suspended acoustical ceiling systems with a ceiling area not to exceed 144 square feet, for all values of SDS,

when perimeter support is provided and perimeter walls are designed to carry the ceiling lateral forces.

B. Lateral force bracing assemblies shall be spaced per the drawings for all values of the component importance factor (Ip) of the ceiling.

C. There shall be a brace assembly a distance of not more than one half of the above spacing from each surrounding wall, expansion joint and at the edges of any ceiling vertical offset. For example, where the brace spacing is 8' x 12', the edge distance shall be 4 feet in the direction of the 8 foot spacing and 6 feet in the direction of the 12 foot spacing.

D. The slope of bracing wires shall not exceed 45 degrees from the horizontal plane and wires shall be taut. Splices in bracing wires shall develop the wire allowable load.

E. Compression struts shall meet the following requirements:

1. The strut shall be sized to adequately resist the vertical component force induced by the ceiling bracing wires and have a maximum kl/r not to exceed 300.

2. The strut shall not be more than one (horizontal) in six (vertical) out of plumb.

1.5 ATTACHMENT OF HANGER AND BRACING WIRES

A. Fasten hanger wires with not less than 3 tight turns in 3 inches. Hanger wire loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops (see ASTM E580, Section 5.2.7.2).

B. Fasten bracing wires with not less than 4 tight turns in 1-1/2 inches.

C. Hanger and bracing wire anchorage to the structure shall be installed in such a manner that the direction of the anchorage aligns closely with the direction of the wire. (e.g. bracing wire ceiling clips must be bent as shown in the details and rotated as required to align closely with the direction of the wire, screw eyes in wood must be installed so they align closely with the direction of the wire, etc.).

D. Separate all ceiling hanger and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc.

E. Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to: piping, ductwork, conduit and equipment. Provide trapeze or other supplementary support members at obstructions to allow typical hanger spacing. Brace assemblies must be configured and/or located in order to avoid obstructions in addition to maintaining the required brace assembly spacing.

F. Provide additional hangers, struts and brace assemblies as required at all ceiling breaks, soffits, or discontinuous areas.

G. Hanger wires that are more than one (horizontal) in six (vertical) out of plumb shall have counter-sloping wires. Note: See ASTM C636, Figure 1, for counter-sloping methods.

H. Attachment of the bracing wires to the structure above and to the main runners shall be adequate for the load imposed. The weight (W_p) shall be taken as not less than 4 psf for calculating seismic forces (F_p).

I. Post-installed anchors (e.g. expansion anchors, screw anchors and power actuated fasteners) shall have a current Evaluation Report acceptable to DSA in accordance with IR A-5.

J. Power-actuated fasteners in concrete are not permitted for bracing wires.

1.6 EXPANSION JOINTS, SEISMIC SEPARATION JOINTS

A. Expansion joints shall be provided in the ceiling at intersections of corridors and at junctions of corridors and lobbies or other similar areas.

B. For ceiling areas exceeding 2,500 square feet, a seismic separation joint shall be provided to divide the ceiling into areas not exceeding 2,500 square feet in accordance with ASTM E580, Section 5.2.9.

1.7 CEILING FIXTURES, TERMINALS, AND DEVICES

A. All fixtures, terminals, and other devices shall be mounted in a manner that will not compromise ceiling performance in accordance with Section 13.5.6.2.2 Item 5 of ASCE 7 as amended by CBC Section 1616A.1.20 (1616.10.16*) and ASTM E580 Sections 5.3 and 5.4.

B. Ceiling panels shall not support any light fixtures, air terminals or devices.

C. Penetrations through the ceiling for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a 2-inch oversized ring, sleeve or adapter through the ceiling tile to allow free movement of 1-inch in all horizontal directions. Alternatively, per ASTM E580, Section 5.2.8.5, a flexible sprinkler hose fitting that can accommodate 1-inch of ceiling movement shall be permitted to be used in lieu of the oversized ring, sleeve, or adapter.

D. Slack safety wires shall be considered hanger wires for installation and testing requirements.

1.8 LIGHT FIXTURES

A. All light fixtures shall be positively attached to the ceiling suspension systems by mechanical means per CEC Article 410.36 to resist a horizontal force equal to the weight of the fixture. A minimum of two screws or approved fasteners are required at each light fixture, per ASTM E580, Section 5.3.1.

B. Surface-mounted light fixtures shall be attached to the main runner with at least two positive clamping devices on each fixture. The clamping device shall completely surround the supporting ceiling runner and be made of steel with a minimum thickness of #14 gage. Rotational spring catches do not comply. A #12 gage slack safety wire shall be connected from each clamping device to the structure above. Provide additional supports when light fixtures are 8 feet or longer or exceed 56 lb. Maximum spacing between supports shall not exceed 8 feet.

C. Light fixtures weighing less than or equal to 10 lb. shall have a minimum of one #12 gage slack safety wire connected from the fixture housing to the structure above.

D. Light fixtures weighing greater than 10 lb. but less than or equal to 56 lbs. may be supported directly on the ceiling runners, but they shall have a minimum of two #12 gage slack safety wires connected from the fixture housing at diagonal corners to the structure above.

1. Exception: All light fixtures greater than two by four feet weighing less than 56 lbs. shall have a #12 gage slack safety wire at each corner.

E. All Light fixtures weighing greater than 56 lb. shall be independently supported by not less than four taut #12 gage hanger wires (one at each corner) attached from the fixture housing to the structure above or other approved hangers. The four taut #12 gage wires or other approved hangers, including their attachment to the structure above, shall be capable of supporting 4 times the weight of the fixture.

1.9 SERVICES WITHIN THE CEILING

A. All flexible sprinkler hose fitting mounting brackets, ceiling-mounted air terminals or other services shall be positively attached to the ceiling suspension systems by mechanical means to resist a horizontal force equal to the weight of the component. Screws or approved fasteners are required. A minimum of two attachments are required at each component.

B. Ceiling-mounted air terminals or other services weighing less than or equal to 20 lb. shall have one #12 gage slack safety wire attached from the terminal or service to the structure above.

C. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 20 lb. but less than or equal to 56 lb. shall have two #12 gage slack safety wires (at diagonal corners) connected from the terminal or service to the structure above.

D. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 56 lb. shall be supported directly from the structure above by not less than four taut #12 gage hanger wires attached from the terminal or service to the structure above or other approved hangers. The four taut #12 gage wires or other approved hangers, including their attachment to the structure above, must be capable of supporting four times the weight of the unit.

1.10 OTHER DEVICES WITHIN THE CEILING

A. All lightweight miscellaneous devices, such as strobe lights, occupancy sensors, speakers, exit signs, etc., shall be attached to the ceiling grid per the drawings. In addition, devices weighing more than 10 lbs. shall have a #12 gage slack safety wire anchored to the structure above per the drawings. Devices weighing more than 20 lbs. shall be supported from the structure above using details provided by the registered design professional (RDP).

1.11 PENDANT MOUNTED LIGHT FIXTURES

A. Where pendant mounted light fixtures are to be installed in areas with a suspended ceiling, the construction documents shall include complete support details complying with the drawings.

B. Support pendant-mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting 2 times the weight of the fixture.

C. If a pendant mounted light fixture is directly and independently braced below the ceiling (i.e., aircraft cables to walls), then a brace assembly is not required above the ceiling.

D. If a pendant mounted light fixture is free to swing 45 degrees from vertical in all directions, and is not directly and independently braced below the ceiling, then a bracing assembly is only required where the pendant hanger penetrates the ceiling. Special details are required to attach the pendant hanger to the bracing assembly to transmit the horizontal and vertical forces. Exception: Where the weight of the fixture is less than 20 pounds, the vertical component of the brace force need not be considered so no compression strut/post is required.

E. Rigid conduit shall not be used for attachment of the fixtures.

1.12 INSTALLATION OF ACOUSTICAL UNITS

A. Install acoustical units with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3. Install hold-down clips and seismic clips in areas indicated, in areas required by authorities having jurisdiction; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

    a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.

4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire- resistance-rated assembly.

1.13 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

C. Remove all debris resulting from the work of this section.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Furnishing of materials and equipment and completion of painting and painter's finish on exposed exterior and interior surfaces as required to complete the painting and finishing as indicated and specified.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates.
2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
3. Section 05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.2 DEFINITIONS

A. Blocking: Two painted surfaces sticking together such as a painted door sticking to a painted jamb.

B. PDCA: Painting & Decorating Contractors of America www.pdca.org.

C. SSPC: Scopes of SSPC Surface Preparation Standards and Specifications. www.sspc.org.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples: Prepare samples of colors and textures based upon the Architect's selections and submit them for review.

1. Painted Wall Samples: Prepare on 8" by 10" matt board in a stair step manner so all required coats show.

2. Painted Wood Samples: Prepare on clear Douglas fir or pine 1" by 4" by 12" long strips, arranged in a stair step manner so all required coats show.

3. Stain Finish Samples: Prepare on a 1" by 4" by 12" long sample of the surface type scheduled for staining.

4. Clear Wood Finish Samples: Prepare on a 1" by 4" by 12" long sample of the surface type scheduled for clear finish.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Quantity: Furnish Owner with an additional 3 percent, but not less than one gallon of each material and color applied.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 16 sq. ft.
   b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. The intent and requirements of this section, is that materials, items and surfaces which are normally painted and finished in construction of this type and quality, shall be so included, whether or not said materials, items or surfaces are specifically called out and included in the schedules and notes on the drawings, or is, or is not, specifically mentioned in these specifications.

C. The following general categories of construction and items are included under other sections, and shall not be a part of this section:

1. Shop prime painting of structural and miscellaneous iron or steel.
2. Shop prime painting of hollow metal.
3. Shop finished construction and items.

D. Paint exposed mechanical, plumbing and electrical construction, which is not factory finished.

E. The Room Finish Schedules indicated, show the location of interior room surfaces to be painted or finished. The schedule indications are general and do not necessarily define the detail requirements. Include detailed refinements and further instructions as may be given for the required complete finishing of spaces and rooms.

F. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in paint products shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver paint in manufacturer's labeled and sealed containers. Labels shall include manufacturer's name, brand, type, batch number, color of paint and instructions for reducing. Thin only in accordance with printed directions of manufacturer. Thinning shall comply with the regulations of the air pollution control district having jurisdiction.

2. Do not deliver or use materials other than those specified, or approved.

B. Storage and Handling: Store paint materials and equipment, when not in actual use, in places specifically assigned for that purpose. Ventilate storage space and provide fire protection. Mix and handle paint in these assigned areas; use metal containers for mixing and handling and designed for safety. Remove paint materials, including rags, tarpaulins, mixers, and empty containers and filled or partially filled containers from the building areas at the close of each working day.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Examine the drawings and the specifications of other trades and consult with the other trades to determine the full extent of surfaces and items that are specified to include shop priming and shop finish painting.

1.7 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

B. Warrant painting and finishing against peeling, fading, cracking, blistering, or crazing for a period of 2 years from the date of "Substantial Completion". The written warranty shall include materials and labor. The warranty shall be signed by the paint manufacturer, the painter and the Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products listed from one of the following manufacturers for the paint category indicated.

1. Benjamin Moore.
2. Dunn-Edwards Corp.
3. PPG Paints.
4. ~~Kelly-Moore Paint Co~~.
5. Sherwin-Williams Co.

B. Primer and sealer coats may be thinned no more than 10 percent, with paint manufacturer's thinner. Use other materials as they come from the can, except as otherwise approved.

C. Secure the Color Schedule before undercoating. Unless otherwise specified, tint undercoats slightly to approximate the color of the finish coat. Obtain approval of colors before proceeding with the finishing operations.

D. Where a specific name is not given for a product or ingredient, provide item of the best quality of the approved manufacturer, which is normally used for the intended purpose.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, is prohibited.

2.3 COLOR SELECTION

A. The Architect will select the finish colors and determine the basic hues of all surfaces to be painted or finished.

B. Colors: Custom colors as selected by the Architect.

C. After the actual painting and finishing has started, the Architect retains the right to make minor modifications in tone and shade on the various surfaces to suit the actual lighting conditions encountered. Submit additional samples, as required, to assist the Architect in his final selection.

D. The number of colors to be used in any given room or space, and on the entire project, will be determined by the Architect.

2.4 MATERIALS

A. Substitutions: Materials will be considered for substitution subject to requirements specified in Section 01 25 13. Submit chemical formulations of materials proposed for substitution to demonstrate that formulation of substitution is similar to formulation of specified product; or results of test showing that performance of substitution is equivalent to performance of specified product.

B. Acceptable Products: Unless otherwise specified in the Paint Schedule, acceptable products include the following or equal:

1. Acrylic Enamel Undercoat - Interior:
   Benjamin-Moore; 253 Moorcraft Superspec Latex Enamel Undercoat
   Dunn-Edwards Corp.; IKPR00 Interkote
   PPG PAINTS;1000 Prep & Prime Enamel Undercoater (92.6 g/L VOC)
   ~~Kelly-Moore Paint Co.; 973 Acry-Plex ZERO VOC Interior Wall Primer Undercoat~~

2. Vinyl Acrylic Sealer:
   Benjamin-Moore; 534 Ultra Spec 500 Interior Latex Primer
   Dunn-Edwards Corp.; VNPR00 Vinylastic
   PPG Paints; 1000 Hi Hide Interior Primer Sealer (92.6 g/L VOC)
   ~~Kelly-Moore Paint Co.; 971 Acry-Plex Zero VOC Interior PVA Primer/Sealer~~
   Sherwin-Williams Co.; Premium Wall & Wood Primer B28

3. Acrylic Gloss Enamel:
   Benjamin-Moore; Ultra Spec EXT 449 Gloss Finish
   Dunn-Edwards Corp.; EVSH60 Evershield Gloss
   PPG Paints; 3028N Ultra-Hide 250 Int/Ext Gloss Enamel (34 g/L VOC)
   ~~Kelly-Moore Paint Co.; Devcryl 1449 Waterborne Gloss~~
   Sherwin-Williams Co.; A-100 Acrylic Gloss A8 Series

4. Acrylic Finish Coat - Flat - Exterior:
   Benjamin-Moore; 447 Ultra Spec EXT Flat Finish
   Dunn-Edwards Corp.; EVSH10 Evershield Flat / SSHL10 Spartashield Flat
   PPG PAINTS; 2200XI Fortis 350 Exterior Flat (49.25 g/L VOC)
   ~~Kelly-Moore Paint Co.; 1200 Premium Professional Exterior 100% Acrylic Flat~~
   Sherwin-Williams Co.; A-100 Exterior Latex A6

5. Acrylic Enamel-Non Blocking - Low Sheen - Interior:
   Benjamin-Moore; Advance Satin Waterborne Alkyd 792
   Dunn-Edwards Corp.; SPMA40 Suprema Low Sheen
   PPG Paints; 1402N Ultra Hide-250Non-Blocking Eggshell (50 g/L VOC)
   ~~Kelly Moore Paint Co.; 1610 Acry-Plex 100% Acrylic Eggshell Enamel~~
   Sherwin-Williams Co.; Pro Industrial Waterbased Alkyd Urethane Enamel B53

6. Acrylic Latex Enamel - Semi-Gloss - Interior:

   Benjamin-Moore; 539 Ultra Spec 500 Semi-Gloss
   Dunn-Edwards Corp.; SPMA50 Suprema Semi-Gloss / SZRO50 SpartaZero
   PPG PAINTS; 6-4510XI Speedhide Zero Semi-Gloss Enamel (Zero VOC)
   ~~Kelly-Moore Paint Co.; 1050 Premium Professional Semi-Gloss Enamel~~
   Sherwin-Williams Co.; Pro Industrial Waterbased Alkyd Urethane Enamel B53

7. Acrylic Enamel-Non Blocking - Semi-Gloss - Interior:

   Benjamin-Moore; EcoSpec W/B Semi Gloss 376
   Dunn-Edwards Corp.; EVSH50 Evershield Semi-Gloss
   PPG PAINTS; 3028N Ultra-Hide 250 Int/Ext Gloss Enamel (34 g/L VOC)
   ~~Kelly-Moore Paint Co.; 1650 Acry-Plex 100% Acrylic Interior Semi-Gloss Enamel~~

Sherwin-Williams Co.; Solo Semi Gloss A76W0051

8. Wood Stain - Interior:
Benjamin-Moore/Lenmar; Waterborne Wiping Stain 1WB.1300
Dunn-Edwards Corp.; Old Masters Water-based Wood Stain
PPG PAINTS Deft DFT300 Waterborne Stain (>250 g/L VOC)
~~Kelly-Moore Paint Co.; Woodcraft 2700 100 VOC Series Stain-Gem-Glo Wiping~~ Stain Sherwin-Williams Co.; Wood Classics Interior Stain A48-200 Series

9. Sanding Sealer - Light Wood - Interior:

Benjamin-Moore/Lenmar; Self Sealing
Dunn-Edwards Corp.; VALPRO, Sanding Sealer (NAS2750)
PPG Paints; Gemini Pre-Cat 275 VOC Series Clear Lacquer (265 g/L VOC)
~~Kelly Moore Paint Co.; 4623 Clear Lacquer Sanding Sealer – Gemini Pre-Cat 275~~ VOC Series Sanding Sealer
Sherwin-Williams Co.; Low VOC Acrylic Lacquer Sanding Sealer Wood Classics

10. Semi-Gloss Lacquer - Interior Light Wood:

Benjamin-Moore/Lenmar; Megavar Waterborne Acrylic Lacquer 1WB.500 Series
Dunn-Edwards Corp.; VALPRO, NAF2756 (60 Sheen) Semi-Gloss
PPG Paints; Gemini Pre-Cat 275 VOC Series Clear Lacquer (265 g/L VOC)
~~Kelly Moore Paint Co.; 4824 275 VOC Semi-Gloss Precatalyzed Lacquer- Gemini~~ Pre-Cat 275 VOC Series Semi-Gloss Lacquer
Sherwin-Williams Co.; Low VOC Water White Lacquer Semigloss Wood Classics

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Portland Cement Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured, including pH testing to determine that alkalinity is within limits established by the manufacturer.

D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Gypsum Board Substrates: Verify that finishing compound is sanded smooth

F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions, including pH testing to determine that alkalinity is within limits established by the manufacturer.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer**,** but not less than the following:

1. SSPC-SP 1, "Solvent Cleaning."
2. SSPC-SP 2, "Hand Tool Cleaning."
3. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates:

1. Clean all galvanized metal with an appropriate Metal Prep and Passivator Remover.
2. To ensure passivators removal, perform the following test:
   a. With a 2% to 5% copper sulfate solution, place a swab or droplets on the prepared area. If the copper sulfate causes the galvanized to blacken, passivator has been removed and is ready for paint applications.
   b. If the copper sulfate has no effect on the galvanized, continue with metal prep solution OR use a Scotch Pad to abrade it being careful not to remove the galvanization itself.
3. Then apply required primer, allow drying as described in the product data sheets and test adhesion prior to applying finish coat(s).

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied at no additional cost to the Owner, to completely hide base material, provide uniform color, and to produce satisfactory finish results.
3. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
4. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
5. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
6. Paint exposed and semi-exposed surfaces of stops and mouldings at hollow metal frames with glazed lites before installation of glazing; paint exposed screw heads at stops and mouldings after installation.
7. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
8. Priming may not be required on items delivered with prime or shop coats, unless otherwise specified. Touch up prime coats applied by others as required ensuring an even primed surface before applying finish coat.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
    a. Equipment, including panelboards and switch gear.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    h. Tanks that do not have factory-applied final finishes.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PAINTING SCHEDULE

A. Exterior Surfaces:

1. Galvanized Metals - Gloss: (Galvanized surfaces exposed to sight and/or weather, unless indicated to be unpainted).

   1 coat Galvanized Metal Primer
   2 coats Acrylic Gloss Enamel

2. Iron and Steel - Gloss: (All other iron and steel surfaces exposed to sight and/or weather).
   2 coats Ferrous Metal Primer*
   1 coat Intermediate Metal Undercoat - Exterior
   1 coat Acrylic Gloss Enamel

   *Omit first coat on shop-primed surfaces.

3. Aluminum - Gloss: (All surfaces not indicated or specified to receive factory finish).

   1 coat Aluminum Primer
   1 coat Intermediate Metal Undercoat - Exterior
   1 coat Acrylic Gloss Enamel

4. Wood - Painted Semi-Gloss:

   1 coat Wood Primer - Exterior
   2 coats Wood Trim Enamel - Semi-Gloss

5. Concrete - Painted Flat:
   1 coat Concrete and Plaster Primer - Exterior
   1 coat Acrylic Finish Coat - Flat - Exterior

6. Integrally Colored Cement Plaster:
   1 coat Concrete and Plaster Primer - Exterior
   1 coat Acrylic Finish Coat - Flat – Exterior

B. Interior Surfaces:

1. Steel Door Frames - Non-Blocking Semi-Gloss: 1 coat Ferrous Metal Primer*
   1 coat Acrylic Enamel Undercoat - Interior
   1 coat Acrylic Enamel-Non Blocking - Semi-Gloss - Interior
   *Omit 1st coat on shop-primed surfaces.

2. Metals - Acrylic Latex Enamel Semi-Gloss: (All other metals Including exposed piping, conduit, electrical panels, miscellaneous brackets, bolts, fasteners, supports, prime coated hardware, casing beads, metal grilles and exposed ducts etc., other than plated or factory finished items).
   1 coat Ferrous Metal Primer*
   1 coat Acrylic Enamel Undercoat - Interior
   1 coat Acrylic Latex Enamel - Semi-Gloss - Interior
   *Omit 1st coat on shop-primed surfaces.

3. Gypsum Board - Low Sheen: 1 coat Vinyl Acrylic Sealer
   1 coat Acrylic Enamel Undercoat - Interior
   1 coat Acrylic Enamel-Non Blocking - Low Sheen - Interior

4. Gypsum Board - Acrylic Latex

   Enamel Semi-Gloss: 1 coat

   Vinyl Acrylic Sealer
   1 coat Acrylic Enamel Undercoat - Interior
   1 coat Acrylic Latex Enamel - Semi-Gloss - Interior

5. Hardwood Trim - Stained: 1 coat

   Wood Stain - Interior
   1 coat Sanding Sealer - Interior
   2 coats Semi-Gloss Lacquer - Interior

6. Wood - Acrylic Latex Enamel - Semi-Gloss:

   1 coat Acrylic Enamel Undercoat - Interior
   2 coats Acrylic Latex Enamel - Semi-Gloss - Interior

7. Miscellaneous: Construction visible through screen vents and grilles shall have one heavy coat of flat black paint.

END OF SECTION

SECTION 10 21 13

SOLID-COLOR REINFORCED COMPOSITE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Floor-anchored, overhead-braced, solid color reinforced composite substrate toilet compartments.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:
1. Section 09 22 16 - Non-Structural Metal Framing: Coordination with blocking in walls to secure panels, wall posts, and stiles.
2. Section 09 29 00 - Gypsum Board, coordination with blocking.
3. Section 09 30 13 - Ceramic Tiling, coordination with layout and installation.
4. Section 10 28 13 - Toilet Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical data for materials, fabrication, finishes, fastenings, hardware, and installation details.

B. Shop Drawings: Submit shop drawings indicating elevations of partitions, thickness of plastic, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, hardware, fittings, mountings and other related items and installation details.

C. Samples: Submit full range of color and pattern samples. After color and pattern selection has been made, submit samples of each color and pattern for verification.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 years experience installing similar products.

C. Field Measurements: Secure field measurements before preparation of shop drawings and fabrication where possible, for proper and adequate fabrication and installation of the work.

D. Coordination: Furnish inserts and anchorages that must be built into other construction for installation of toilet compartments.

E. Regulatory Requirements: Provide toilet compartments meeting the requirements for the physically disabled of the 2022 California Building Code (CBC) Title 24 Part 2, and 2010 ADA Standards for Accessible Design.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in the manufacturer's original protective packaging except that should packaging become wet, remove it immediately to avoid wet storage stains.

B. Store materials in an enclosed shelter providing protection from damage and exposure to the elements.

1.6 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 recommended limits.

1.7 WARRANTY

A. Submit manufacturer’s extended warranty under the provisions of Section 01 78 36.

B. Submit Manufacturer’s standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.

C. Submit Manufacturer’s standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc.. www.bobrick.com; as represented by R.E. Edwards & Assoc 925-829-2942. Location of manufacturing shall be the United States.

B. Substitutions: Section 01 213 – Product Options and Substitutions.

2.2 SOLID COLOR REINFORCED COMPOSITE (SCRC) SUBSTRATE (SierraSeries)

A. Solid Color Reinforced Composite (SCRC) Partitions: Bobrick SierraSeries.
1. Color(s): As selected by Architect from manufacturer’s standard SierraSeries range.

B. Toilet Partitions:

1. Configuration: Floor-mounted, overhead-braced partitions; with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.
   a. Basis-of-Design: Bobrick 1092.67 SierraSeries Toilet Partitions, vandal resistant.
      1) Design Type: Standard height.
         a. Door/Panel Height: 58 inches.
         b. Floor Clearance: 12 inches.

      2) Hardware: Vandal resistant full-height stainless steel hardware.

C. Materials: Solid color reinforced composite (SCRC) material for stiles, panels, doors, and screens with Bobrick GraffitiOff® coating, thermoset and integrally fused into homogenous piece; high density polyethylene (HDPE), high density polypropylene not acceptable.
1. Composition: Dyes, organic fibrous material, and polycarbonate/phenolic resins.
2. Surface Treatment: Non-ghosting, graffiti resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure.
3. Edges: Same color as the surface.
4. Provide material not less than 3/4-inch thick, with edges eased and free from saw marks.
   a) Color(s): As selected by Architect from manufacturer's standard colors.

D. 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.
6. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.

E. Finished Thickness:
1. Stiles and Doors: 3/4 inch.
2. Panels and Screens: 1/2 inch.

F. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 7 gauge, 3/16 inches thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
2. Stile Shoes: One-piece, 22 gauge, 18-8 S, Type 304 stainless steel, 4 inch height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch or 1 inch stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

G. Wall Posts: Pre-drilled for door hardware, 18-8 S, Type 304, 16 gauge stainless steel with satin finish; 1 inch x 1-1/2 inches x 58 inches high.

H. Anchors: Expansion shields and threaded rods at floor connections as applicable.

I. Hardware: Stainless steel. Chrome-plated "Zamak", aluminum, extruded plastic hardware not acceptable.
1. Compliance: Operating force of less than 5 lb.
2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on in-swing doors.
3. Materials: 18-8 S, Type 304, heavy-gauge stainless steel with satin finish.

4. Doorstops: Prevents in-swinging doors from swinging out beyond stile; on out-swing doors, doorstop prevents door from swinging in beyond stile.
5. Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners secured directly into core not acceptable.
   a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb per insert.
6. Coat Hooks: Combination hook and rubber-tipped bumper, sized to prevent door from hitting mounted accessories, projecting no more than 1-1/8 inch from face of door. Mount hook at 48-inches above finish floor.
7. Hardware Type: Institutional Hardware (.67).
   a. Latch and Keeper for Doors: 14 gauge sliding door latch, 11 gauge keeper; latch slides on a shock-resistant nylon track. Sliding latch shall require less than 5 pounds of force to operate. Twisting latch to operate will not be acceptable. Latch track shall be attached to the door by machine scews into factory-installed threaded brass inserts. Latch track shall be attached to the door by machine scews into factory-installed threaded brass inserts.
   b. Hinges: 16 gauge stainless steel continuous piano hinge, self-closing. Continuous hinge shall be attached to the door and stile by theft-resistant, pin-in-head Torx stainless steel machine screw into factory installed threaded brass inserts. Fasteners secured directly to the core are not acceptable.
   c. Slide-Bolt Latch: Surface mounted stainless steel latch unit mounted 40- inches above finished floor. Slide door latch shall be 14 gauge and shall slide on nylon track. Sliding latch shall require less than 5 pounds of force to operate. Twisting latch to operate will not be acceptable. Latch track shall be attached to door by machine screws into factory installed threaded brass inserts.
   d. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors.
   e. Door Pull: Manufacturer's standard “U” shaped for out-swinging doors and both sides of accessible compartment doors, mounted 40-inches above finished floor. Mount pull directly below the latch in accordance with CBC 11B- 604.8.1.2.
   f. Mounting Brackets: 18 gauge stainless steel and extend full height of panel.
      1) U-Channels: Secure panels to stiles.
      2) Angle Brackets: Secure stiles-to-walls and panels-to-walls.

2.3 FABRICATION

A. Panels and Doors:

1. Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors for standard toilet compartments and 36-inch wide in-swinging doors for compartments equipped for use by physically disabled.
2. Aluminum edging strip to be fastened to the bottom edge of all doors and panels.

B. Pilasters:

1. Anchorage and Leveling Devices: Leveling device shall be 7 gauge, hot rolled steel bar, chromate-treated and zinc-plated, thru-bolted to base to solid color reinforced composite stile. Furnish 4-inch high pilaster shoes held in place by concealed clips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before covering wall framing with finish materials, examine framing to ensure that backing plates have been installed behind wall mounting brackets in such position as to receive all attachment screws.

3.2 PREPARATION

A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
   1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
   2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.3 INSTALLATION

A. General: Install toilet compartments as shown on the shop drawings and in accordance with the manufacturer's specifications and printed installation instructions. Install toilet compartments and doors in a rigid and substantial manner, straight and plumb, with horizontal lines level.

B. Pilasters: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead bracing to each pilaster with not less than two fasteners.

C. Panels: Provide clearances of not more than 1/2 inch between pilasters and panels and 1 inch between panels and walls.

   1. Secure panels and screens to walls with continuous brackets.

   2. At light gage steel framed walls fasten brackets with toggle or molly bolts into metal studs or backing plates fastened directly to the studs.

3.4 ADJUSTING AND CLEANING

A. Hardware Adjustment: After installation, carefully adjust hardware for proper operation. Except for accessible stalls, set hinges on in-swinging doors to hold open approximately 30 degrees from the closed position when unlatched. Set hinges on out swinging doors to return to the fully closed position. Adjust doors so that bottoms of doors are level with the bottoms of the pilasters when the doors are in the closed position. Accessible stall doors shall be self-closing.

B. Cleaning: Clean compartments and doors upon completion of work and leave free from imperfections.

END OF SECTION

SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Warm-air dryers.
3. Childcare accessories.
4. Underlavatory guards.
5. Custodial accessories.

B. Products Installed But Not Furnished or Supplied Under This Section:

1. Designated toilet tissue dispensers, paper towel dispensers, and trash receptacles are Owner-Furnished, Contractor Installed.

C. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

D. Related Sections:

1. Section 26 05 13 - Conductors and Cables: Electrical supply, conduit, wiring, boxes, and wiring devices for hand dryers.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
ASTM International (ASTM)
General Services Administration Federal Specifications (Fed. Spec.)

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.

2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for project.
5. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Regulatory Requirements: Provide toilet accessories meeting the requirements for the physically disabled of the 2022 California Building Code (CBC), and 2010 ADA Standards for Accessible Design.

C. Products: All products (other than warm-air dryers) shall be supplied by a single manufacturer. All toilet room accessories shall be keyed alike using manufacturers standard key to avoid Owner’s maintenance department from having to handle multiple manufacturers keys, for ease of replenishing and maintenance.

D. Baby Changing Stations: Provide products which comply with the following standards and requirements.

1. Antimicrobial Treatment: Changing surfaces embedded with Microban®, with antibacterial claim substantiated by Kirby-Bauer test or other manufacturer approved equivalent standard industry test methodology.
2. Americans with Disabilities Act (ADA).
3. ANSI A117.1 - Accessible and Usable Building and Facilities.
4. ANSI Z535.4 - Product Safety Signs and Labels.
5. ASTM F 2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
6. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
7. European Standards: EN 12221 Changing units for domestic use.

8. CPSIA: Conformity with the U.S. Product Safety Commission product safety rules, bans, standards and regulations that include applicable chemical compliance requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver toilet accessories to the site in unopened containers labeled with the manufacturer's name and model numbers as they occur on the submittals. Store accessories in their containers in a dry location.

1.9 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer’s standard warranty period for Electric Hand Dryers: 5 years from date of Substantial Completion.

D. Baby Changing Stations: Units shall be backed by manufacturer’s 5-year limited warranty on materials and workmanship and include a provision for replacement caused by vandalism.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished, Contractor Installed Products:

1. Toilet tissue dispensers.
2. Paper towel dispensers.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 MATERIALS

A. Stainless Steel: ASTM A666, Type 304, with No. 4 finish (satin), minimum nominal thickness of 0.0312-inch unless otherwise specified.

B. Steel Sheet: ASTM A1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

C. Galvanized Steel Sheet: ASTM A653, with G60 hot-dip galvanized coating.

D. Galvanized-Steel Mounting Devices: ASTM A153, hot-dip galvanized after fabrication.

E. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service), nickel plus chromium electro-deposited on base metal.

F. Mirror Glass: Mirror quality plate or float glass in accordance with ASTM C1036 with silver coating, copper protective coating and nonmetallic paint coating complying with Fed. Spec. DD-M-411B.

G. Fasteners: Stainless steel except fully concealed fasteners may be galvanized steel.

2.3 PUBLIC-USE WASHROOM ACCESSORIES SCHEDULE

A. Manufacturer: Bobrick Washroom Equipment Company.

B. Stainless Steel Grab Bars: With snap flange covers.

1. Satin Finish with Peened Grip:
   a. Basis of Design: Bobrick Model B-6806.99X42. Drawing Designation: EQ-04
      1) Length: 42 inches.
   b. Basis of Design: Bobrick Model B-6806.99X36. Drawing Designation: EQ-05
      1) Length: 36 inches.
2. Compliance: Accessibility guidelines (including ADAAG) for structural strength.
   a. Capacity: Designed to support 900 lbs. in compliant installations.
3. Description: Clearance between grab bar and finished wall is 1-1/2 inches.
4. Grab Bar Materials: 18-8, Type 304, stainless steel tubing with satin finish.
5. Grab Bar Construction: 18 gauge (1.2 mm), ends heliarc welded to flanges.
6. Outside Diameter: 1-1/2 inch (38 mm).
7. Mounting Flanges: Concealed, 18-8, Type 304, 1/8 inch thick, stainless steel plate.
   a. End Flanges: 2 inches x 3-1/8 inches with two holes for attachment to wall.
   b. Intermediate Flanges: 2-5/8 inches x 3-1/8 inches wide x 3-1/8 inch diameter.
8. Snap Flange Covers: 18-8, Type 304, 22 gauge drawn stainless steel with satin finish, 3-1/4 inch diameter x 1/2 inches deep; snap over mounting flange to conceal mounting screws.
9. Mounting Accessories: Provide the following optional mounting accessories as scheduled and indicated on the Drawings and as required for complete installation.
   a. Mounting Kits: Provide optional Bobrick Part No. 252-30 Mounting Kit; Three Type 304 stainless steel, Phillips round-head, sheet-metal screws for each flange.
   b. Anchor Devices: Provide optional Bobrick Part No. 2583 Optional Mounting Kit; for 3/4 inch to 1 inch panels.
   c. Anchor Devices: Provide optional Bobrick Part No. 2586 Optional Mounting Kit; for 1/2 inch panels.

C. Recessed Multi-Roll Toilet Tissue Dispensers: Drawing Designation: EQ-06

1. Basis of Design: Bobrick ClassicSeries Model B-3888.

2. Cabinet: 18-8, Type 304, 22 gauge stainless steel. All-welded construction with satin finish on exposed surfaces.
3. Flange: Drawn, one-piece, seamless, 18-8, Type 304, 22 gauge stainless steel with satin finish.
4. Door: Front of door is drawn, one-piece, seamless, 18-8, Type 304, 22 gauge stainless steel. 18 gauge stainless steel door frame, secured to cabinet with two rivets; with satin finish on exposed surfaces and equipped with a tumbler lock keyed like other washroom accessories.
5. Dispensing Mechanism, Inner Housing and Cam: 18-8, Type 304, 18 gauge stainless steel.
6. Spindles: Heavy-duty, one-piece, molded ABS plastic; theft-resistant, spindles retained in dispensing mechanism when door is locked.
7. Toilet Tissue Dispensing: Unit holds two standard-core toilet tissue rolls up to 5-1/4 inches in diameter (1800 sheets). Roll held in reserve automatically drops into place after bottom roll is depleted, depleted rolls can only be removed after unlocking door.

D. Surface-Mounted Toilet Seat Cover Dispensers: Drawing Designation: EQ-07.

1. Basis of Design: Bobrick ClassicSeries Model B-221.
2. Materials: 18-8 Type 304 stainless steel with satin finish.
3. Construction: All-welded, 22 gauge; with beveled opening.
4. Filling: Concealed opening in bottom for filling.
5. Dispensing: Single- or half-fold paper toilet seat covers.
6. Capacity: 500 paper toilet seat covers.

E. Robe Hooks: Drawing Designation: EQ-08.

1. Basis of Design: Bobrick Classic Model B-6717.
   a. Finish: Satin.
   b. Configuration: Single hook.
2. Projection from Wall: 2 inch.
3. Flange and Support Arm: All-welded, 18-8, Type 304, 22 gauge stainless steel.
4. Mounting: Concealed bracket, 18-8, Type 304, 16 gauge stainless steel; secured to wall plate with a stainless steel setscrew.
5. Wall Plates: Concealed, 18-8, Type 304, 16 gauge stainless steel.
6. Caps: 18-8, Type 304, 10 gauge stainless steel; welded to support arm.

F. Stainless Steel, Welded, Angle Frame Mirrors: Drawing Designation: EQ-09.

1. Basis of Design: Bobrick Model B-290 1836.
   a. Overall Size: 24 inches W x 36 inches H.
2. Angle Frame:
   a. Materials: Type 304 stainless steel angle 3/4 inch x 3/4 inch, with satin finish with vertical grain on exposed surfaces.
   b. Construction: One-piece, roll-formed construction with continuous integral stiffener.
   c. Design: Beveled design on front of angle to hold mirror tightly against frame; prevents exposure to sharp edges.
   d. Corners: Heliarc welded, ground, and polished smooth.
3. Mirror:
   a. No. 1 quality, 1/4 inch (6mm) float/plate glass.
   b. Edges: Protected with plastic filler strips.
   c. Back of Mirror: Protected by full-size, shock-absorbing, water-resistant, non-abrasive 3/16 inch (5mm) thick polyethylene padding.

4. Mounting: Removable, galvanized steel back with integral horizontal hanging brackets located at top and bottom for mounting on Concealed one-piece rectangular wall hanger(s); galvanized steel back fastened to frame with Concealed screws to permit glass replacement; attachment by rivets or tabs is not acceptable; Concealed Phillips head locking setscrews secure mirror to wall hanger in bottom of frame.

G. Surface-Mounted Sanitary Napkin Disposal Units: Drawing Designation EQ-10.

1. Basis of Design: Bobrick ConturaSeries Model B-270.
2. Container: All-welded, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish on exposed surfaces. Front of container shall have same degree of arc, radius on corners and edges as other Bobrick ConturaSeries washroom accessories.
3. Cover: Drawn, one-piece, seamless, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish. construction. Front of cover has same degree of arc, radius on corners and edges as other Bobrick ConturaSeries washroom accessories.
4. Hinge: Full-length stainless steel piano-hinge.

H. Surface-Mounted Vertical Soap Dispensers: Drawing Designation: EQ-13.

1. Basis of Design: Bobrick Classic Model B-2111.
2. Compliance: Valve is operable with one hand, without tight grasping, pinching or twisting of the wrist and with less than 5 pounds of force (22.2 N) to comply with barrier-free accessibility guidelines (including ADAAG).
3. Container:
   a. Materials: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
   b. Construction: Body is drawn, one-piece, seamless construction.
4. Valve: Corrosion-resistant, black molded plastic push button and spout, antibacterial-soap-resistant plastic cylinder; soap head-holding mushroom valve, stainless steel spring, U-packing seal and duckbill.
5. Mounting: Vandal-resistant, concealed wall plate; back plate with mounting bracket.
6. Filling: Locked, hinged stainless steel lid for top filling opens with key provided. To prevent corrosion of tank, use only chloride-free pH-neutral liquid soaps.
7. Refill Indication: Clear acrylic refill-indicator window.
8. Capacity: 40 fl oz.

2.4 WARM AIR DRYERS Drawing Designation: EQ-17.

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products from Excel Dryer Corporation, www.exceldryer.com.

B. High-Speed Warm-Air Dryer:

1. High Efficiency Heated Air Hand Dryer: XLERATOR, EPD Certified, Rapid-drying, energy efficient, rapid drying, automatic sensor, adjustable speed and sound control, adjustable heat control, electric hand dryer; surface mounted or semi-recessed; entire dryer internally grounded. Made in the USA Certified.
2. Basis-of-Design Product: Model XLERATOR XL-W.
3. Description: High-speed, warm-air hand dryer for rapid hand drying.
4. Mounting: Recessed. ADA compliant recess kit is fabricated of 22 GA 18-8 type 304 stainless steel with #4 satin finish with 16 GA 18-8 type 304 stainless steel dryer mounting plate. All welded construction. 16-3/8 inches wide by 26 inches high by 3-3/8 inches deep.
5. Controls: Automatic, activated by infrared optical sensor located next to the air outlet. Dryer will operate as long as hands are under the air outlet and has a 35-second

lockout feature if hands are not removed. Control includes adjustable sound and speed control mechanism, adjustable heat control with High, Medium, Low and Off settings and a filter sensor which is activated should the filter become clogged. Sensor equipped with externally visible Red LED light that flashes error codes to assist in troubleshooting. Control assembly sealed for protection against moisture, lint, dust and vandalism.

6. Cover Material and Finish:
   a. Material: Zinc die cast.
   b. Finish: White, painted.
6. Air Intake: Inlet openings on bottom of cover.
7. Air Outlet: Delivers focused air stream of 19,000 LFM at nozzle and 16,000 LFM at average hand position of 4 inches below air outlet.
   a. Provide Noise Reduction Nozzle: Reduces air deflection noise level by 9 dB and increases the dry time by 2-3 seconds.
8. Pre Filter: Extends the lifespan and improves reliability. Reduces lint, dust and other airborne debris from entering the internal motor chamber. Filter sensor is activated if filter becomes clogged.
9. Nominal Size: 11-3/4 inches wide by 12-11/16 inches high by 6-11/16 inches deep.
10. Weight:
    a. 17 pounds die cast cover.
11. Power Source:
    a. 110 - 120 Volts, 11.3 - 12.2 Amps, 50/60 Hz, 1240 - 1450 Watts.
12. Combination Motor and Blower: Series commutated, through-flow discharge, vacuum type; 5/8 HP, 20,000 RPM. Airflow rate: 19,000 linear feet per minute at air outlet, 16,000 linear feet per minute at average hand position of 4 inches below air outlet.
13. Heater: Nichrome wire element, mounted inside blower housing to be vandal resistant. Heater Safeguard: Automatic resetting thermostat to open when airflow is restricted and close when airflow is resumed.
14. Air Temperature: 135 degrees F measured at average hand position of 4 inches below air outlet. Air Heater Output: 970 watts.
15. All metal parts coated according to Underwriters Laboratories, Inc. requirements.

2.5 CHILDCARE ACCESSORIES

A. Recessed-Mounted, Horizontal Design, Stainless Steel, Changing Stations:

1. Basis of Design: Model KB110-SSRE as manufactured by Koala Kare Products, a Division of Bobrick.
2. Materials: FDA approved blow molded high-density polyethylene (HDPE) clad in 18 gauge Type 304 stainless steel, brushed finish. Includes flange in same material and finish.
3. Operation: Concealed pneumatic cylinder providing controlled, slow opening and closing of the changing station bed.
4. Stainless Steel Liquid Diversion Channel: Prevents liquids that may be present on the changing surface from draining into the wall.
5. Hinge Mechanism: Reinforced full-length steel-on-steel hinge with integrated steel hook plate.
6. Changing Surface: Contoured, concave and smooth, 442 sq. in.
7. Safety Straps: Replaceable, snap-lock, nylon protective holding straps.
8. Performance: Units exceed static load requirements called out by ASTM Standard F 2285, Standard Consumer Safety Performance Specification for Diaper Changing Stations for Commercial Use.
9. Mounting: Factory-drilled mounting holes and mounting hardware included.

10. Features: No hinge structure exposed on interior or exterior surfaces; two bag hooks; built-in liner dispenser with 25 liner capacity.
11. Instruction Graphics: Universal molded instruction graphics and safety messages in multiple languages.

2.6 UNDERLAVATORY GUARDS

A. Underlavatory Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings. Acceptable products or equal:
Brocar Products, Inc.; Trap Wrap
Truebro, Inc.; Lav-Shield

2.7 CUSTODIAL ACCESSORIES

A. Mop and Broom Holders:

1. Basis of Design: Bobrick Model B-223 x 24.
   a. Length: 24 inches with 3 mop/broom holders.
2. Mounting Base: 18-8, Type 304, 22 gauge stainless steel with satin finish.
3. Mop and Broom Holders: Replaceable, spring-loaded rubber cams with anti-slip coating; accommodates handles from 7/8 inch to 1-1/4 inch in diameter; with powder coated steel retainers.

2.8 FABRICATION

A. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

B. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless steel hinge. Provide anchorage that is fully concealed when unit is closed.

C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034-inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

D. Mirror-Unit Hangers: Provide one of the following mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 6 keys to Owner as specified in Section 01 78 23.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before covering wall framing with gypsum board, examine framing to ensure that backing plates and grab bar mounting kits have been installed behind surface mounted accessories in such positions as to receive all attachment screws.

B. Verify that pipes, vents, conduits and other construction features do not protrude into rough wall opening space required for recessed accessories.

C. Do not proceed with the work until unsatisfactory conditions have been resolved.

3.2 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:

1. Verify blocking has been installed properly.
2. Verify location does not interfere with door swings or use of fixtures.
3. Comply with manufacturer's recommendations for backing and proper support.
4. Use fasteners and anchors suitable for substrate and project conditions.
5. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
6. Conceal evidence of drilling, cutting, and fitting to room finish.
7. Test for proper operation.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.

C. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square.

D. Baby-Changing Stations: Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:

1. Verify blocking has been installed properly.
2. Verify location does not interfere with door swings or use of fixtures.
3. Use fasteners and anchors suitable for substrate and project conditions.
4. Install units at location and height indicated on the Drawings.
5. Install units level, plumb and in proper relationship with adjacent construction.
6. Adjust for proper operation.

3.3 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 22 00 00

PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 ANCILLARY GENERAL CONDITIONS

A. The following shall be ancillary to the General and Supplementary Conditions and Division 1 Specification Sections:
   1. Prior to bidding on the project, thoroughly examine all construction documents and specifications, survey the existing site conditions, and include all necessary allowances in bid proposal.
   2. In case of a discrepancy in the specifications, between the specifications and the drawings, within the drawings, or between work under this section and other sections, the Contractor shall figure the most stringent and most expensive alternate and, after award of contract, secure direction from the Owner's Representative.

1.3 DESCRIPTION OF WORK

A. The Contractor shall furnish all labor, materials, testing, tools, equipment, services, and transportation necessary for the completion of all plumbing work as indicated on the drawings and specifications herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner. Work includes, but not limited to the following:
   1. Plumbing Fixtures.
   2. Soil, waste, and vent piping system including connections to equipment furnished in another section of work, stub-outs, and connections to exterior stub-outs.
   3. Storm drainage piping system including roof drains, overflow drains, area drains, insulation of horizontal lines and connections to stub-outs.
   4. Indirect waste piping including insulation and connections to equipment furnished in another section of work.
   5. Condensate drain piping system including insulation and connections to equipment furnished in another section of work.
   6. Domestic hot and cold-water piping systems including water heaters, mixing valves, circulating pumps, pipe insulation, connections to equipment furnished in another section of work, and connections to exterior stub-outs.
   7. Hangers, anchors, sleeves, metal supports, and channels as required for work under this section including sound isolators where indicated.
   8. Piping and valve identification.
   9. Furnishing and installation of plumbing fixtures and trim.
   10. Final piping connections to all fixtures, equipment, including equipment furnished under other sections.

11. Miscellaneous steel work including floor sleeves, slots, inserts, plates, supports, hangers, etc.
12. Testing, adjusting of completed work, inspections, and instructions.
13. Repair of damage done to premises because of this installation and removal of all debris left by those engaged in this installation.
14. Shop drawing, submittals, as-built drawings and operation and maintenance manuals.
15. Permits and connection fees.
16. Flashing and counter flashing.
17. All rigging hoisting, transportation, and associated work necessary for placement of all equipment in the final location shown.
18. Concrete coring, cutting, and patching as it relates to this work.
19. Trenching, and compacting for work under this section.
20. Painting of exposed piping and supports in accordance with Division 09, Painting.

1.4 RELATED WORK ELSEWHERE

A. Division 07, Fire Stopping.

B. Division 07, Sealants.

C. Division 08, Access Panels/Doors.

D. Division 09, Painting.

E. Division 21, Wet-Pipe Sprinkler System.

F. Division 26, Electrical.

1.5 REFERENCE AND STANDARDS

A. Regulatory compliance: All work performed under this Division shall comply with the latest currently adopted editions of all codes and regulations and all requirements of all Authorities Having Jurisdiction. The following references and standards are hereby made a part of this Section and work shall conform to applicable requirements herein except as otherwise specified herein or shown on the Drawings.

B. Codes and Standards: Conform to all applicable codes and standards as stated herein and as described in Division 1 of the Specifications, including the following:
1. American Gas Association (AGA)
2. American National Standards Institute (ANSI)
3. Adhesive and Sealant Council (ASC)
4. American Society of Mechanical Engineers (ASME)
5. American Society for Testing and Materials (ASTM)
6. American Society of Civil Engineers (ASCE)
7. California Building Code (CBC)
8. California Plumbing Code (CPC)
9. California Fire Code (CFC)
10. California Energy Conservation Code, Title 24
11. State of California Administrative Code (CAC) Titles 8, 17, and 24
12. California Electric Code (CEC)

13. National Electrical Manufacturers Association (NEMA)
14. National Fire Protection Agency (NFPA)
15. Underwriters' Laboratories (UL)
16. Comply with all ADA and California Title 24 requirements for disabled access.
17. Division of State Architect, State of California (DSA)
18. City Fire Marshal requirements
19. Comply with the latest edition of all applicable standards, including AWWA, PDI, and OSHA

C. Minimum requirements: The requirements of these are the minimum that will be allowed unless such requirements are exceeded by applicable codes or regulations, in which the regulatory codes or regulation requirements shall govern.

D. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted Authorities Having Jurisdiction and from the Owner's Representative.

1.6 WORK RESPONSIBILITIES

A. Site Conditions:
1. Examine all the drawings and the specifications and survey the existing site conditions.
2. Resolve all conflicts with code requirements, site conditions, the work of other trades, or other mechanical contractors.
3. Verify the location of all existing utilities prior to construction and protect from damage.
4. Pay all costs incurred due to damage of existing utilities or other facilities.

B. Drawings:
1. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of their work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
2. The general intent of the design indicated on the drawings shall be followed as closely as possible. Coordinate with architectural, structural, mechanical, and electrical drawings and the work of other trades prior to of piping and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Owner's Representative for approval. Only when Owner Representative's approval is given, in writing, shall Contractor proceed with installation of the work.
3. Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the Owner's Representative may permit the installation to remain. However, all costs incurred to revise the contract drawings by the Engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
4. Bring discrepancies between different drawings, between drawings and actual field conditions or between drawings and specifications, promptly to the attention of the Owner's Representative for decision.

5. Install pipe with all necessary offsets and to conform to the structure. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, maintain required accessibility, keep openings and passages clear, and satisfy the requirements of the governing codes and standards of good practice. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
6. Clearances and Openings: Contractor shall cooperate and coordinate their work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to their requirements for equipment and installation of any kind, regardless of specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
7. Contractor shall and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.
8. The architectural drawings and specifications take precedence over the plumbing drawings for location of casework, equipment, lights, diffuser, plumbing fixtures, etc. Contractor shall refer to the drawings, specifications, and review shop drawings for all work, to coordinate their work with the other work of the project.
9. All scaled and figured dimensions are approximate and are given for estimate purposes only. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc.
10. Drawings are diagrammatic and size and locations of equipment are generally shown to scale. Make use of data in all Contract Documents, and informational documents, and verify this information against field conditions.
11. As far as possible, the work has been indicated on the drawings in such positions as to suit and accommodate the work of the other trades, but the work as indicated is largely diagrammatic and is shown primarily for clarity. Contractor is responsible for the correct placing of their work and the proper location and connection of their work in relation to the work of other trades.
12. Where apparatus and equipment have been indicated on the drawings, dimensions have been from typical equipment of the class indicated. Carefully check the drawings to see that the equipment will fit into the spaces provided.
13. Where equipment is furnished by another Division or others, verify dimensions and the correct locations of this equipment before proceeding with the rough-in of connections.

C. Responsibility:
1. Be responsible for any cooperative work must be altered due to lack of proper supervision or failure to make proper provision in time. Such changes shall be directly supervised by the Owner's Representative and shall be made to their satisfaction.
2. Provide complete functioning systems and include all labor, materials and associated tools and transportation required for the system to operate safely and satisfactorily.
3. Provide all work indicated on the drawings regardless of mentioned in the specifications.
4. Coordinate the installation of plumbing items with the schedules for work of other trades and other contractors to prevent delays in total work. Assume responsibility for any

cooperative work which must be altered due to lack of proper supervision or failure to make proper provisions in time.

5. Notify the Authority Having Jurisdiction when work is ready for inspection.

D. Coordination of Installation:
   1. Bring to the Owner Representative's attention prior to installation any conflicts with other trades which will result in unavoidable contact to the equipment, piping, etc., described herein due to inadequate space, etc.
   2. Bring to the Owner Representative's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation.
   3. Provide written notification to Owner's Representative a minimum of fourteen (14) days prior to a utility shut down.
   4. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such closure.
   5. Restoration of Damage: Repair or replace, as directed by Owner's Representative, materials and parts of premises which become damaged as result of installation of work of this Division. Remove replaced parts from premises.
   6. Where new pipes are to be connected to an existing pipe or a stub provided under another section, verify location, size, elevation, and all other information necessary for connection. This verification shall be done at the start of construction. Should there be a problem, contact the IOR and/or Architect immediately to resolve the problem.

1.7 PERMITS, LICENSES, AND INSPECTIONS

A. Obtain and pay for all permits, fees and inspections required by work under this Section.

B. Inspections: All work shall be regularly inspected by the Authority Having Jurisdiction. Certificates of approval shall be delivered to the Owner's Representative.

1.8 SERVICE CONNECTIONS

A. Arrange and pay all costs for utilities required to complete work of this section. Connection to all on-site services, payment of service charges, and provision for the installation of temporary utilities are included.

B. Certain site utilities are to be connected to and/or extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which is to be connected. In event depth of lines is not sufficient to permit connection in manner indicated; Contractor shall obtain direction from the Owner's Representative before proceeding with this work.

C. Verify that utility company’s size their services and meters to suit ultimate demand indicated on the drawings.

D. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping outside of the building to civil site stub and within the building itself.

E. Domestic Water: The. Contractor shall be responsible for the domestic water service outside of the building to civil site stub and within the building itself.

F. Storm Drain: The Contractor shall be responsible for the storm drain service outside of the building to civil site stub and within the building itself.

1.9 NOISE AND VIBRATION

A. Cooperate in reducing objectionable noise or vibration. If noise or vibration, resulting from improper installation, occurs in the building, correct these conditions at no cost to the Owner.

1.10 QUALITY ASSURANCE

A. Qualifications:
   1. For the actual installation and testing of work under this section use only thoroughly trained and experienced work personnel completely familiar with the items required and the manufacturer's current methods of installation.
   2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill.
   3. The execution of the work shall be in strict accordance with the best practice of the trades, the intent of this specification, and all codes and ordinances.

B. Contractor's Qualifications: A firm with at least five (5) years of successful installation experience on projects with plumbing systems work similar and of comparable size and scope to that required for this project. The installer shall have performed at least five (5) similar projects in the San Francisco Bay Area. Contractor shall be prepared to submit written evidence of the installer's experience.

C. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

D. All materials and equipment installed as part of this work shall be new and the manufacturer's current model.

E. Soldering: Soldering of copper tubing shall be done in accordance with the Copper Development Association Copper Tube Handbook Instruction on Joining and Forming Copper Tube, Soldered Joints. Permits for on-site soldering shall be obtained from DSA/Fire Marshal.

F. Brazing: Brazing of copper tubing shall be done in accordance with the standards of the American Welding Society or the Copper Development Association. Copper Tube Handbook Instruction on Brazing. Permits for on-site brazing shall be obtained from DSA/Fire Marshal.

G. Welded Joints: Weld in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified for the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test. Contractor shall conduct the ANSI qualification test. Permits for on-site welding shall be obtained from DSA/Fire Marshal.

1.11 PRODUCTS

A. Products shall be obtained from local suppliers or suppliers with local representation. Items of the same type shall all be purchased from the same supplier.

B. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.

D. Protection of Materials:
   1. Protect materials, equipment and apparatus provided under this Division from damage, water, dust, or similar impairment, both in storage and installation until Notice of Completion has been filed. Materials, equipment, or apparatus damaged because of improper storage or protection will be rejected and must be removed from site.
   2. Cap openings in pipes with manufactured caps or fittings. Do not use taped caps.
   3. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

E. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and soldered ends.
   3. Set ball valves open to minimize exposure of functional surfaces.

F. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

G. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

1.12 REVIEW OF CONSTRUCTION

A. The Owner's Representative may review work at any time.

B. Advise Owner's Representative fourteen (14) calendar days in advance that work is ready for review at following times:
   1. Prior to backfilling buried work.
   2. Prior to concealment of completed Contract items.
   3. When requirements of Contract have been completed.
   4. Prior to installation of suspended dry wall ceiling.

C. Do not or conceal work without Owner Representative's consent.

D. Maintain on job a set of specifications and drawings for use by the Owner's Representative.

E. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

1.13 SYSTEM ACCEPTANCE

A. Final Review: Request a final review prior to system acceptance after:
   1. Completion of the installation of all systems required under the Contract Documents.
   2. Submission and acceptance of operating and maintenance data.
   3. Completion of pipe, valve, and equipment identification.
   4. Completion of cleaning.
   5. Satisfactory operation of all systems for a period of one (1) week.

B. Acceptance shall be contingent upon:
   1. Completion of final review and correction of all deficiencies.
   2. Satisfactory completion of the acceptance tests which shall demonstrate compliance with all performance and technical requirements of the Contract Documents.
   3. Submission of as-built drawings.

1.14 DAMAGE BY LEAKS

A. Contractor shall be responsible for damage to any part of the premises caused by leaks in the pipe or equipment installed under applicable sections for a period of twenty-four (24) months from the date of acceptance of the work by the Owner.

1.15 SUBMITTALS

A. Submit shop drawings and product data in accordance with **Division 01** and as follows:

B. Submittal Requirements:
   1. Submit manufacturer's product brochures for all products. Written descriptions of products are not acceptable. Furnish, all at one time, prior to any installation, submittal data on all fixtures, material, equipment, and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules. Product submittals shall be submitted in PDF format with table of contents.
   2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
   3. Submittals will be checked for general conformance with the design concept of the project, but the review does not guarantee quantities shown and does not supersede requirements of this Division to professionally install work.
   4. To be valid, all submittals must:
      a. Identify project name and location, Contractor's, Subcontractor's, supplier's and manufacturer's name, address, and telephone number.
      b. Include table of contents.
      c. Identify manufacturer's name and model numbers.
      d. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
      e. Include all pertinent construction, installation, performance, and technical data.
      f. Have all product data sheets labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
      g. Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

h. Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, and item numbers.

C. Product Data:

1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data, such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, and accessories. Include certified drawings on major equipment such as water heaters, pumps, and tanks.

D. Submit product data and brochures for, but not limited to the following:

1. Pipe Material, Fittings and All Piping Specialties.
2. Pipe corrosion protection materials.
3. Unions, Flanges and Dielectric Isolators.
4. Pipe Supports and Seismic Bracing.
5. Escutcheons, Flashing and Sleeves.
6. Fire stopping, including UL listing system numbers and details.
7. Pipe Isolation.
8. Insulation.
9. Valves (all types), including backflow preventers.
10. Trap Primer Valves.
11. Water Hammer Arrestors (Shock Absorbers).
12. Thermometers and Pressure Gauges.
13. Drains, Cleanouts and Vent Caps.
14. Access Doors.
15. Pipe and equipment markers, and valve tags.
16. Flexible Connectors and Seismic Joints.
17. Hose Bibbs.
18. Plumbing Fixtures and Trim.
19. Pumps (all types).
20. Water Heaters.
21. Mixing Valves.

E. Shop Drawings:

1. General: Prepare and submit plans, sections, details, and diagrams to required scales for specified areas. Drawings shall be prepared using AutoCAD 2020 or higher software. Drawings shall be coordinated, dimensioned, and indicate equipment, pipe, duct, fire protection, and electrical in relation to architectural and structural features. Include minor piping, drains, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, etc. Complete and detailed shop drawings of a scale equal to or larger than the design documents shall be maintained throughout the coordination and construction phase indicating all equipment trades' work clearly. All equipment including piping, etc. shall clearly indicate both top and bottom elevations as well as distances from equipment to established building lines. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.
2. Use of contract documents for shop drawings is not acceptable.
3. Required Drawings: Prepare and submit drawings for all areas and all plumbing work. Scale shall be minimum 1/4”=1’-0” in mechanical rooms, toilet areas, and a minimum 1/8”=1’-0” elsewhere.

1.16 SUBSTITUTIONS

A. Base manufacturer is indicated in the equipment schedules and specifications. In specification, additional acceptable manufacturers may be indicated. Other manufacturers, materials, or methods shall not be used unless approved in writing by the Owner's Representative. The burden of proof as to the equality of any proposed substitute manufacturer, material, or method shall be upon the contractor. Substitutions, shall be submitted as follows:

1. Requests for substitution review and acceptance shall be accomplished by table of comparison listing pertinent features of both specified and proposed materials, such as material of construction, replacement or maintenance access, motor type, horsepower, voltage, phase, service factor. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for specified item shall be placed side by side with product data sheets for the corresponding proposed substitution item within the submittal. In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION". Review of proposed substitutions will not be made until receipt of satisfactory comparison tabulation.
2. Provide calculations and other detailed data justifying how items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
3. It shall be the responsibility of the Contractor to provide adequate information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be reviewed, and re-submittal of same will not be allowed.
4. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
5. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications, or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
6. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
7. The Owner or their authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures, or materials. Decisions of the Owner or that of their representative shall be final and conclusive.
8. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Owner's Representative. If first proposed product submittal is rejected, Contractor shall submit the first-named or scheduled product.
9. Contractor shall be responsible for all costs and coordination due to the substitution, such as impacts on electrical requirements, weights, openings in slabs and roofs, structural framing, housekeeping pad size, etc.
10. All costs incurred to revise the contract drawings by the Engineer for re-submittal to the building department or Authority Having Jurisdiction, indicating the as-installed condition, shall become the responsibility of the Contractor.

1.17 RECORD DRAWINGS (AS-BUILT DRAWINGS)

A. Record of Job Progress: Keep an accurate dimensional record of the "As-built" locations of all work as required. This record shall be kept up to date on prints as the job progresses and shall be always available for inspection. In addition, record drawings are to be used by the Owner's Representative for job review and field inspections.
   1. Where enlarged plans are provided in the construction set, contractor markups shall be kept on the enlarged plans.

B. Include on as-built drawings:
   1. Main shut-off valves plainly marked and identified.
   2. Position of all buried or concealed mains accurately dimensioned, both horizontally and vertically.
   3. Changes in location of piping, duct, or equipment from construction documents. Bottom elevations of each duct and pipe.
   4. Ceiling and duct access panel locations.
   5. Location of temperature control devices including static pressure control probe, stats, selected zones, etc.
   6. Location of all equipment.
   7. Invert elevation of sewer and storm drainpipe below grade.

C. "As-Built" documentation shall be transmitted to the Owner within ten (10) days after Owner Representative's acceptance of the completed installation. As-built documentation shall include the following (Unless noted elsewhere, furnish number of copies indicated):
   1. PDF of as-built documents. One (1) copy of final AutoCAD drawing files shall also be provided on CD disk.
   2. Four (4) sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
   3. Four (4) sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions.
   4. Manufacturer’s literature, reports and operation and maintenance data shall be in a labeled three (3) ring binder.

D. Submit in accordance with Division 01 Project Record Drawings and Electronic Documentation of Project.

1.18 OPERATION AND MAINTENANCE DATA

A. The installing contractor shall provide:
   1. All literature and instructions provided by the manufacturer describing proper operation and maintenance of any equipment and devices installed.

B. Data shall include but is not limited to the following: list of all equipment with manufacturer's name, model number, local representative, service facilities and normal channel of supply for each item. O&M manuals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Operation and Maintenance to match “Product Submittals".
   1. System Description: Description of start-up and operating procedures.
   2. Controls: Diagrams and description of operating sequence of each system.
   3. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts list with parts numbers. Mark each sheet with identification number and actual installed condition.

4. Materials and Accessories: Manufacturer's brochures parts lists with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
5. Certificate of factory tests and code compliance as specified.
6. Recommend preventive maintenance schedule and procedures.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND TRIM

A. Refer to plumbing fixture schedule in construction documents for fixture specifications.
1. Fixtures and equipment shall be certified by the State Authorities and comply with the efficiency standards and water usage requirements of State and Local Authorities.

B. General: Provide factory fabricated fixtures of type, style and material indicated.
1. Plumbing Fittings, trim and accessories:
   a. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves or dispensing devices of type and size indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shutdown of water supply piping systems. Stop valves shall be provided at each fixture.
   b. Vacuum Breakers: provide with flush valves and water outlets equipped for hose attachment.
2. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting seam marks, roller marks, foundry sand holes, stains, discoloration, or other imperfections on finished units are not acceptable.
3. Where piping, fittings, trim, and accessories are exposed or semi-exposed provide bright chrome plated or polished stainless-steel units. Provide copper or brass where not exposed.
4. Escutcheons: Where fixture supplies and drains penetrate walls, provide chrome plated brass escutcheons. Provide box style escutcheons for p-trap penetrations.
5. Stainless steel fixtures conforming to ANSI A112.19.3M. Type 302/304, hardest workable temper. Finish shall be No., 4, bright, directional polish on exposed surfaces, or as indicated.
6. Vitreous China: White Vitreous China unless otherwise noted. Fixtures conforming to ANSI A1 High quality, from fire cracks, spots, blisters, pinholes, and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ASTM C-554.
7. Traps: Lavatory and sink p-traps shall be commercial grade, chrome plated cast brass body with cleanout, with 17-gauge brass adjustable wall bend, cast brass nipple, 17-gauge tube, and cast brass slip nuts. No reducing washers allowed. Trap shall be provided with forged brass with brass box style escutcheon. Traps to have a 2" water seal and rough-in complete. Trap adapter extensions are not allowed. Trap shall be by CSA or other recognized testing authority and bear manufacturers name. Brasscraft Commercial, McGuire, or Zurn Commercial.
8. Lavatory and sink water supply shall be heavy duty commercial grade and include chrome plated all-brass stops with all-brass stem (no plastic stems allowed) and loose-key handle. Kits shall have chrome plated flexible copper risers and deep forged brass with setscrew flange and have EPDM washers. Inlet shall be IPS with chrome plated nipple. Supply riser lengths to conform to fixture manufacturers recommended rough-in dimensions. Outlets shall be compression. Stops shall be certified to 200psi line pressure. Supply kit shall be

certified by CSA or other recognized testing authority, bare manufacturers name and comply with the SDWA (Safe Water Act) "No Lead" restrictions AB1953. Supply kits shall be Brasscraft Commercial, McGuire, or Zurn Commercial.

9. Lavatory grid drains to have chrome plated cast brass strainer (with overflow for lavatories with overflow drains) with brass lock nut. Drain tailpiece shall be seamless brass tube and a 6" long. Provide offset type for ADA accessible fixtures. Grid drain shall be certified by CSA or other recognized testing authority. The drain body shall bear manufacturers name being visible after installation.
10. Product submittals for p-traps and lavatory grid drains shall include documentation that product is CSA listed or other recognized testing authority.
11. Water Connections: Shall have rigid metal to metal connections. Slip joints utilizing non-metallic washers are not permitted. All fixtures shall have stops or valves. All stops shall be lock-shield type, unless otherwise noted.
12. Provide Schedule 40 red brass nipples at copper lines serving fixtures. Galvanized nipples are not allowed.
13. Fixture Supports:
    a. Carriers: Fixture supports for all off-floor plumbing fixtures conforming to ANSI A1 Provide floor mounted commercial grade cast-iron supports for fixtures of either graphitic gray iron, ductile iron, malleable iron, or steel as indicated. Carriers for water closets shall be rated to support loads of up to 500 lbs. Submittals indicate that water closet carriers can meet this requirement. Provide cast iron nipples and couplings for water closets and urinals. ABS is not acceptable. Carriers shall be manufactured by J.R. Smith or Zurn.
    b. Backing: For fixtures other than those specified or required to be furnished with carriers, 1-1/4” x 6" wide steel flat plate welded to steel studs or secured to brick or concrete, drilled, and tapped to match hanger. Also install backing where bottom of fixture meets wall. Bolt fixtures to backing through holes in fixture casting.
14. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
15. Flush Valve Supports: All flush valves shall be installed to prevent movement. Supply pipe serving flush valves shall be installed with Holdrite #102-26 flush valve support (#114-C for wall mounted water closets). Supply pipe to be soldered to the support.
16. Exposed P-traps and Angle Stops
    a. All exposed lavatory and sink trim under the fixture on wheelchair accessible fixtures shall be covered with a white anti-microbial vinyl insulating outer shell. Material shall be flame retardant and fungal and bacterial resistant. Insulating kits shall include covers for drain tailpiece, drain offsets, all p-trap components and hot and cold-water supplies including supply risers. Insulation kits shall be Truebro Lav Guard 2, or equal.
    b. Shall meet the requirements of the Americans with Disabilities Act (ADA).

2.2 STORM, SOIL, WASTE & VENT PIPING SYSTEMS

A. Above and Below Ground: No-hub cast iron soil pipe and fittings manufactured from gray cast iron with a tensile strength of not less than 21,000 psi, bituminous coated interior and exterior, conforming to the requirements of ASTM A888 and CISPI Standard 301. Each length of pipe shall be hydrostatically (water) tested by the manufacturer to verify compliance. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF international. All pipe and fittings shall be of the same manufacturer.

B. Above and Below Ground: Schedule 40 ABS plastic DWV (or Schedule 40 solid wall PVC only is requested in writing from the Owner) with solvent cement fittings.
   1. Underground plastic DWV piping systems shall be installed per ASTM D2321.

C. No Hub Couplings:
   1. Above Ground: No-hub couplings shall comply with CISPI 310 and bear the NSF trademark. No-Hub couplings shall be constructed of Type 304 stainless steel with 305 stainless steel worm drive screws. The worm drive clamps shall have a hexagon head to accept a 3/8-inch socketed torque wrench. The clamps shall be tightened to a minimum of 80-inch pounds. (Single corrugated shield, 4 band 80-inch pound torque or 2 band 80-inch pound torque minimum). The gasket material shall be neoprene rubber meeting the requirements of ASTM C-564. Submittal to include copy of compliance to the requirements of FM 1680 Class I by certified independent third-party testing laboratory. No-Hub couplings shall be Husky SD2000 or Clamp-All High Torq 80. No coupling reducing fittings allowed.
   2. Below Ground: No-hub couplings shall comply with CISPI 310 and all requirements of Factory Mutual 1680 Class I, 15 PSI rated pressure. No-Hub couplings shall be constructed of Type 304 stainless steel with 305 stainless steel worm drive screws. The worm drive clamps shall have a hexagon head to accept a 3/8-inch socketed torque wrench. The clamps shall be tightened to a minimum of 80-inch pounds. (Single corrugated shield, 4 band 80- inch pound torque or 2 band 125-inch pound torque minimum). The gasket material shall be neoprene rubber meeting the requirements of ASTM C-564. Submittal to include copy of compliance to the requirements of FM 1680 Class I by certified independent third-party testing laboratory. No-Hub couplings shall be Husky SD4000 or Clamp-All High Torq
   125. No coupling reducing fittings allowed.

2.3 DOMESTIC HOT AND COLD-WATER PIPING SYSTEMS

A. Above Ground:
   1. Copper Tube: Type ‘L’, hard-drawn temper, ASTM copper tubing with ANSI B16.22 wrought copper sweat type fittings. Pipe shall be NSF 61 Certified and bear the NSF Certification mark. Submittal to include that pipe is NSF 61 certified.
   2. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver. Engelhard 100, or equal.
   3. Mechanically formed tee fittings are not acceptable.
   4. Fittings: Wrought copper or cast brass solder sweat type.

B. Below Ground:
   1. Tube Size 3" and Smaller: Copper tube; Type "K", hard-drawn temper; wrought-copper fittings, brazed-joints, long radius elbows. Pipe shall be NSF 61 Certified and bear the NSF Certification mark. Submittal to include documentation that pipe is NSF 61 certified.
   2. Piping below building floor shall be Type “K” soft annealed copper tubing with no fittings below the slab.
   3. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver. Engelhard 100, or equal.
   4. Trap primer: use plastic-coated tube, Streamline ‘PlumbShield’ or equal plastic-coated Type K tubing. Comply with manufacturer's installation instructions.
   5. Provide concrete thrust blocks at all changes in direction, changes in size, stops and dead ends, and at valves where thrusts may be expected.

2.4 CONDENSATE PIPING SYSTEMS

A. Copper Tube: Type 'M', hard-drawn temper, ASTM copper tubing with ANSI B16.22 wrought copper sweat type fittings. Pipe shall be NSF 61 Certified and bear the NSF Certification mark. Submittal to include that pipe is NSF 61 certified.

B. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver. Engelhard 100, or equal.

C. Schedule 80 CPVC DWV piping, and fittings installed per ASTM F439.

D. For all high efficiency condensing equipment: Schedule 40 PVC upstream of Heat Transfer Products model N110 inline condensate neutralizer and type "M" copper downstream. Neutralizer to be located at equipment condensate drain outlet.

E. For connections to equipment on vibration isolators provide flexible connector after trap.

2.5 INDIRECT WASTE PIPING SYSTEMS

A. Pipe size 1" and smaller: ASTM B88 DWV copper pipe and fittings.

B. Pipe size 1-1/4" and larger: ASTM B306 DWV copper pipe and fittings.

C. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver Engelhard Silvabrite 100, or equal.

2.6 DRAINS

A. Conforming to ANSI A1.

B. Coated cast iron body, except as noted, with integral double drainage flange, weep holes and inside caulked bottom or no-hub outlet.

C. Provide cast iron P-trap at all floor drains, floor sinks and trench drains. All floor drains to have trap primers.

D. Coordinate drain, area drain, trench drains, and floor sink rim elevations to be flush with finish floor and at low point of floor.

2.7 TRAP PRIMER VALVES

A. Corrosion resistant brass containing no springs or diaphragms, activated by a 5 to 10 psi pressure drop, provide with distribution unit when serving 2 to 4 drains, ASSE 1018 certified and Listed with Precision Plumbing Products Model P-1 & P-2 with DU Series distribution unit, or equal.

B. Provide trap primers for all floor drains including piping floor drain to trap primer valve. Provide shut-off valve upstream of trap primer valve.

C. When concealed, provide access panel for maintenance or replacement. Use size appropriate for access.

2.8 CLEANOUTS

A. Conforming to ANSI A112.36.2. Cleanouts shall be manufactured by J.R. Smith or Zurn.

B. Cast bronze, full size up to four inch.

C. Floor Cleanouts: J.R. Smith Fig. 4026-U-F-C, coated cast iron adjustable floor cleanout with inside caulk connection, flange with flashing clamp, internal bronze plug, scoriated round nickel bronze cover secure to rim with vandal-resistant screws.

D. Wall Cleanouts: J.R. Smith fig. 4422C-U and fig. 4532S-U, cast bronze taper thread plugs with stainless steel cover and vandal-resistant screws. Screw length as required meeting installation requirements. Wall cleanouts shall be located a minimum of 18” above finished floor.

2.9 VALVES

A. General:
1. All valves used for domestic water shall meet the criteria of California AB1953 low lead provisions.
2. Provide all valves of first quality of approved manufacturer, have proper clearances, and be tight at the specified test pressure. Mark on each valve the maker's name or brand, the figure or list number, and the guaranteed working pressure cast on the body and cast or stamped on the bonnet or provided with other means of easy identification.
3. All valves must be of the product of one manufacturer, except for special application. Figure numbers of manufacturers are listed to indicate the types selected for design, performance and standard of quality and appearance.
4. Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are specified but are not available.
5. Sizes: Same size as upstream pipe, unless otherwise indicated.
6. Operators:
    a. Hand wheels fastened to valve stem for all valves other than quarter turn.
    b. Lever handles on quarter-turn valves, 6 inch and 8 inch and larger gear operated, except for plug valves. Provide plug valves with square heads and operating wrench. Provide gear operator for valves 8 inch or larger.
7. Extended stems: Where insulation is indicated, or specified, provide extended stems arranged to receive insulation.
8. End Connection: Valves 2" and under shall be sweat or threaded 2-1/2” and larger shall be flanged or full lug style.
9. Figure numbers of manufacturers are listed to indicate the types selected for design, performance and standard of quality and appearance.

B. Ball Valves: MSS SP-110; rated for 150 psi saturated steam pressure, 600 psi WOG pressure; full port, two or three-piece bronze body construction, chrome plated solid bronze ball, blowout proof stem, reinforced "Teflon" seat and seals, separate adjustable packing gland and nut, and vinyl covered steel handle. Provide locking type handle where required.
1. Valves 2" and Smaller: Nibco T/S-685-80-LF, Watts Series LFB6080/LFB6081 or equal.
2. Valves 2-1/2”and Larger: Use butterfly valve.

C. Butterfly Valves: MSS SP-67; rated at 200 psi, body conforming to ASTM A 126, Class B. Provide full lug style valves with field replaceable EPDM phenolic backed sleeve, aluminum bronze disc, stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks.
   1. Nibco LD-2000, Watts Model BF03-121-45/BF03-121-4G or equal.

D. Check Valves:
   1. Swing Check Valves: 2" and Smaller: MSS SP-80; Class 125, 200 psi WOG, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc. Provide valves capable of being refitted while the valve remains in the line.
      a. Nibco T/S-413-Y-LF or equal.
   2. Swing Check Valves: 2-1/2" and Larger: MSS SP-71; Class 125, 200 psi WOG, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal wing, and bronze disc or cast-iron disc with bronze disc ring, flanged ends. Provide valves capable of being refitted while the valve remains in the line.
      a. Nibco F-918-N or equal.
   3. Lift Check Valves: 2-Inch and Smaller: Class 125; cast-bronze body and cap conforming to ASTM B 62; horizontal or angle pattern, lift-type valve, with stainless steel spring, bronze disc holder with renewable "Teflon" disc. Provide valves capable of being refitted and ground while the valve remains in the line.
      a. Nibco or equal.
   4. Non-Slam Check Valves: Provide non-slam check valves on the discharge of pumps. Check valves to be silent closing, class 125, iron body, bronze mounted spring leaded center guide.
      a. Valves 2" and Smaller: Nibco T/S-480-Y-LF or equal.
      b. Valves 2-1/2" and Larger: Nibco F-910-B or equal.

E. Water Pressure Relief Valves: Provide ASME labeled, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, Wilkins No. P174A, Watts, or equal.

F. Combination Pressure and Temperature Relief Valves: Provide ASME labeled, adjustable bronze spring and diaphragm combination pressure and temperature type with test lever and automatically reseating type thermostatic element, Relief valve shall be type as recommended by the water heater equipment manufacturer.

G. Balancing Valves: Fully assembled, forged brass body, 304 stainless steel parts, EPDM O-rings, 20 mesh stainless steel strainer, nickel-plated brass ball valve, 400 psi/250°F rated, accessible flow control cartridge, ports for testing, Griswold Isolator "R" Series, or equal.

H. Valve Box: Christy B03 reinforced concrete utility box with reinforced concrete lid. Provide steel, checker plate, traffic lids on all paved areas and walkways 5'-0" wide or greater.

2.10 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Every effort shall be made by the contractor to alleviate hydraulic shock (water hammer). Should water hammer be present in the final installation and water hammer arrestors have not been installed as noted by this specification and all the authorities named within, it shall be the responsibility of the contractor to provide water hammer arrestors per this specification at no additional cost to the Owner.

B. Locate and size per Plumbing and Drainage Institute Manual WH-201.

C. Provide water hammer arrestors in water lines to equipment or fixtures having quick closing valves, flush valves, sensor operated metering faucets, mechanical metering faucets, foot pedal valves, knee operated valves, and any equipment that might produce water hammer.

D. Water hammer arrestors shall be certified by the Plumbing and Drainage Institute (PDI). Water arrestors shall have threaded stainless steel casing, partially filled with liquid, and charged with gas as required for line pressure, stainless steel or neoprene bellows, J.R. Smith “Hydrotrol" or Zurn “Shocktrol”.

E. When concealed, provide access panel for maintenance or replacement. Use size appropriate for access.

F. Provide 6" brass nipple at connections to copper lines.

2.11 CORROSION PROTECTION

A. All buried copper and steel piping and fittings shall be cleaned, primed then protected by wrapping.
   1. Piping 3” and smaller: Prime pipe and machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Hand wrap fittings using 100% overlap wrap extending 6” beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions. Wrap pipe with 3M "Scotchrap 51" corrosion protection tape (20 mil thick) and pipe primer, or equal.
   2. Piping 4" and larger: Encase in 8 mil polyethylene tube encasements in accordance with ANSI/AWWA A21.5/C105 and manufacturer's instructions.
   3. All below ground metallic fittings, valves, flanges, bolts, shall be protected against corrosion as follows:
      a. All metallic components as described above shall receive a heavy coating of "Henry's" oil base roof mastic, or equal.
      b. After mastic coating is completed and inspected, wrap entire metallic component with a minimum of 10 mils. polyethylene wrap as manufactured by Visqueen or equal, overlapped 50% of the circumference and extended beyond ends of component as required for polyethylene to be secured to piping. The overlap seam shall be located to avoid material from entering the encapsulate area. The ends and seam of the of the polyethylene material shall be secured to the piping and sealed with 3M "Scotchrap 51" corrosion protection tape (20 mils thick) and pipe primer, and 2" wide pipe wrap sealing tape.
      c. The mastic coating shall be inspected and approved prior to the finish application of the polyethylene material, which shall also be inspected.

2.12 PIPE SUPPORTS, ANCHORS, AND HANGERS

A. Unless detailed on the drawings, all piping shall be supported with, B-Line, Grinnell, Super Strut, Tolco, or equal, pipe hangers and supports. All hangers and supports furnished for this installation shall be of one manufacturer. Piping support system will comply with MSS-SP88, ASME B31 or NFPA 13/CFC. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide felt lined hangers for copper piping systems.

B. Special pipe supports for piping in equipment and other locations when shown on drawings shall be constructed as detailed on drawings. Unless otherwise shown on drawings, support channels,

frames, brackets, and legs of special supports shall be made of B-Line, Grinnell, Super Strut, Tolco, Unistrut, or equal channels, attaching clips, pipe clamps, and other required accessories. Piping installed within partitions and connected to plumbing fixture trim shall be securely attached to adjustable stud brackets, not more than 2-feet away from and on the inside of wall penetration.

C. Hanger Rods: Hanger rod size shall be no less than the standard rod sizes listed on the MSSSP-69. Rods shall be steel rods, threaded at ends only with a minimum safety factor of 5 over the imposed load, Tolco Fig. 103, or equal. All thread rods are not acceptable. Provide rod stiffeners as required.

D. Where beam clamps are used, provide beam clamp retaining strap.

E. Powder-driven and explosive type fasteners are not allowed.

F. Equipment Support Members: Install AISC steel beams to accommodate support for pipe and equipment from above when it is not practical to install concrete anchors.

G. No metallic pipes shall have metal-to-metal contact with hangers, clamps, brackets, or any other pipe support, or be otherwise in direct contact with any part of the building structure.

H. Finish of all pipe support attachments, rods, hangers, etc. shall be galvanized or cadmium plated.

I. Steel for Equipment Support: Support steel shall be of new material conforming to ASTM A36, latest edition. Brackets, supports, etc., fabricated from ferrous metal shall be hot dipped galvanized after fabrication. Steel hangers shall have a safety factor of 4.0 or greater.

J. Miscellaneous Steel, Bolts, Nuts, Washers, etc.: Miscellaneous steel angles, channels, brackets, rods, clamps, etc., shall be of new materials conforming to ASTM A36. All steel parts exposed to weather or where noted shall be hot dipped galvanized after fabrication.

K. All bolts and nuts, except as otherwise specified, shall to ASTM "Standard Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners", Designation A307. Bolts shall have heavy hexagon heads, and nuts shall be of the hexagon heavy series. All bolts, washers, nuts, anchor bolts, screws, and other hardware, unless otherwise specified, shall be galvanized, and all galvanized nuts shall have a free running fit. Bolts shall be of ample size and strength for the purpose intended.

L. Concrete Anchors:
1. For New Concrete Slabs with Metal Decking: B-Line, Hilti, Red Head, or equal, steel deck inserts or wedge type expansion anchors.
2. For New Concrete Floor or Base: B-Line, Hilti, Red Head, or equal, hook bolts, wedge type expansion anchors, or Deco adjustable concrete anchors.
3. For Existing Concrete Slabs: B-Line, Hilti, Red Head, or equal, self-drilling concrete anchors. Locate anchors to clear rebar.
4. Maximum loading on inserts and rods shall not exceed 75 percent of ratings.
5. Powder actuated fastening systems will not be allowed.

M. Insulated pipes shall be supported with Pipe-Shield, Inc., Model “CS-CW” unless otherwise noted, or equal, pipe hanger shield with waterproofed calcium silicate insulation encased in a galvanized-sheet metal shield completely around the pipe. Shield shall be 26 gauge for pipes up to 1”, 22 gauge for 1-1/4” and 1-1/2”, 20 gauge for 2" to 8" in size, and 16 gauge for 10" and larger. Insulation shall be same thickness as pipe insulation.

2.13 SEISMIC RESTRAINTS

A. General Requirements: Seismic restraints shall be provided for all vibration isolated equipment, both supported and suspended, and all vibration isolated piping.

B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the mechanical engineer, the project inspector, and DSA.

C. Seismic Restraint Systems for Piping:

1. Piping, ductwork, and electrical distribution systems shall be braced to comply with the forces and displacements prescribed in ASCE 7-16 Section 13.3 as defined in ASCE 7-16 Section 13.6.8, 13.6.7, 13.6.5.6, and 2022 CBC Section 1616A.1.23, 16A.1.24, 1616A.1.25 and 1616A.1.26.
2. The bracing and attachments to the structure shall be detailed on the approved drawings or they shall comply with one of the HCAI pre-approval of manufacturer's certifications (OPM) as modified to satisfy anchorage requirements of HACI 318-19 Chapter 17.
3. Copies of the OPM manual(s) shall be on the jobsite prior to the start of hanging and bracing of the ductwork and pipe distribution systems.

2.14 PIPE ISOLATION

A. All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line "Vibra Clamp" and "Vibra Cushion", Super Strut, "Trisolator", or equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.

B. Provide pipe and sound isolation for all piping through walls, Acoustoplumb by LSP Products, Holdrite Silencer by Hubbard Enterprises, or equal.

2.15 PIPE INSULATION

A. General: Conform to NFPA Section 90A, with special regard to the fire hazard requirements of ASTM E84 and NFPA No. 255, latest revision, including vapor barriers and adhesive. All insulation shall be UL listed and shall meet all code requirements, minimum California State Energy Code Title 24. Insulation shall be Owens Corning, Johns-Manville, or equal.

B. Fire Hazard Rating: Insulation, jackets, facings, adhesives, coatings, and accessories shall be acceptable to the Fire Marshal, and shall not exceed the following fire hazard classifications: Flame-spread: Maximum 25, Fuel Contributed: Maximum 50, Smoke Developed: Maximum 50. Rating to be in accordance with UL Test Method for Fire Hazard Classification of Building Materials, No. 763.

C. Domestic Cold, Hot Water, Hot Water Return: Fiberglass, Heavy Duty 25ASJ/SSL, heavy density, UL listed non-combustible fiberglass segmented pipe insulation with an integral

vapor barrier jacket. The jacket shall have a pressure sealing lap adhesive. Insulation density shall be between 4 and 7 PCF. Insulate cold water piping in concealed areas and warm (heated) areas with minimum insulation. Insulate exterior cold-water piping with 1" insulation. Insulation for hot water shall comply with California Title 24 requirements. Required thickness shall be a function of the pipe size as indicated below.

D. Indoor Piping -Fluid Temperature Range (105°F and Above):

Pipe Diameter	Insulation Thickness
1” and smaller	1”
Up to and including 2”	1.5”
2-1/2” and larger	1.5”

E. Outdoor Piping -Fluid Temperature Range (105°F and Above):

Pipe Diameter	Insulation Thickness
1” and smaller	1”
Up to and including 1”	1.5”
1-1/4” and larger	2”

F. Condensate Drain, Storm Drain and Overflow Drain: Fiberglass, Heavy Duty 25ASJ/SSL, heavy density, UL listed non-combustible fiberglass segmented pipe insulation with an integral vapor barrier jacket. The jacket shall have a pressure sealing lap adhesive. Insulation density shall be between 4 and 7 PCF. Insulate horizontal storm drain and overflow drain lines, elbows up to roof drain body, and roof drain bowls with a 1” thick insulation. Insulate all condensate drains with a minimum of ½” thick insulation.

G. Insulate fittings, valves, joints, expansion joints, and couplings with insulation of same material and thickness as adjoining pipe. Use pre-molded fiberglass covers or radical mitered segments of pipe insulation. For valves, expansion joints, fittings and accessories requiring servicing or inspection, insulation shall be removable and replaceable without damage. Enclose within two-piece no. 15 gauge aluminum covers fastened with cadmium-plated bolts and nuts. Concealed items shall be labeled. Unions and flanges, strainers, air chambers and water arrestors, need not be insulated.

H. All insulation shall be continuous through walls, sleeves, pipe supports and hangers, and other pipe penetrations.

I. Finish insulation at supports, protrusions, and interruptions. No hangers or supports shall be embedded in insulation.

J. For exterior applications and piping exposed to weather, provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover piping and all fittings with 0.016" aluminum or stainless-steel jacket (meeting ASTM B209) with moisture barrier, and with two 318" wide 0.015" thick aluminum or 0.010" thick stainless-steel bands per 3 feet section (18" on center), completely watertight. Lap all joints 2" minimum and seal per manufacturer's recommendations. Locate seams on the bottom side of horizontal piping.

K. All insulated piping drops exposed in finished areas shall be jacketed in stainless steel jacket, secured, and sealed around pipe to prevent entrance of water during cleaning process.

L. Insulated pipes shall be supported with Pipe-Shield, Inc., Series A-9000, or equal, pipe hanger shield with waterproofed calcium silicate insulation encased in a galvanized sheet metal shield completely around the pipe. Shield shall be 26 gauge for pipes up to 1-1/2", 22 gauge for 2", 20 gauge for 2-1/2" to 8" in size, and 16 gauge for 10" and larger. Insulation shall be same thickness as pipe insulation. Provide calcium silicate insulation with insulation protection saddles and shields at pipe hangers. Insert sections shall be installed on all insulated piping located centrally under each hanger where the insulation rests on hanger. Vapor barriers and jacketing continuous over insert.

2.16 ESCUTCHEONS, FLASHINGS AND SLEEVES

A. Provide sleeves for each pipe passing through footings, foundations, walls, partitions, floors, roofs, and other locations where needed, whether shown or not.

B. Piping penetrating below grade exterior walls and floors, and floors in all food service areas including pantries, shall be sleeved, and made watertight using Thunderline "Link Seal" sealer, or equal.

C. Sheet metal pipe sleeves: Fabricate from galvanized sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge. Adjustocrete, Sleevecrete, or equal.

D. Set all pipe sleeves and inserts in place before concrete is poured. Coordinate the placing of these items to avoid delaying concrete placing operations.

E. Sleeves for insulated piping shall be of adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking. Provide galvanized steel pipe sleeve, minimum 18 gauge, sized for maximum 1-inch space between insulation and sleeve. Omit specified insulation and apply same thickness of UL approved insulation through thickness of wall and extending 1" either side. Provide UL rated ceramic fiber packing. Pack space between sleeve and insulation with packing and seal ends with approved seal. Seal shall be positively fastened using metal plates, or escutcheons. Commercial pipe sleeve assemblies which are UL rated and which have been approved by the fire marshal for this purpose shall be used. Pipe Shields Inc. F1000 series or equal. Use only assemblies which have been designed for the service on which they are to be used.

F. Caulk space between sleeve and pipe or pipe covering through rated walls, partitions, and floors with fire rated, incombustible, UL listed, permanently plastic, waterproof non-staining compound leaving a finished, smooth appearance. Fire stopping shall be in accordance with specification **Division 07**. Provide supporting backing to secure material in place.

G. Provide sleeves as follows:

SLEEVE LOCATION	**SLEEVE MATERIAL**
Interior Wall, Partitions	Galvanized sheet metal
Membrane Waterproof Floor and Roof Construction	Standard weight black steel pipe with flashing clamp device welded or threaded to pipe sleeve. Flashing clamp device J.R. Smith 1720 or equal by Zurn

Non-membrane Floor Construction	Standard weight black steel pipe
Footings and Foundations	Schedule 40 galvanized steel pipe
Exterior Walls	Standard weight galvanized steel pipe with a continuously welded water stop of ¼" steel plate extending from outside of sleeve a minimum of 2" all around

H. Escutcheons, Finish and Plates:

1. Smooth up rough edges around sleeve with plaster.
2. Provide escutcheon plates where exposed pipes pass through walls, ceilings, or floors, in all finished rooms and conspicuous locations. Provide chrome or nickel-plated plates sized to fit pipe and pipe covering and give a finished appearance. Escutcheons held in place by set screws allowing enough clearance to care for expansion and shall be sufficient size to cover the opening around the pipe. Provide plates on pipes extending through sleeves.

2.17 THERMOMETERS

A. Type: Weksler Fill", or equal, industrial, green reading mercury glass tube, 9" cast of extruded case, double strength glass window, adjustable angle, stainless steel bulb chamber, brass extended separable socket. Provide stainless steel protected shield for outside application. Install for easy reading from floor with clear sight line.

1. Domestic Cold Water: Range of 0-120°F.
2. Domestic Hot Water: Range of 30 -240°F.

B. Separable Sockets: Brass 150 psi at with 2%" extension necks. Install vertically in runs of pipe.

C. Thermometer Wells: Install in piping for all thermometers. Construct to withstand pressure, temperature, and fluid in which installed with extension necks. Install vertically in horizontal runs of pipe.

D. For thermometers and wells through insulation, provide extensions to compensate for insulation thickness.

2.18 PRESSURE GAUGES

A. Weksler, or equal, drawn steel or brass case, glass lens, 4½" dial, 1% accuracy, ANSI B40.1 Grade 2A, phosphor bronze, bourdon tube, brass bottom connection.

1. Scale: White coated aluminum with permanently etched markings, black graduations and numerals, 270° arc scale.
2. Range: Dial range approximately twice the working pressure.

B. Provide pressure gauge cocks between pressure gauges and gauge tees on piping system.

2.19 VENT THROUGH ROOF

A. Provide Stoneman No. 1100-5, one (1) piece, four (4) pound, series with reinforcing steel boot counter-flashed with cast iron flashing sleeve and equipped with vandal-proof hood for all vent piping. Seal joint between flashing and pipe with waterproofing compound.

B. All vents through roof shall be provided with vent caps that have cast iron sleeve and dome secured with recessed Allen key set screws. Vent caps shall be manufactured by J.R. Smith or Zurn.

2.20 ACCESS DOORS AND PANELS

A. Furnish under this Division as shown and required by Regulatory Agencies for access to all concealed valves, water arrestors, unions, etc. Doors shall be in accordance with requirements of Division 08. Doors in this Division 08, and Division 26 shall be from same manufacturer for identical appearance and keying. Sizes: 24" x 24" inches' minimum for ceilings and 12" x 12" minimum for walls. Doors shall be furnished with cylinder locks. Furnish fire rated doors when located in rated construction. Deliver doors for installation under **Division 08**. Mark each door to accurately establish its location.

2.21 IDENTIFICATION OF PIPING AND EQUIPMENT

A. Above ground piping:
   1. All piping is to be identified as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, pressure sensitive pipe markers consisting of pipe content wording and arrow indicating directions of flow on ANSI color background. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other. Provide at each end of each marker, two and one-fourth inch wide self-sticking clear tape around periphery of pipe or insulation to further secure marker. All markers shall be applied to clean surfaces free of dust, grease, oil, or any other material which will prevent adhesion. Install after cleaning, painting and insulation is complete. Pipe identification shall comply with ANSI A13.1 for the "Scheme Identification of Piping Systems".
   2. Location and visibility for pipe identification:
      a. On all horizontal runs spaced twenty feet (20') maximum but not less than once in each room at entrance and exit of each concealed space.
      b. At each branch and riser takeoff.
      c. Within one foot (1') of each valve and control device.
      d. At every change in directional flow.
      e. At every pipe passage through wall, floor, and ceiling construction.
      f. Where capped piping is provided for future connections, provide legible and durable metal tags indicating symbol identification.
      g. At all wall and ceiling access
      h. Near major equipment items and other points of origination and termination.
      i. Attention shall be given to visibility with reference to pipe markings where pipelines are located above or below the normal line of vision; the lettering be placed below or above the horizontal centerline of the pipe.
   3. ANSI Color Coding of Piping:

SERVICE	COLOR OF FIELD	COLOR OF TEXT
Condensate Drain	Yellow	Black
Domestic Cold Water	Green	White

SERVICE	COLOR OF FIELD	COLOR OF TEXT
Domestic Hot Water	Yellow	Black
Domestic Hot Water Return	Yellow	Black
Non-Potable Water	Yellow	Black
Sanitary Sewer	Green	White
Sanitary Vent	Green	White
Storm Drain	Green	White
Storm Drain Overflow	Green	White

4. Size of Legend Letters:

OUTSIDE DIAMETER OF PIPE COVERING	MINIMUM LENGTH OF COLOR FIELD	MINIMUM SIZE OF TEXT
¾" to 1-1¼"	8"	½"
1½" to 2"	8"	¾"
2½" to 6"	12"	1¼"
8" to 10"	24"	2½"
Over 10"	32"	3½"

5. All exposed water piping and valves downstream of devices shall be properly identified and labeled as "Non-Potable" water.

B. Buried Utility Warning and Identification Tape:

1. All underground piping shall be identified with underground warning pipe markers as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, non-adhesive four (4) mil polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines. Tape shall be of the type provided in rolls, six inches (6") minimum width, color coded for the utility involved, with warning identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification for lines shall be "CAUTION (TYPE OF SERVICE) LINE BURIED BELOW". Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.
2. Run detector tape continuously along pipe and terminate in adjacent valve boxes or other suitable facilities. No splices will be allowed. Locate over buried pipe at twelve inches (12") below finish grade. Protect tape from damage during installation and Tape that is broken, cut or crumpled shall be completely replaced. Install twelve (12") above the top of the respective pipe and twelve (12") below the surface during backfill. Provide detectable type for buried non-metallic pipes.
3. ANSI Color Code of underground tape shall be as follows:

SERVICE	COLOR OF FILED	COLOR OF TEXT
Natural Gas	Yellow	Black
Water	Blue	Black

SERVICE	COLOR OF FILED	COLOR OF TEXT
Sanitary Sewer	Green	Black
Storm Sewer	Green	Black
Electric	Red	Black

C. Valve Identification:
   1. All valves shall have brass identification tag as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, brass valve identification tag secured with brass chain and “S” hook. Tags shall bear the service identification and numerical identification of the valve.
   2. Engrave identification tags with "normally open" (green) or “normally closed” (red).
   3. Tags:
      a. Minimum two inches (2") square pattern for plumbing and two inches (2") triangle for fire protection.
      b. No. 18 BS gauge brass with stamped numbers and letters filled in with black enamel paint. Engraving, ink, dye and vinyl fill are not acceptable.
      c. Identifying number and system letter. Top line shall be ¼” characters and should abbreviate the service. Example: Hot Water – HW. The second line shall be characters and should list the valve number. Example: 1st floor shall begin 101, second floor begin 201.
      d. Attach 6”-12” of brass jack chain around bonnet or stem of the valve in a way that it cannot accidentally come off. Attach appropriate size brass “S” hook to the chain in the most conspicuous location. Hang valve tag from the "S" hook. Valve tag should not be attached to the wheel causing interference with valve operation.
      e. Provide on: All valves and controls.
   4. Where shut-off valves are installed on-branch line leading to emergency safety equipment (emergency showers and eyewashes), the valves shall be locked in the open position labeled for identification.

D. Equipment Identification:
   1. Provide engraved plastic nameplates on all plumbing equipment, including but not limited to the following: Pumps (all types), water heaters, heat exchangers, and tanks. Provide nameplates on each piece of equipment and at the disconnect, and the breaker. Nameplates shall conform to the following, provided the equipment accommodate the sizes outlined:
      a. Black background with white lettering.
      b. Sizes: Equipment 2” x 4”, disconnect 1” x 2½”, breaker 1” x 3”.
      c. Lettering shall be ¾” (¼” minimum) or sized for the maximum per nameplate.
      d. Nameplate shall be provided with both adhesive backing and screw holes to insure permanent application.
      e. Material shall be 2 ply 1/16" thick with beveled edges.
   2. Properly identify each piece of equipment and controls pertaining thereto by nameplates mounted on equipment and controls using round head brass machine screws, pop rivets or contact cement. Cardholders in any form not acceptable. Install with corrosion resistant mechanical fasteners and adhesive and seal with clear lacquer.
   3. Place warning signs on machines driven by electric motors which are controlled by fully automatic starters, in accordance with Article 3281, General Industry Safety Orders.
   4. Small devices, such as pumps, may be identified with tags.
   5. Identify control panels and major control components outside panels with nameplates.
   6. Identify equipment out of view behind access doors, in unfinished rooms on the face of the access door.
   7. Emergency Safety Equipment: Emergency units shall be with highly visible signs in

8. At plumbing fixtures where water exceeding 120 degrees is accessible to users, warning signs with letters at least 2 inches high shall be posted above the fixture. Sign shall have "Danger Hot Water/Tap Symbol" in warning triangle and the words “Danger Hot Water, Use with Caution, Can Cause Severe Bums". Sign shall be approximately 12"high by 8" wide Semi-Rigid PVC and color shall be on White.

E. Valve and Equipment Identification Charts:
1. Provide five typewritten schedules giving numbers, service and locations, and notations of open or closed, of all tagged valves. Enclose each schedule in separate transparent plastic binder. List piping systems with symbol and color coding on pipe identification chart. List valve model numbers and symbol for service corresponding to piping symbol on valve identification chart. Provide small "key plan' identifying valves as related to column lines. Schematic flow diagrams of each piping system indicating:
2. Location and function of each tagged valve.
3. Type, size and essential features of each system.

F. Submit drafts of valve schedule for review before preparing final sets.

G. Frame five copies of reviewed schedule under glass, mount where directed.

H. Provide typewritten list of equipment in triplicate, indicating location, service for each piece of equipment, suitably framed, with glass front.

2.22 STRAINERS

A. Wye type, with Monel or stainless-steel strainer cylinder and gasketed machined strainer cap, bronze body, threaded, 250 pound, Apollo 59 Series, or equal.

2.23 FLEXIBLE CONNECTORS

A. All equipment, either rigidly mounted or mounted on vibration isolators, shall be attached to the piping system using flexible connectors designed for seismic movement. Flexible connectors shall be capable of movement in the ±X, ±Y and ±Z planes and must completely isolate the equipment from the piping.

B. Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings. For potable water service, connectors shall be classified in accordance with 61-1977 standards.

C. Flexible connectors attached to fuel gas lines, shall be specifically manufactured for gas applications, and certified by the American Gas Association.

D. Flexible connectors shall be flexible corrugated hose and braid, stainless steel, rated, 125psig minimum, 150 lb flange for pipe sizes 2-1/2” and larger and threaded ends for 2" and smaller, as manufactured by Dormont Manufacturing Co., or equal. Provide flexible metal hose assembly as shown on the drawings.

PART 3 - EXECUTION

3.1 DRAWINGS AND SITE

A. Drawings:
   1. All scaled and figured dimensions are approximate and are given for estimate purposes only. Before proceeding with any work, carefully check and verify all dimensions, sizes, lengths, etc.
   2. So far as possible the work has been on the drawings in such positions as to suit and accommodate the work of the other trades, but the work as indicated is largely diagrammatic and is shown primarily for clarity. Contractor is responsible for the correct placing of their work and the proper location and connection of work in relation to the work of other trades.
   3. Where apparatus and equipment have been indicated on the drawings, dimensions have been taken from typical equipment of the class indicated. Carefully check the drawings to see that the equipment will fit into the spaces provided.
   4. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.
   5. Contact Owner's Representative before any digging and investigate all existing conditions. Secure permit from Owner's Representative prior to initiation of underground excavation.

3.2 GENERAL PIPING INSTALLATION

A. Carry all exposed and concealed horizontal lines of pipe on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction. Use trapeze hangers for supporting groups of pipes. Piping in parallel shall be evenly spaced and supported.

B. Conceal all piping in furred walls and partitions and pipe spaces except where specifically noted otherwise. Check all piping runs beforehand with all other trades. Run piping to maintain proper clearance for maintenance and to clear opening in exposed area. Run piping in strict coordination with mechanical piping, ducts, and equipment, plumbing work, all electrical conduit and equipment, structural, and architectural conditions. Where work of other trades prevents installation of the piping as shown on the Drawings, reroute piping at no extra cost. Verify all inverts in pitched lines before starting work.

C. Install all exposed piping parallel to or at right angles with building walls and tight to walls or ceilings wherever possible, except where otherwise shown on the Drawings.

D. No valve and no piece of equipment or trim shall support the weight of any pipe.

E. Support all pipe from the building structure so that there is no apparent deflection in pipe runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Do not support pipe from or brace to ducts, other pipes, conduit, or any materials shown on the Drawings. Piping or equipment be immobile and shall not be supported or hung by wire, rope, plumber's tape or blocking of any kind.

F. Install all piping free from traps and air pockets and true to line and grade.

G. Wherever changes in sizes of piping occur, make such changes with reducing fittings, as the use of face bushings will not, in general, be permitted. Install eccentric reducing fittings where necessary to provide free drainage of lines.

H. Furnish and install insulating unions or insulating flanges as hereinbefore specified at all connections of ferrous and non-ferrous piping.

I. Firestop all pipes penetrating fire rated construction in accordance with specification **Division 07**.

J. No cutting or drilling of structural members shall be done without prior written approval of structural engineer.

K. Rough-In Work: Proceed as rapidly as the building construction will permit. All piping shall be completed, tested, and approved before being enclosed.

L. Thoroughly clean piping before installation. Cap all pipe openings to exclude dirt until fixtures are installed and final connections are made.

M. Provide a drip at any point in the gas lines where condensate may collect. All drips shall be readily accessible to permit cleaning or emptying.

N. Show no tool marks or threads on exposed plated, polished, or enameled connections to fixtures.

O. Provide each connection to faucet or fixture with an air chamber, eighteen inches (18") long, placed in a vertical position and one (1) pipe size larger than the pipe served.

P. Pitch: Horizontal sanitary and storm drain piping shall be installed at a uniform grade of not less than one-fourth inch (¼") per foot, unless otherwise indicated or directed.

Q. Contraction and Expansion: Install all work in such a manner that its contraction and expansion will not do any damage to the pipes, the connected equipment, or the building. Install offsets, swing joints, expansion joints, seismic joints, anchors, etc., as required to prevent excessive strains in the pipe work. All supports shall be installed to permit the materials to contract and expand freely without putting any strain or stress on any part of the system. Provide anchors as necessary.

R. Equipment and Fixtures Furnished under other Sections: For rough-ins and connections to fixtures and equipment furnished under other sections, ascertain exact sizes, services and locations before starting work. Verify accuracy of work shown on drawings before starting work. Contractor is responsible for providing proper installation. Provide proper prevention on all hot and cold-water service.

S. All piping shall be installed within designated finished and open ceiling heights as noted on the architectural drawings.

T. Coordinate the installation of access panels with the equipment or valve being served. Valves and equipment located in ceiling spaces shall be accessible and located no more than 2'-0" above the access panel and within arm reach. Distances greater than 2'-0" only allowed when it is not possible to meet the 2'-0" requirement. Approval from the Owner's representative shall be obtained for such installations.

U. Provide membrane clamping device for all piping drains and hose bibbs passing through any waterproof membrane.

V. Powder actuated fastening systems will not be allowed. Embeds, beam clamps, or drilled fasteners will be required, unless otherwise noted. Earthquake bracing shall be required for all piping.

W. All piping into stem walls and footings shall be double half lap wrapped with one-eighth inch (⅛") thick "Armaflex" insulation. The Contractor shall also provide blocked out areas in stem wall and footing as required for the installation of the piping. All piping shall avoid the lower eight inches (8") of the footing and the Contractor shall coordinate and provide dropped footings as required for the installation of the underground piping.

X. All piping on roof shall be anchored to neoprene or close-cell polyethylene blocking with pipe straps. Blocking shall be set in mastic at 6'-0" on center.

Y. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

Z. Provide pipe isolation for all piping through walls and floors. No piping shall have direct contact with walls, ceilings, floors, pipe supports, or hangers.

AA. Where pipe passes through building seismic or movement expansion joints: install flexible connection as manufactured by Metraflex to allow vertical and horizontal movement during an earthquake or ground settlement. Installation methodology shall be in conformance to design building movement for horizontal and lateral displacements.

3.3 PIPE JOINTS

A. Ream pipe ends to remove burrs, inspect each length of pipe carefully and remove all obstructions prior to fabrication.

B. Screwed Piping: Cut with machine cutter, hand pipe cutter or carborundum pipe wheel with file or scrapper or pipe reamer. Do not ream to exceed I.D. of pipe and thread to requirements of ANSI B2.1. Use Teflon tape on male thread prior to joining other services. No more than two full threads shall remain exposed after joining. Teflon tape shall not be used on steam trap piping.

C. Copper Tubing: Cut square; remove burrs and clean pipe and inside of fitting to a bright finish with steel wool, wire brush, sandpaper, or emery cloth. Apply solder flux with brush to tubing. Remove internal parts of solder-end valves prior to soldering. Provide dielectric unions at points of connection of all copper tubing and any ferrous piping and equipment.

D. Threaded Joints: Use threaded joints for natural gas pipes of size 2 inches and smaller. Where possible use pipe with factory-cut threads, otherwise cut pipe ends square, remove all fins and burrs, and cut taper pipe threads per ANSI B2.1. Threads shall be smooth, clean, and full cut. Apply thread tape to male threads only. Work piping into place without springing or forcing. Backing off to permit alignment of threaded joints will not be permitted. Engage threads so that not more than two threads remain exposed. Use unions for connections to valves for which a means of disconnection is not otherwise provided.

E. Press Joints: Press Installation Training Requirement: Installation training shall be provided on site by manufacturer personnel and documented with Engineer or safety director. Installation procedures, depth guides, and tool inspection shall be provided by manufacturer for all product types (steel or copper) for reference and safety assurance.

F. Welded Joints: Use welded joints for natural gas piping of sizes larger than two inches and all fuel oil piping. Weld by the shielded metal-arc process using covered electrodes and in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified for the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test report. Contractor shall conduct the ANSI qualification test.

3.4 PIPE SUPPORTS

A. Maximum hanger spacing and rod sizes for horizontal runs of piping shall be as noted in Table 313.3 & Table 313.6 respectively of the California Plumbing Code.

B. Every branch of piping over three feet (3') long shall have a separate hanger. Support at each horizontal branch connection. Provide at least one (1) hanger per branch.

C. Support all suspended piping with clevis or trapeze hangers and rods.

D. Hangers and supports shall be adequate to maintain alignment and prevent sagging and shall be placed within eighteen inches (18") of a joint. Support shall be provided at each horizontal branch connection. Hangers shall not be placed on joints. Make adequate provision to prevent shear or twisting of the pipe or joint.

E. Support for cast iron no-hub pipes shall be adjacent to joint, not to exceed eighteen inches Provide hangers on the piping at each side of and within eighteen inches (18") of a no-hub pipe coupling so that the coupling will not bear any weight. Provide supports at every other joint, unless over four feet (4') then support on each side of the coupling within eighteen inches (18") of the joint. Hangers shall not be placed on the coupling. Provide hangers adequate to maintain alignment and prevent sagging of the pipe. Make adequate provision to prevent shear or twisting of the pipe or joint.

3.5 CLEANOUTS

A. Size: Cleanouts of same nominal size as pipe they serve, except where they occur in piping four inches (4") and larger, in which case they shall be four inches (4") in size.

B. Accessibility: Make all cleanouts accessible. Use graphite on all cleanouts with all-threads being thoroughly greased after acceptable pressure test.

C. Cleanouts Locations:
1. Where indicated on drawings and as noted. Exact locations as directed by the Representative.
2. At all horizontal offsets.
3. At ends of or storm drain lines more than five feet (5') in length.
4. At one-hundred feet (100') maximum intervals on all or drain horizontal runs within the building lines.
5. At base of all soil/waste stacks and storm drain lines.
6. For cleanouts in finished portions of building, locations subject to Owner Representative's approval before installation.
7. Do not locate floor and wall in patient rooms, electrical rooms, and elevator machine rooms.

3.6 ROOF OPENINGS

A. Flash each pipe extending through roof with properly sized lead flashing assembly. Make watertight. Install vent caps on all vents through roof.

3.7 PLUMBING FIXTURES INSTALLATION

A. Installation: Set Fixtures level and in proper alignment with respect to walls and floors and sets of fixtures equally spaced. Install supplies in proper alignment with fixtures and with each other. Install flush valves in alignment with the fixture without vertical or horizontal offsets.

B. Seals: Seal all wall and floor mounted fixtures watertight where fixture is in contact with wall or floors. Fill all cracks and open spaces between fixtures and wall or floor with non-elastomeric sealer. Seal fixtures to wall and floor surfaces with sealant as specified in **[Division 07]**, color to match fixture.

C. Caulking: Caulk all deck mounted trim at the time of assembly, including fixture and casework mounted. Caulk all self-rimming sinks installed in casework.

D. Trim: Make up trim with care and with the proper tools in order that no tool marks show after installation.

E. Bolt carrier base supports to floor in accordance with manufacturer's installation instruction and recommendations.

F. Water Closets and Urinals: Test and adjust all flush valves for water closets and urinals for proper flow. Bowls shall completely evacuate with a single flush. Splashing of water out of the bowl is not acceptable.

G. Metered Faucets: Test and adjust all metered faucets for proper flow, duration of cycle.

H. Extra Stock: Furnish special and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten (10) units.

I. Installation of emergency safety equipment (emergency showers and eyewashes): Install emergency safety equipment in conformance with ANSI 2358.1-1998. Locate identification signs in accordance with this standard. Where shut-off valves are installed in the branch line leading to emergency safety equipment, the valves shall be indicating type (OS&Y or ball valve with lever handle), labeled for identification, and locked in the open position.

3.8 TESTING AND ADJUSTING

A. Provide all equipment required for testing, including fittings for additional operating. Plumbing Inspector shall be present at time of testing.

B. After the inspection has been approved or portions thereof, certify in writing the time, date, name, and title of the person reviewing the test. This shall also include the description of what portion of the system has been approved.

C. A complete record shall be maintained of all testing that has been approved and shall be made available at the job site.

D. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.

E. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated. Repairs shall be made with new materials. No caulking of screwed joints or holes will be acceptable.

F. Protection: Isolate all equipment subject to damage from test pressure. Make no test against a service valve or meter.

G. No part of any work shall be concealed or covered until after it is inspected, tested, and approved by the Inspector. All piping for plumbing shall be completely installed and tested as required by the Plumbing Code. The test pressures indicated are a minimum only. All tests shall be as required by the governing authority as well.

H. Sanitary Waste and Vent; Waste and Vent; and Drain Piping Systems: No-hub joints shall be tightened using a calibrated torque wrench. The water test shall be applied to the system either in its entirety or in sections. The piping shall be tightly plugged and submitted to a ten-foot (10') head (4.3 psi) of water located at the highest point. Provide a separate standpipe above the highest point being tested or extend the system to obtain the required ten-foot (10') head of water. The water shall be kept for at least thirty (30) minutes before the inspection starts. System shall hold water four (4) hours. Coordinate test tees with wall construction. Test tees shall not interfere with construction. Testing with compressed air or gas is not recommended.

I. Domestic Water: Test the system with water at a hydrostatic pressure of not less than one hundred twenty-five (125) psi. Provide a pressure gauge located at the highest point of the system being tested, with a shutoff valve and bleeder valve so arranged to check gauge operation. When the piping system operates at higher pressure than seventy-five (75) psi, the hydrostatic test pressure shall be fifty (50) psi above the operating pressure. The test shall be applied not less than 1 hour prior to inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately as specified for the entire system. There shall be no drop at the end of four hours.

J. Apply tests for a minimum period of four (4) hours or tests are complete.

K. Work may be tested in sections, if necessary, for convenience. In this case, test of last section shall include connections between previously tested sections and section under test.

L. Furnish all labor and all other utilities required to make tests. Make compliance tests in the presence of the Owner's Representative.

M. Should any piece of equipment, apparatus, materials, or work fail in any of these tests, immediately remove and replace by perfect material, and retest the portion of the work replaced.

3.9 PIPE DISINFECTION AND CLEANING

A. Supervision and Testing: Supervision and Testing: Perform disinfection under Plumbing Inspector's supervision. Disinfection shall be subject to written approval upon receipt of satisfactory laboratory test results.

B. Contractor's Responsibility:
   1. Furnish labor, equipment, materials, and transportation to disinfect domestic hot and cold-water systems and fire lines directly connected thereto, in conformity with procedures and standards described herein.
   2. Disinfect domestic hot and cold-water systems as required by the Public Health Department and all Authorities Having Jurisdiction.
   3. If no disinfection requirements are provided by the Authorities listed above, then disinfection shall conform to California Plumbing Code Sections 609.10.

C. Preliminary Preparations:
   1. Service Cock: Provide within three feet (3') of the entrance of the supply main to the building, a three-fourths inch (¾") service cock, or valve, for introducing the disinfecting agent into the lines.
   2. Flushing: After final pressure tests and before draining for disinfection, open each fixture or outlet until the water flow is clear.

D. Standards Necessary for Approval:
   1. The water system shall have been uniformly chlorinated under the supervision of Plumbing Inspector.
   2. The results of water sample analysis shall be negative for the Aerogenes organisms, with a coliform MPN of less than 2.2 and a total plate count of less than 100 bacteria per milliliter.
   3. If the test for the bacteriological quality of the water in the system does not meet the standards, repeat the disinfection procedure until the specified standards are met.

E. Final Approval: Health Department will give written approval for acceptance and use of the water system after the above procedures have been successfully completed and the standards met.

F. Temporary hook-ups shall be disinfected. All fittings and piping in temporary systems are to be disinfected.

G. Upon completion of the work, all records and certifications approving pipe disinfections shall be submitted to the Owner's Representative before final payment is made.

3.10 PROTECTION, CARE AND CLEANING

A. Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this work and until completion.

B. During construction, properly cap all lines and equipment nozzles to prevent of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint, or other work of other trades by covering it with polyethylene sheets.

C. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put into operation. All systems of any nature shall be thoroughly cleaned and flushed of all contaminates such as cuttings, filings, lubricant, rust, scale, grease, solder, flux, welding residue, debris, etc. Any piece of equipment or part of any system which malfunctions or is damaged due to failure or neglect on the of this Division to observe this paragraph shall be repaired or replaced to the satisfaction of the Owner's by and at the total expense of this Contract.

D. After completed installation, clean all systems.
   1. Piping, and Equipment, Non-insulated or to be insulated: clean exterior thoroughly to remove most, plaster, cement, and dirt before insulation is applied.
   2. Piping and Equipment to Be Painted: Clean exterior of piping, and equipment, exposed in completed structure, removing rust, plaster, cement, and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable non-toxic solvents. Touch up primer coat as required.
   3. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil and leave surfaces clean and polished.

4. Plumbing Fixtures: Clean and polish fixtures immediately prior to final inspection of Owner Representative's occupancy. Clean floor drain grates, faucet aerators and outlets, check each fixture to insure against trap stoppage.
5. Chrome or Nickel-Plated Work: Thoroughly polish.
6. Factory Finished Items: Remove grease and oil and leave surfaces clean and polished.

E. All code stamps and nameplates shall be protected from damage and must be clean and legible before final inspection.

F. All piping shall be flushed out or blown out after pressure testing is complete and before being put into use. All strainer screens shall be removed and cleaned.

G. After start-up and testing, strainer screens shall again be removed and cleaned.

3.11 PAINTING AND IDENTIFICATION

A. After completion of hydrostatic tests, all system piping exposed to view in or on the building shall be painted in accordance with **[Division 09]**.

B. Provide pipe, valve, and equipment identification, and signage in accordance with referenced standards, codes, and specifications.

3.12 ACCESSIBILITY OF EQUIPMENT

A. The installation of valves, thermometers, gages, traps, cleanouts, control devices or other specialties requiring reading, adjustment, inspection, repairs, removal, or replacement shall be conveniently and accessibly located with reference to the finished building.

3.13 CLOSING IN OF UNINSPECTED WORK

A. Do not allow or cause any work to be covered up or enclosed until inspected, tested, and approved.

3.14 EMERGENCY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding the guarantee bond or relieving the Contractor of their responsibility during the bonding period.

3.15 CLEAN UP AND REMOVAL OF SCRAP

A. For work under all Mechanical Sections, trash and scrap shall be cleaned up and removed from the site as the work progresses.

3.16 PRELIMINARY OPERATIONS

A. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

3.17 EXCAVATION AND TRENCHING: (As required for this section)

A. Trenches for underground piping shall have uniform grades same as for pipe. Pipe shall be embedded in six inches (6") minimum layer of clean sand all around.

B. Loose earth shall be tamped solid around sides and on top of sand-covered pipe and remainder thoroughly compacted to prevent settlement of the surface. After completion of backfill, the grade shall be finished to match the existing, or as directed. All paving and walkways shall be finished to match the existing.

C. Provide and maintain dewatering pumps as required. After piping installation, it shall be inspected and approved by the Owner's Representative before Backfill shall not be placed on or around piping for twenty-four (24) hours after pipe joints have been made and before lines are properly tested and approved.

D. Provide barricades, signs, lanterns, shoring, sheeting, and pumping as part of Work in this Division as required to insure safe conditions. Provide shoring and cross bracing of sufficient strength to properly support the walls of all excavations at depth of four feet (4') or more as required to protect personnel, and as required by OSHA.

E. Minimum burial for piping exterior to the building shall be thirty-six inches (36") minimum cover from top of pipe to finished grade except as otherwise shown, or as determined by invert elevations. Contractor shall verify all piping elevations, and invert elevations before starting work.

F. Excavation and pipe installation on public property shall be fully coordinated for timing and procedures with the authorities having jurisdiction. Work shall to all local Public Work rules and regulations. All paved areas and concrete sidewalks damaged during this work shall be repaired to match existing when new to the satisfaction of the governing authorities.

G. Dispose of all surplus excavation material and seepage water as directed by general contractor and in accordance with local codes and applicable laws.

H. Trees: When it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and roots. Where a ditching machine is run close to trees having roots smaller than two inches (2") in diameter, the wall of the trench adjacent to the trees shall be hand trimmed making clean cuts through the roots. All cuts through roots one-half inch and larger in diameter shall be painted with "Tree-Seal", or equal. Trenches adjacent to trees should be filled within twenty-four (24) hours after excavation, but where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas. Stockpiling of earth or building materials within the drip line of trees is prohibited. Where any roots two inches (2”) and larger are encountered, the Contractor shall hand tunnel under root and protect it by burlap wrapping.

I. Water piping shall not be run in the same trench with sewer or drainage piping unless separated as required by the plumbing code.

J. Pitch: Horizontal sanitary and storm drain piping shall be installed at a uniform grade of not less than one-fourth inch per foot, unless otherwise indicated or directed.

3.18 BACKFILL

A. Trenches: Do not place backfill in trenches until pipe installation has been reviewed and accepted by the Owner's Representative.

B. Within twenty-four (24) hours or as soon as pipe has been laid and inspected, place in layers to the elevation at which excavation was begun, or to a height of six inches (6") from rocks or lumps greater than four inches (4") in any dimensions. Place in six-inch (6") layers and bring up evenly and tamp continually on both sides of pipe. Use excavated materials or other approved materials as directed. Tamp by hand or with pneumatic tampers. Machine tamping and compaction by flooding or puddling will not be accepted.

C. Compaction: Relative compaction of backfilling for pipe trenches and concrete structures shall be not less than 90 percent in accordance with Test Method No. Calif. 216 and ASTM D1557-58T. Fills below structures and the upper eighteen inches (18") of sub-grade beneath areas to be paved shall be compacted to 95%.

D. Settling: which subsides or settles below finish grades or adjacent ground during warranty period shall be removed to top pipe and replaced with compacted fill as specified.

3.19 GUARANTEE

A. At completion, furnish the Owner's Representative a written guarantee, in triplicate, that work has been performed in accordance with Drawings and Specifications and to replace or repair, to the satisfaction of the Owner's Representative any portion of the work that fails within the guarantee period after final acceptance provided such failure is due to Also agree to replace or repair, with like any part of the building or equipment installed by other trades but damaged by them in installing their work.

B. During the guarantee period, make four (4) inspections of the work at six (6)-month intervals after final acceptance to check the performance of systems and correct any guaranteed items. Inspections to be made in the presence of the Owner's Representative.

C. Guarantee in writing all plumbing work for a period of twenty-four (24) months following date of certificate of final acceptance.

D. All apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

E. All plumbing and electrical apparatus shall operate at full capacity without objectionable noise or vibration.

F. The plumbing systems shall provide the performance required at standard operating conditions.

G. Where a manufacturer's guarantee exceeds one (1) year, the longer guarantee/warranty shall govern.

3.20 TRAINING

A. Submit a written test schedule to the Owner's Representative for approval a minimum of three (3) weeks prior to proposed training dates.

B. Provide three (3) sessions of two (2) hours each of instruction to the Owner regarding proper use and operation of the system. Submit a written course outline and a sample of all manuals to be used two (2) weeks prior to the scheduling of the training. Training shall include both classroom and "hands-on" sessions and shall occur after final inspection and testing. Location and timing of the training session is to be arranged with the Owner's Representative.

C. Two weeks prior to scheduled training dates, furnish the Owner's Representative with six (6) bound copies of complete instructions, including catalog cuts, diagrams, drawings, and other descriptive data covering the proper testing, and maintenance of each type of system installed, and the necessary information for ordering replacement parts. In addition, post one (1) copy of complete instructions at the control panel location.

D. Session shall include detailed training and instructions covering the necessary and recommended testing, operating, and maintenance procedures for each type of system. Session shall include training and instructions covering the emergency operation procedures for type of system.

E. Session shall include training and instructions covering the emergency operation procedures for each type of system.

END OF SECTION

SECTION 26 05 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to provide and install the Electrical Work as shown on the drawings and as specified hereinafter, including, but not limited to the following:
   1. Electrical and telecommunications service provisions as outlined on the drawings, including temporary power for construction.
   2. Branch circuit wiring, wiring devices and connections to all equipment requiring electrical service.
   3. Lighting fixtures completely lamped, including switches, raceways and wiring.
   4. Emergency egress/exit illumination system.
   5. Telecommunications system.
   6. Fire Alarm system.
   7. Mechanical equipment power connections, and motor starters where noted.
   8. Low voltage lighting control system and programming.
   9. Clock/Speaker system.
   10. All required incidental work, such as roof flashing, electrical testing, title 24 acceptance testing, and temporary power.
   11. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the the drawings.
   12. It is the intent of the drawings and specifications that systems be complete and, except as otherwise noted, be ready for operation.

1.02 RELATED WORK

A. Division 1 - General Requirements

B. Division 9 - Finishes

C. Division 23 - Mechanical

D. Section 07270 - Firestopping

1.03 INCORPORATED DOCUMENTS

A. Requirements of the General Conditions, Supplementary Conditions, and Division 1 Sections apply to all work in this Section, unless modified herein.

B. Published specifications, standard tests or recommended methods of trade, industry or government organizations apply to work of this Section where cited by abbreviations noted below, unless modified herein.
   1. 2022 California Code of Regulations.
   2. 2022 California Building Standards Administrative Code, Part 1, Title 24, C.C.R.
   3. 2022 California Building Code (CBC), Part 2, Title 24, C.C.R. (Based on 2021 International Building Code with 2022 California Amendments).
   4. 2022 California Electrical Code (CEC), Part 3, Title 24, C.C.R. (Based on 2017 National Electrical Code with 2022 California Amendments).
   5. California Energy Code, Part 6, Title 24, C.C.R.

6. 2022 California Fire Code (CFC), Part 9, Title 24, C.C.R. (Based on 2021 International Fire Code with 2022 California Amendments).
7. 2022 California Green Building Standards (CALGreen) Code, Part 11.
8. American Society of Civil Engineers 7-16 (ASCE/SEI), Minimum Design Loads for Buildings and Other Structures.
9. Underwriters' Laboratories, Inc. (UL).
10. Local Utility Company regulations.

C. All State and Municipal Codes and Ordinances.

1.04 CONDITIONS AT SITE:

A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.

B. Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner to the complete satisfaction of the Owner.

1.05 QUALITY ASSURANCE

A. Conformance:
1. All work shall conform to the applicable requirements of Article 1.3 above.
2. The Contractor shall notify the Architect, prior to submission of bid, about any part of the design, which fails to comply with abovementioned requirements.
3. If after contract is awarded, minor changes and additions are required by aforementioned authorities, even though such work is not shown on the drawings or covered in the specifications, they shall be included at Contractor's expense.

B. Coordination:
1. The Contractor shall become familiar with the conditions at the job site, and with the drawings and specifications and plan the installation of the electrical work to conform with the existing conditions and that shown and specified so as to provide the best possible assembly of the combined work of all trades.
2. The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Architect's approval, before work proceeds in these areas. No additional costs will be considered for work, which must be relocated due to conflicts with the work of other trades.
3. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.

1.06 SUBMITTALS

A. Product Data:
1. Comply with the provisions of Section 01 33 00 - Submittals.
2. Within 15 days after award of the Contract, submit:
   a. Complete electrical, lighting, and signal systems material list of all items proposed to be furnished and installed under this Division. Provide manufacturers data sheets for all devices, raceways, fixtures, equipment, and related products to be used for the Division 26, 27, and 28 work.
   b. Manufacturers' specifications and other data required demonstrating compliance with the specified requirements.
   c. Manufacturers' recommended installation procedures which, when approved by the Architect, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.
3. Shop Drawings: Furnish shop drawings and/or equipment cuts for the following:
   a. Light fixtures including lamps and ballasts
   b. Fire alarm system
   c. Telecommunications system
   d. Disconnect switches

e. Low voltage lighting control system
f. Power and signal concealed service floor boxes, and furniture panel infeed boxes.
g. Clock/Speaker system if specified herein and/or indicated on the drawings.

4. Test Reports:
   a. Factory Tests: As specified for specific equipment.
   b. Field Tests: Performance tests as specified for specific equipment.
   c. Megger Tests: As specified under TESTING.
   d. When series rated circuit breakers are used, provide a letter from the manufacturer of the equipment confirming that U.L. series rating exists for all protective devices. State the available fault current from the Utility Company and indicate that the overcurrent devices exceed the available fault current at the respective point of protection.
   e. Special Seismic Certification documentation as per CBC Section 1616A and ASCE/SEI 7-16 requirements for all equipment defined as 'critical' with an importance factor of 1.5 in Paragraph 1.10.M.3 of this Section.
   f. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-16 requirements.
5. Maintenance and Operating Manuals:
   a. Systems Description: Description of operating procedures.
   b. Controls: Diagrams and description of operation of each system.
   c. Equipment: Manufacturer's brochures, ratings, certified shop drawings, maintenance data, and parts lists with part numbers. Mark each sheet with equipment identification number and actual installed condition.
   d. Materials and Accessories: Manufacturer's brochures, parts lists with part numbers, and maintenance data where applicable. Mark each sheet with identification number of system and location of installation.
   e. The Maintenance and Operation Manual shall be presented in a bookmarked PDF file with tabbed sections as stated below. Provide all information in each section as stated below.
      1) 26 5101:
         (a) Insert the approved submittals for the light fixtures.
         (b) Highlight the lamp type that was installed for each light fixture.
         (c) Provide the names, address and telephone numbers of the manufacturer and the closest manufacturer's representative for each light fixture.
      2) 26 5101:
         (a) Insert the approved submittals for the motion sensing light control equipment.
         (b) Insert all operating instructions.
         (c) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative of the equipment.
         (d) Include the manufacturer's recommended maintenance of the equipment.
      3) 26 5700:
         (a) Insert the approved submittals for the low voltage lighting control equipment.
         (b) Insert all operating instructions.
         (c) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative of the equipment.
         (d) Include the manufacturer's recommended maintenance of the equipment.
      4) 27 0000:
         (a) Insert the approved submittals for the telecommunications system.
         (b) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative of the equipment.
         (c) Include the manufacturer's recommended maintenance of the equipment.

5) 28 3100:
   (a) Complete the “Record Of Completion” entirely.
   (b) In the “Download File” indicate the exact equipment that the Monitor Modules are monitoring. i.e. fire sprinkler flow switches, tamper switches, etc..
   (c) Simplify the Download File so that it coincides with the submitted and approved fire alarm single line diagram.
   (d) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative of the equipment.
   (e) Include the manufacturer's recommended maintenance of the equipment.
   (f) Insert an abbreviated data sheet that states how to test, reset and silence the fire alarm system.
   (g) Insert the name and telephone number of the Central Station that receives the alarms, and the proper sequence to follow during an alarm.
6) 27 5100:
   (a) Insert the approved submittals for the clock and speaker system and equipment.
   (b) Insert all operating instructions.
   (c) Provide the names, address and telephone numbers of the manufacturer, the closest manufacturer's representative of the equipment and the telephone company contact.
   (d) Include the manufacturer's recommended maintenance of the equipment including the UPS.
7) 26 0800:
   (a) Insert all systems testing results.

6. Record Documents: "As-builts": As specified under Paragraph 3.2 of this Section.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all trades.

B. Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with approved manufacturers' recommendations.

C. Replacements: 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.

D. This Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

1.08 SCHEDULING/SEQUENCING

A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by this Contractor.

B. The Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

1.09 REQUIREMENTS

A. The contract drawings indicate the extent and general arrangements of the conduit wiring systems, etc. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable, and within thirty-five (35) days after award of the electrical contract.

B. Unless material list and data is received as a complete and all-inclusive submittal within the stipulated time all items shall be provided as specified, with no deviations permitted.

C. Any and all additional costs incurred by the substitution of electrical material or equipment, or installation thereof, whether architectural, structural, plumbing, mechanical or electrical, shall be borne by the Contractor under this Section.

D. Burden of proof of equality of any substitution for a specified product is the responsibility of this Contractor.

E. Where required by Architect to ascertain equality of substitute product, Contractor may be requested to provide the specified item and the submitted substitution for comparison, at no additional cost to the Owner.

1.1 DESCRIPTION OF DEMOLITION AND REPLACEMENT WORK

A. This project includes the demolition and replacement, modification, or enhancement of existing facilities. As such, the project scope for this contractor shall include all associated electrical, lighting, and signal system upgrades and demolition/removal work at the existing buildings(s) and/or site. The intent is that all systems will be complete and functional at the completion of this contract and that all old systems, equipment, feeders, circuits, wiring, and related devices (no longer used) be completely and neatly removed. Where discrepancies between the drawings and existing conditions are noted, the Architect or Owner shall be notified immediately for resolution.

B. As with every renovation project, the electrical work will include (and require) exploration and other field work on a daily basis to complete the new designed equipment and connections within the constraints of the existing building and existing site conditions.

C. The contractor shall include as part of the base bid, sufficient labor hours to provide such exploration and field work throughout the duration of the project. Change orders for miscellaneous coordination of existing conditions will not be approved unless specific and latent conditions are uncovered that warrant such additional compensation or require additional work not shown on the drawings or included in the specifications, or implied by the designed conditions.

D. New raceways and wiring to new and renovated equipment are to be installed unless otherwise noted. Where raceways are installed in accessible concealed locations (i.e. unfinished spaces or electrical / mechanical / attic spaces), EMT with wire shall be used. Where new wiring is required to be routed through existing walls and ceilings that cannot readily be accessible for new conduit, MC cable or flex conduit and wiring may be installed, fished through and secured in each space as required by Code.
Non-metallic sheathed cable shall not be utilized on this project.

E. All new raceways shall be installed concealed and all new equipment installed flush, unless otherwise noted on the drawings or in these specifications.

1.2 GUARANTEE

A. This Contractor shall guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of one (1) year or as per the General Conditions of this project, whichever is longer. Dates shall be from the date of final acceptance of the building. The contractor shall further guarantee that he will, at his own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the guarantee. Such

repair or replacement shall be guaranteed for one (1) year from the date of repair or replacement.

1.3 PERMITS AND INSPECTIONS

A. This Contractor shall arrange for and obtain all required permits and inspections.

B. Do not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

1.4 IDENTIFICATION

A. Provide p-touch style labeling of circuit designations for all receptacles on the project.

B. Each branch circuit of panel boards to have a permanently fixed number with load directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten

description of equipment supplied by breakers. Where changes are made to existing panelboards, newly typewritten circuit directories shall be prepared to replace existing directories.

C. Provide label on all motors: "Caution. Automatic equipment. May start at any time."

D. Provide silk-screened or engraved identification labels on all switch box covers identifying specific loads that are not readily apparent to the user, including electroshades, projection screens, exhaust fans, audio-visual controls, etc.. Submit proposed labels to Architect for approval prior to manufacture of labels.

E. Provide identification of all pull boxes, junction boxes, and conduit stub-ups on the project as outlined below:
   1. For Power Feeders:
      a. Stencil cover with identifying circuit number.
      b. Lettering 1" high.
      c. Color of lettering black.
      d. Place lettering on cover in neat manner; run parallel to long sides of box.
   2. For branch circuits, grounding, communication, signal, and control systems boxes and blank conduit stub-outs:
      a. Paint inside back of each j-box, front of each cover, and ends of each blank conduit stub-out with identifying system color as listed below:

1)	277/480-volt	Orange
2)	120/208-volt	Blue
3)	Telephone/Data	Grey
4)	Ground system	Green
5)	Fire Alarm	Red
6)	Lighting control	Orange/White
7)	Clock/Speaker	Brown
8)	Emergency Power 277V	Orange/Red
9)	Emergency Power 120V	Blue/Red

PART 2 - PRODUCTS

2.01 GENERAL

A. Refer to applicable Division 26, 27, and 28 Sections for complete products specifications.

2.02 MATERIALS

A. Materials of the same type or classification, used for the same purpose, shall be the product of the same manufacturer.

2.03 ACCEPTABLE MANUFACTURERS

A. Materials shall be of make mentioned elsewhere in this specification. All materials shall be the best of their several kinds, perfectly new and approved by the Underwriters' Laboratories.

B. Where material, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality, style and utility and shall be the basis of the bid. Materials so specified shall be furnished under the contract unless changed by written approval of the Architect. Where two or more designations are listed, choice shall be optional with this Contractor, but this Contractor must submit his choice for final approval.

2.04 POSTED OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment where indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and

other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instruction exposed to the weather. Operating instruction shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

2.05 CATALOGED PRODUCTS/SERVICE AVAILABILITY

A. Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonable convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Drawings:
   1. The general arrangement and location of wiring and equipment is shown on the electrical drawings and shall be installed in accordance therewith, except for minor changes required by conflict with the work of other trades.
   2. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.
   3. Drawings indicate the circuit and panel which supplies each device or fixture. Provide and install conduit and conductors to make all connections from panel to nearest device and from first device to additional devices on same circuit. Conduit size and fill shall satisfy NEC requirements. Two or three different phases supplied by a 3-phase panel may share a single neutral only if circuit positions are adjacent in the panel. Do not exceed 4 #12 or 3 #10 conductors in a
   ½" conduit, 7 #12 or 5 #10 in a 3/4" conduit, and 11 #12 or 9 #10 in a 1" conduit, unless otherwise noted. Provide common handle-tie on breakers for multi-wire branch circuits (with common neutral), per NEC. If more than three current carrying conductors are installed in one conduit, conductor size shall be increased as required per NEC. Do not share neutrals for branch circuit runs to electronic equipment or where noted on the drawings.
   4. Drawings indicate the location of all light switches. Where fixtures in a room are controlled by more than one switch, the same lower case letter is drawn adjacent to a switch and each fixture controlled by that switch. Where no lower case letter is adjacent to a switch, all fixtures in the room are controlled by that switch. Provide and install conduit and wire from fixture to switch and between fixtures as required to accomplish switching shown. Do not route branch circuit wiring for light fixtures through switch boxes. Where dimming controls are specified, provide required dimming control wiring in addition to power wiring from control device to all controlled light fixtures. Provide separate conduit for dimming control wiring unless otherwise indicated on the drawings.
   5. Drawings indicate location of all signal outlet boxes. Provide and install conduit system as required and complete system wiring, unless otherwise noted.
   6. Control wiring is generally not shown on the plans. Contractor shall refer to control diagrams and provide and install all wiring and raceways required to make all interconnections.
   7. All branch circuit wiring No. 12 or No. 10 as noted, all control wiring No. 14, except as

noted next to "slash marks" on the drawings, or as noted under "Wire," as specified herein.

8. All dimensions, together with locations of doors, partitions, etc. are to be taken from the Architectural Drawings, verified at site by this Contractor.
9. Maintain "as-built" records at all times, showing the exact location of concealed conduits and feeders installed under this contract, and actual numbering of each circuit. Upon completion of work and before acceptance can be considered, this Contractor must forward to the Architect, updated CAD plans, corrected to show the electrical work as actually installed.
10. All standard 20A branch circuit conductors shall be #12 minimum for up to 75 linear circuit feet, #10 minimum for up to 150 linear circuit feet, and #8 for runs longer than 150 feet.

B. Measurements: Before ordering any material or closing in any work, verify all measurements on the job. Any differences found between dimensions on the drawings and actual measurements shall be brought to the Architect's attention for consideration before proceeding.

3.03 FIELD QUALITY CONTROL

A. All workmanship shall be first class and carried out in a manner satisfactory to and approved by the Architect.

B. This Contractor shall personally, or through an authorized and competent representative, constantly supervise the work and so far as possible keep the same foreman and workmen on the job throughout.

3.04 INSTALLATION/APPLICATION/ERECTION

A. All electrical raceways and devices shall be installed concealed (for raceways) and/or flush mounted (for devices), unless otherwise noted. Provide cut-in boxes and "fish" flexible MC or flex conduit and wire through existing walls to remain, unless shown otherwise on plans. Cut and patch to facilitate such installation to match adjacent and original finish.

B. All cutting, repairing and structural reinforcing for the installation of this work shall be done by the General Contractor in conformance with the Architect's requirements.

3.05 EMERGENCY POWER SOURCES

A. All emergency source circuits shall be installed in separate raceways (from normal power), per 2017 NEC 700.10(B), or the applicable code at the time of permitting.

3.06 TEMPORARY LIGHTING AND POWER

A. Provide and install temporary lighting and power systems for the duration of construction, of adequate size to accommodate the required lighting and power loads. Coordinate with other trades to insure adequate sizing.

B. Provide distribution equipment as required to support all construction activities.

3.07 FIRE STOPPING AND FIRE RATED PENETRATIONS

A. All electrical equipment mounted in, on, or through fire rated construction shall be installed to maintain the fire rating of the construction.

B. Provide fire rated pads (or other suitable assembly) around all electrical junction boxes in fire rated walls/ceilings/floors to maintain the fire rating.

C. Provide fire rated construction around all recessed light fixtures and/or panel board / cabinets mounted flush in fire rated walls to maintain the fire rating. Coordinate depth of construction with other trades to avoid conflicts.

D. Conduit sleeves shall be provided as a means of routing cables through fire-rated walls or floors. Openings in sleeves and conduits used for system cables and those which remain (empty) spare shall be sealed with an approved fireproof, removable sagging material. Sleeves which pass vertically from floor to floor shall be sealed in a similar manner using an approved re-enterable system. Additional penetrations through rated assemblies necessary for passage of tel/data wiring shall be made using an approved method and permanently sealed after installation of cables.

3.08 ADJUSTING AND CLEANING

A. All electrical equipment, including existing equipment not "finish painted" under other sections, shall be touched up where finished surface is marred or damaged.

B. All equipment, lighting fixtures, etc., shall be left in clean condition, with all shipping and otherwise unnecessary labels removed there from.

3.09 SCHEDULES

A. Coordination: Coordinate installation of electrical items with the schedule for other work to prevent unnecessary delays in the total Work.

3.1 WARNING SIGN MOUNTING

A. Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

3.2 PAINTING OF EQUIPMENT

A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6
corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.

B. Field Applied: Paint electrical equipment as required to match finish or meet safety criteria. Painting shall be as specified in the respective equipment section.

3.3 TESTS

A. Testing and inspection: See Section 26 08 00 - Testing.

END OF SECTION

SECTION 26 08 00

TESTING

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Work Included in This Section: All materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of the electrical work, including but not limited to the general systems noted below:
   1. Grounding system.
   2. Lighting system.
   3. Distribution system.
   4. Fire Alarm system.
   5. Lighting control system.
   6. Telecommunications system.
   7. Title 24 Acceptance Testing.
   8. Test additional work where specified in other Sections of these specifications or where indicated on the drawings (provide all materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of this Electrical Work):
      a. Medium voltage switchgear, transformers, and distribution system.
      b. Clock/Speaker system.
   9. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
   10. All work shall comply with Sections 26 05 00 and 26 27 00.
   11. In addition to the general system tests and inspections indicated above, the Contractor shall perform the following inspections and tests. The Contractor shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections:
      a. System Grounding.
      b. Switchgear, Switchboards, Distribution Panels, Panelboards.
      c. Feeders.
   12. The purpose of these tests is to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

1.02 APPLICABLE CODES, STANDARDS, AND REFERENCES

A. All inspections and tests shall be in accordance with the International Electrical Testing Association - Acceptance Testing Specifications ATS-2021 (referred to herein as NETA ATS-2021).

1.03 QUALIFICATIONS

A. Qualifications of the Testing Firm shall be as listed in NETA ATS-2021.

PART 2 - PRODUCTS

2.01 THIS ARTICLE DOES NOT APPLY TO TESTING.

PART 3 - EXECUTION

3.01 GENERAL

A. Final test and inspection to be conducted in presence of the Authority having Jurisdiction (AHJ) or Inspector of Record (IOR). Test shall be conducted at the expense of, and managed by, the Contractor, at a mutually agreed time. Submit written test report of all tests, with test result values and overall outcome.

B. All portions of the electrical installation shall be inspected and tested to ensure safety to building occupants, operating personnel, conformity to code authorities and Contract Documents, and for proper system operation.

3.02 INSPECTIONS AND TESTS

A. Tests: Field tests shall be performed and reports submitted, as per Section 26 05 00, Part 1.
   1. Final Inspection Certificates: Prior to final payment approval, deliver to the Owner, with a copy to the Architect, signed certificates of final inspection by the appropriate local authority having jurisdiction.
   2. Grounding System:
      a. All ground connections shall be checked and the entire system shall be checked for continuity. The resistance of grounding electrodes in the system shall be measured using a 3 point fall-of-potential method. The maximum ground resistance shall be three ohms. If the measured ground resistance exceeds three ohms, install (1) additional ground rod, bonded and interconnected with the grounding electrode system.
      b. Ground tests shall meet or exceed the requirements of the National Electric Code.
   3. Lighting Systems:
      a. The interior and exterior lighting systems shall be checked for proper local controls and operation of entire installation, including the operation of the low voltage lighting control system.
   4. Power Distribution System:
      a. Test each individual circuit at each panelboard with equipment connected for proper operation. Inspect the interior of each panel.
      b. Check verification of color coding, tagging, numbering, and splice make-up.
      c. Verify that all conductors associated with each circuit are in same conduit.
      d. Demonstrate that all lights, jacks, switches, outlets, and equipment operate satisfactorily and as called for.
   5. Fire Alarm System: Verify that all equipment, components, and devices function as specified. Refer to Section 28 3101 for additional testing requirements.
   6. Clock/Speaker System: Verify that all equipment, components, and devices function as specified. Refer to Section 27 5100 for additional testing requirements.
   7. Lighting Control System: Verify that all equipment, components, and devices function as specified. Refer to Section 26 5101 for additional testing requirements.
   8. Telecommunications System: Verify that all equipment, components, and devices function as specified. Refer to Section 27 0000 for

additional testing requirements.

B. Title 24 Acceptance Testing: Contractor shall complete the requirements for Title 24 Acceptance Testing, as per CA Title 24, Part 6.
   1. Perform testing requirements as per Title 24 Lighting Acceptance requirements. Testing shall include construction inspection of installed controls, occupancy / motion sensor testing, manual daylighting controls testing, automatic time switch controls testing, and demand response system interface, as applicable.
   2. Complete and submit all required forms for complete Acceptance Testing.
   3. Acceptance tests must be performed or overseen by certified Acceptance Test Technicians.
   4. Obtain required review and approval of Acceptance Forms to allow final certificate of occupancy to be granted.

END OF SECTION

SECTION 26 27 00
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below:
   1. Raceways, feeders, branch circuit wiring, wiring devices, safety switches and connections to all equipment requiring electric service.

B. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.

C. All work shall comply with Section 26 05 00.

1.02 RELATED WORK

A. Division 09 - Finishes

B. Division 23 - Motors and Mechanical Equipment Installation

1.03 SUBMITTALS

A. Comply with the provisions of Section 26 05 00.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Refer to Section 26 05 00, Basic Electrical Requirements, Part 2 - Products.

B. List of Equipment Manufacturers:

C. Conduit and Conduit Fittings
   1. Allied Tube and Conduit, Wester Tube and Conduit, LTV Steel Tubular, National Electric Products, AFC, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, Killark Electric Manufacting Company, Raco, VAW Aluminum Company, Bridgeport, Steel City, Thomas & Betts, Carlon, O.Z. Gedney, Appleton, Regal.

D. Wire and Cable (600V)
   1. American Wire Company, General Wire and Cable Corporation, Okonite Company, Rome Cable Corporation, Cerrowire, American Insulated Wire, AFC Cable Systems, Essex, Simplex Wire and Cable Company, Southwire.

E. Solderless Lugs and Grounding Connections
   1. Burndy Engineering Company Inc, O.Z. Gedney Company Inc, Penn Union Electric Corporation, Thomas and Betts Company Inc.

F. Pull Boxes, Gutters, Special Cabinets
   1. Schneider-Square D Company, Columbia Electric Manufacturing Company, General Electric Company, Eaton Inc.

G. Outlet Boxes
   1. Appleton Electric Company, Killark Electric Manufacturing Company, Lew Electric Fittings Company, National Electric Products Corporation, Raco, Steel City Electric Company, Carlon, Bowers.

H. Floor Boxes
   1. Steel City Electric Company, Hubbell Inc, RCI, Walker.

I. Wiring Devices
   1. Leviton, Arrow-Hart, Cooper, Hubbell, Lutron, Bryant.

J. Conduit Racks, Hangers
   1. General Electric Company, Killark Electric Manufacturing Company, Caddy, National Electric Products Corporation, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, VAW Aluminum Company, Superstrut, B-Line.

K. Safety Switches (Disconnect and Fusible)
   1. Schneider-Square D Company, Eaton-Cutler Hammer Inc, General Electric Company.

L. Fuses
   1. Bussman Manufacturing Company, Chase-Shawmut Company.

M. Firestopping
   1. 3M, Nelson.

2.02 MATERIALS

A. Grounding:
   1. Provide and install grounding system as noted on the drawings.
   2. Grounding electrode conductor: bare stranded copper type, #4/0 minimum.
   3. Install ground wires in rigid conduit.
   4. All grounding electrode conductor connections "thermite" or "cad-weld" welded.
   5. Use approved pressure type solderless connector or use fusion welding for all connections to and bonding of grounding electrode system. All connections shall be visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.
   6. Terminate grounding conduits at equipment with ground bushing, with ground wire connected through bushing.
   7. Provide No. 12 stranded (green) THHN conductor from outlet box to ground screw of every receptacle.
   8. Ground all isolated sections of metallic raceways.
   9. Provide #12 minimum stranded (green) THHN conductor sized per NEC, or as noted, connected continuously throughout branch circuit for all circuits, bonded to panel ground bus, and to all electrical devices and equipment enclosures.

B. Circuit Breakers:
   1. General: Circuit breakers shall be molded case rated for 480 or 240 volts, multiple or single pole and amperage rating as shown on the drawings, bolt on, manually operated with "de-ion" arc chutes.
   2. Branch circuit breakers shall be rated for the amps interrupting capacity or U.L. series rated with the distribution and main circuit breakers, General Electric type THQB or equal, minimum 10,000 A.I.C for 120/208 volt; type TEY or equal, minimum 14,000 A.I.C for 277/480 volt.
   3. Where mechanical equipment is U.L. listed for overcurrent protection with fuses or HACR type circuit breakers, provide fuses where a fused switch is shown. Where the overcurrent protection is a circuit breaker provide HACR, (Heating, Air-Conditioning and Refrigeration) type.
   4. Provide switch rated type "SWD" circuit breakers were the circuit breaker is used as a switching device in a panelboard.

C. Raceways: Only the raceways specified below shall be utilized on this project. Substitutions shall be pre-approved in writing. All bare conduit ends (stub-ups or stub-outs) shall be provided with bushed ends or manufactured insulated throat connectors:
   1. Rigid Type - hot dip galvanized or sherardized steel, use on all exterior locations, below grade or in concrete slab, and to 18" on either side of structural expansion joints in floor slabs, with completely watertight, threaded fittings throughout. Compression fittings are not acceptable.
      a. All rigid steel conduit couplings and elbows in soil or concrete or under membrane to be ½ lap wrapped with Scotch #50 tape and threaded ends coated with T&B #S.C.40 rust inhibitor prior to installation of couplings.
      b. ½ lap wrap all rigid steel conduit stub-ups from slab or grade to 6" above finished grade level with Scotch #50 tape.
   2. In lieu of rigid steel conduit for power and control raceways and branch circuit conduits in soil or concrete slabs, "Schedule 40" PVC with Schedule 80 PVC conduit elbows and stub-ups may be used with code size (minimum No. 12) ground wire. A “stub-up” is considered to terminate 6" above the finished surface.

a. Schedule 80 PVC conduit shall be used in all concrete footings or foundations and to 18" of either side of footings or foundation walls.
b. Schedule 80 PVC conduit shall be used in all concrete masonry unit (CMU) walls or columns.
c. All conduit runs in concrete floor slabs (where allowed) shall be installed to comply with all applicable CBC and structural codes to maintain the structural integrity of the floor slab. Where conflicts occur, alternate routing shall be provided at no additional cost to the Owner.
d. Where schedule 80 PVC is coupled to schedule 40 or other raceways with differing interior dimensions, each end shall be reamed with a reaming tool to reduce the edge profile for protection of the passing conductors during the pull.

3. Intermediate metal conduit may be used in all exposed interior locations, except that electrical metallic tubing may be used in some locations as noted below. Utilize steel compression type fittings for all exposed conduit runs, unless otherwise noted. Die-cast zinc fittings are unacceptable.
4. Electrical metallic tubing shall be used exposed in interior electrical and mechanical rooms, in interior unfinished spaces, and in interior concealed and furred spaces, made up with steel watertight or steel set screw type fittings and couplings. EMT shall not be used in under-building crawl spaces or other areas subject to moisture. Set screws shall have hardened points. Die-cast zinc fittings are unacceptable.
5. Surface mounted rectangular steel raceways and boxes: use for all surface mounted installations, unless otherwise noted (all catalog numbers listed are Wiremold - equals allowed) - color Ivory, unless otherwise noted;
   a. #V500 for branch power runs on ceilings and walls (used with V500 series straps, elbows, connectors and V5000 series low profile boxes and covers).
   b. #2000 or 2400 low profile for larger power run requirements on ceiling or walls (used with V2000 series straps, elbows, connectors and low profile boxes and covers).
   c. #2400D for dual service power and tel/data run requirements (used with divided V2400 boxes and covers).
6. Surface mounted rectangular non-metallic dual service raceways; Wiremold #5400 (Ivory) or equal with all required compatible activation covers, bezels, inserts, and blank plates for a complete installation. Refer to drawings for outlet quantities in raceway and feed points. All raceway fed flush from rear with horizontal j-boxes, unless otherwise noted.
7. Use flexible conduit for all motor, transformer and recessed fixture connections, minimum ½"; "Seal tite" type used outdoors and in all wet locations, provide with code size (minimum No. 12) bare ground wire in all flexible conduit.
8. All conduit cuts (factory or field cut) shall be perfectly square to the length of the conduit and cut ends shall be reamed with a reaming tool to provide a smooth edge to the passing conductors and to remove all burs and scrapes. Use of a hand file is not acceptable.
9. All electrical raceways shall be installed concealed, unless otherwise noted. Cut and patch to facilitate such installation to match adjacent and original finish. All exposed conduits, where required, shall be installed parallel to building members.
10. All emergency source circuits shall be installed in separate raceways (from normal power), per 2017 NEC 700.10(B), or the applicable code at the time of permitting.
11. Where existing conditions preclude the installation of EMT in existing walls to remain, provide and install cut-in type boxes and "fish" flexible MC or flex conduit and wire through existing walls to remain, unless shown otherwise on plans.
12. Fasten conduits securely to boxes with locknuts and bushings to provide good electrical continuity.
13. Provide chrome escutcheon plates at all exposed wall, ceiling and floor conduit penetrations.
14. Support individual suspended conduits with heavy malleable strap or rod hangers; supports for ½ inch or 3/4 inch conduit placed on maximum 7-foot centers; maximum 10-foot centers on conduits 1 inch or larger.
15. Support multiple conduit runs from Kindorf B907 channels with C-105 and C-106 straps.

16. To facilitate pulling of feeder conductors, install junction boxes as shown or required.
17. All empty conduits on the project shall be provided with a nylon pull rope to allow pulling of future conductors intended for the specific raceway. Provide plastic wire-tie style nameplate tags on each end of pull rope with printed

    identification of conduit use and the location of the opposite end of the rope. Pull ropes for telecommunications service conduits shall meet the utility company requirements.
18. Where conduits pass through structural expansion joints in floor slab, rigid galvanized conduit shall be used 18" on either side of joint, complete with Appleton expansion couplings and bonding jumpers, or equal. All above grade expansion joint crossings shall also utilize expansion joint couplings or flex conduit transitions as required for each particular installation. Installed condition shall allow for a minimum deflection of raceway and wire (in any direction) equal to the structural expansion joint dimension (building to building). No solid conduits shall be allowed to cross expansion joints without proper provisions for building and seismic movement.

D. Outlet Boxes and Junction Boxes. Verify all backbox requirements with devices to be installed prior to rough-in.
1. One piece steel knockout type drawn boxes, unless otherwise noted, sized as required for conditions at each outlet or as noted.
2. Flush-mounted boxes equipped with galvanized steel raised covers for device mounting flush with finished surface. Provide extension rings as required on all acoustical or additional wall treatment areas to bring top of cover flush with finished surface (coordinate with architectural drawings). Devices shall be capable of being tightly mounted to boxes without distorting or bending device or mounting hardware.
3. Boxes for fixture outlets: 4-inch octagon or larger as required, or as noted.
4. Switch and receptacle outlets - not smaller than 4-inch-square in furred walls, with raised cover for single device; ganged where required.
5. Outlet and switch boxes for wet locations, cast aluminum FS or FD type with cast aluminum gasketed spring lid cover. Weatherproof “Bell” type boxes are not acceptable.
6. All connectors from conduit to junction or outlet boxes shall have insulated throats. Connectors shall be manufactured with insulated throats as integral part. Insertable insulated throats are unacceptable.
7. Outlet boxes for telecommunications, 4" square or larger as required or noted, multi-ganged for voice, data, and other services where indicated on the drawings.
8. Conduit Bodies: Malleable iron type, with lubricated spring steel clips over edge of conduit body, O-Z/Gedney type EW, or equal.
9. Floor Boxes:
    a. Classification and Use: Floor boxes shall have been examined and tested by Underwriters Laboratories Inc. to meet UL514A and Canadian Standard C22.2 and shall bear the appropriate label. Floor boxes shall conform to the standard set in the National Electrical Code. Multi-compartment boxes shall have been evaluated by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.
    b. Floor boxes shall provide flush or recessed device outlets that will not obstruct the floor area. Refer to Drawings for size and types. This specification covers concrete and wood frame floor applications with Wiremold 800, 860 and 880 and RFB Series boxes.
    c. Cast-Iron Boxes: Box interior and exterior shall be painted. Boxes shall be available in 1,2, and 3 gang configurations. Boxes shall also be available in deep and shallow versions. Box shall provide 1-3/4 inches of pre-pour adjustment and 1/2 inch of post-pour adjustment.
    d. Steel Boxes: Boxes shall be manufactured from stamped steel and formed. Boxes shall be available in 1,2, and 3 gang configurations. Boxes shall also be available in deep and shallow versions. All stamped steel versions shall provide 1-3/4 inches of pre-pour adjustment and 1/2 inch of post-pour adjustment.
    e. Nonmetallic Multi-service Floor Boxes: Boxes shall be manufactured through the use

of injection molded Geon M3900 PVC material. The box shall be rectangular in shape. Boxes shall allow for ganging of boxes together through a dovetail interlocking mechanism. Knockouts shall be provided on the side walls of each box to provide for pass-through capability between each gang. Boxes shall also have concrete depth markings on the exterior of the box to indicate box depth at the time of the pour. Boxes shall also provide graduated cubic inch markings on the interior of the box to indicate volume capacity at the appropriate box depth. Box shall accommodate concrete depths from
3-1/2 inches minimum to 6 inches maximum.

1) Floor boxes shall provide (2) 1-1/4 inch conduit openings to feed cabling to the box. Boxes shall provide the means to reduce this opening to fit 1 inch, 3/4 inch and 1/2 inch conduit sizes. Box shall be equipped with a high impact mudcap to protect the box from damage and prevent concrete entry during the pour and debris entry after the pour. Box shall also provide ratchet teeth along interior box walls to attach cover. Box shall include internal spacer to prevent deformation of the box sidewalls when high temperature additives are used in the concrete pour.
2) Adjusting rings shall be used to attach flanges and covers to the floor box body. Adjusting ring shall have ratchet teeth to align with the teeth on box wall to connect box body without the use of adhesive or mechanical fasteners. Adjusting ring shall provide for 10 degrees of adjustment after concrete pour to adjust to various concrete conditions and floor finishes. Provide brass inserts to mount finish flanges to box body. Adjusting ring shall also provide for grounding locations using brass inserts.
3) Adjusting ring shall provide the ability to accept a modular connectivity system. Modular communication inserts shall snap directly into the adjusting ring openings. Adjusting ring shall provide a fiber storage loop to maintain proper fiber optic bend radius control and excess fiber storage. Each adjusting ring shall except up to six connectivity activation locations. Adjusting ring shall allow modular connectivity inserts to be mounted recessed and protected when not in use.

f. Covers and Flanges:
   1) Floor box options shall accept aluminum, brass and nonmetallic cover plates and flanges.
   2) Flanges shall be available in one-, two-, and three-gang applications. Each flange shall provide 1/2 inches of adjustment to accommodate various floor coverings and concrete depths.
   3) Flanges shall accommodate connectivity outlets and modular inserts.
   4) Modular inserts shall snap directly into each flange using a mounting bezel.
g. Multi-Compartment Boxes:
   1) Boxes shall be fully adjustable, providing a maximum of 1-7/8 (RFB4) 2” (RFB9/RFB11) inch pre-pour adjustment, and a maximum of 3/4 inch post-pour adjustment.
   2) Boxes shall provide a series of device mounting plates that will accept both duplex power devices, as well as plates that will accommodate connectivity and AV outlets with modular inserts.
   3) The box shall provide ¾”, 1” and 1 ¼” conduit size openings with 2” KO for larger size boxes.
   4) Cover shall be cast aluminum. Lid shall be offered with solid, flush surface for tile, wood or terrazzo and an insert option for carpet inlay.
   5) Cover options shall support loads from 390LBS to 3000LBS
   6) Use cast iron boxes for on-grade applications (RFB4-CI-1). Stamped steel allowed for above grade applications (RFB-4 and RFB-4DB).

E. Wire and Cable (line voltage and signal systems):
   1. 600-volt class where used for or run with line voltage power wiring, insulation color coded, minimum No. 12 AWG for power branch circuits, No. 14 for power control circuits, and wiring size and type as directed by signal system manufacturer for each

signal system.

2. All conductors shall be copper.
3. Size and insulation type:
   a. Standard locations: #12 to #1 AWG: THWN for wet locations and THHN for dry locations. #1/0 through #4/0 AWG: XHHW (55 Mils). 250MCM and larger: XHHW (65 Mils). All wire sizes used shall be based on a 75 degree insulation rating, unless specifically used with 90 degree rated breakers and devices.
   b. All wiring (power and signal) installed underground between buildings, or in wet or damp locations, shall be outside listed and rated for wet locations.
   c. High temperature and non-standard locations: Provide wire type and insulation category suitable for area of use as defined in NEC table 310-13.
4. Conductors No. 8 and larger and as otherwise noted on drawings shall be stranded. Power conductors No. 12 and No. 10 shall be solid or stranded. Power conductors No. 14 or smaller shall be solid.
5. Provide signal system wiring for each system to meet the system manufacturers requirements and recommendations for each device or equipment type. Signal wiring systems shall be provided with shielding and/or insulation type and cable quantities as directed by the manufacturer, and meet all NEC requirements for locations used.
6. Install all wiring branch circuits and feeders (low voltage and line voltage) in conduit unless noted otherwise on the drawings. Contractor shall mandrel all feeders and pass a "sock" (or utilize other suitable means) through each raceway prior to pull to remove all water and construction debris. All raceways shall be completely clear of any obstructions or debris and all cut ends shall be reamed, prior to pull. Utilize pulling compound on all runs to insure minimum friction and pulling tension.
7. Megger test all feeders prior to energizing. See section 26 08 00 for additional information.
8. Approximately balance branch circuits about the neutral conductors in panels.
9. Connections to devices from "thru-feed" branch circuit conductors to be made with pigtails, with no interruption of the branch circuit conductors.
10. Neutral conductor identified by white outer braid, with different tracers of "EZ" numbering tags used where more than one neutral conductor is contained in a single raceway.
11. Neatly arrange and "marlin" wires in panels and distribution panelboards with "T and B Ty-rap" or approved equal plastic type strapping.
12. All wire and cable shall bear the Underwriters' Label, brought to the job in unbroken packages; wire color-coded as follows:

	Voltage	Phasing	A	B	C	N
b.	120/208	3PH4W	Black	Red	Blue	White
c.	2083PH	3W	Black	Red	Blue	--
d.	277/480	3PH4W	Brown	Orange	Yellow	White
e.	4803PH	3W	Brown	Orange	Yellow	--

13. The equipment grounding conductor shall be insulated copper; where it is insulated, the insulation shall be colored green.
14. Label each wire of each electrical system in each pull box, junction box, outlet box, terminal cabinet, and panelboard in which it appears with "EZ" numbering tags indicating the connected circuit numbers.
15. Provide permanently affixed adhesive labels with machine printed lettering (min. 1/8" high) at junction boxes serving fixtures that are supplied by (2) electrical sources (i.e. normal and emergency lighting). Label to read "CAUTION - This light fixture is powered by (2) separate sources. The normal power source breaker and the emergency power source breaker must be turned off before servicing this light fixture."

F. Switches: Model numbers are Hubbell, color to be selected by architect, unless otherwise noted. All switches to utilize screw terminals for wire connections - no plug-in terminations:
   1. Single Pole - No. HBL1221

2. Two Pole - No. HBL1222
3. Keyed, - No. HBL1221L
4. Motor Rated Double Pole (30A) - Hubbell No. 7832
5. Motor Rated Three Pole (30A) - Hubbell No. 7810.
6. Low voltage Data line switches - Refer to lighting control system (for compatibility)

G. Receptacles: Mounting straps and contacts shall be one piece design, constructed of minimum .050" solid brass. Base shall be high strength, heat resistant, glass reinforced nylon. Device shall accept up to #10 wire, side or back wired with screw terminals -

no plug-in terminations. Hubbell, Leviton, Pass & Seymore, or equal. Color to be selected by architect, unless otherwise noted. Numbers listed below are Hubbell:

1. 15A 3PG 125 volt duplex - No. HBL5262
2. 20A 3PG 125 volt duplex - No. HBL5362
3. 20A 3PG 125 volt ground fault interrupter receptacle; GFI receptacles shall conform to the 2006 UL requirements to a) interrupt power to the unit in the event of internal failure, or b) provide an audible or visual indication of internal failure of the GFI; No. GF20 or equal. Through wiring to down stream GFI designated receptacles is not acceptable.
4. 15A 3PG 125 volt half controlled duplex receptacle - No. BR15C1(color), with permanent "controlled" marking, factory applied.
5. 20A 3PG 125 volt half controlled duplex receptacle - No. BR20C1(color), with permanent "controlled" marking, factory applied.
6. 15A 3PG 125 volt full controlled duplex receptacle - No. BR15C2(color), with permanent "controlled" marking, factory applied.
7. 20A 3PG 125 volt full controlled duplex receptacle - No. BR20C2(color), with permanent "controlled" marking, factory applied.
8. GFI Module (blank face), no indicator light, 20A - No. GFBF20 or equal.
9. All receptacles located in exterior or wet locations shall be corrosion resistant with UV stabilized body.
10. All receptacles in locations identified in NEC 406.12 (i.e. dwelling units, hotel/motel guest rooms, child care, preschool, K-12 schools, business office common areas, clinics, medical, and outpatient facilities, assembly area common areas, dormitory units, and assisted living units) shall be tamper resistant.

H. Plates: Leviton, or equal, except as noted:

1. The color of all faceplates shall match the color of the devices installed under/in the faceplate, except as specifically noted otherwise.
2. For flush outlet boxes, for switches, and receptacles: nylon, color to be selected by architect, unless otherwise noted.
3. Plates for surface-mounted outlets: galvanized steel unless otherwise noted.
4. Weatherproof duplex receptacle plates for exterior locations with ground fault interrupter receptacles in type FS or FD boxes - Hubbell #WPFS26 or compatible equal. Verify cover compatibility with box type and device installed.
5. Weatherproof "in-use" cover, vertical or horizontal mount, for exterior with GFCI receptacles. Die-cast metal alloy, TayMac MX series or equal with openings to match installed devices.
6. Locking plates for duplex receptacles where noted; Pass & Seymour #WP26-L (non-weather proof).
7. Locking plates for duplex exterior GFCI receptacles (or in wet or damp locations); Heavy duty cast aluminum flush cover with locking latch and key, Pass & Seymour #4600 with appropriate mounting plate for type of device installed. Coordinate backbox requirements and finished wall trim-out with wall installer prior to rough-in to insure an adequate and neat trim appearance upon completion.
8. Plates for flush tele/data boxes: white nylon or as otherwise directed - provide and install at each tele/data outlet plate to match duplex power outlet plate, for jack installation under Section 27 00 00. Where the power and tele/data outlet

boxes are shared the plate shall be continuous in multi-gang locations. See drawings.

I. Equipment Disconnects: All disconnects shall be located to allow proper code required clearance in each area. Locations shown on drawings are diagrammatic only. The contractor shall coordinate exact locations in the field (with other trades) prior to rough-in to insure proper clearances.
   1. Motor Disconnect Switches and Safety Switches: General Electric Company Heavy Duty Type "THD", cover interlocked with operating handle so that cover cannot be opened with switch in closed position and switch cannot be closed with cover in open position. 240V or 480V rating, single or multi-pole as required or as noted on drawings, in Nema 1 enclosure indoors or Nema 3R enclosure outdoors unless otherwise noted. Provide dual element motor circuit fuses sized as recommended by equipment manufacturer (for final equipment actually installed).
   2. Code required disconnects: Provide a local disconnect in addition to the branch circuit protection device for all equipment as required by code (whether shown or not). Disconnects shall consist of a motor rated switch (or disconnect) for all motor loads less than 3/4HP or other suitable disconnect sized to match branch circuit conductors and load current of equipment, with number of poles as required.

J. Lugs and Connectors: Thomas and Betts "lock-tite", for No. 4 and larger wire; 3M "Scotchlock" fixed spring screw-on type wire connectors with insulator for No. 6 and smaller wire.
   1. All splices shall be made up with screw-on type connectors - no plug-in or push-in style connectors acceptable. Wires shall be solidly twisted together with electricians pliers before screw-on connector is installed to ensure a proper connection in the event of wire nut failure. No exceptions.
   2. Connectors listed or labeled for “no wire twisting required” are not an acceptable substitute for actual wire twisting.
   3. Utilize porcelain type connectors in all high temperature environments (above 105 degrees Celsius).

K. Splice Insulation: "Scotch" electrical tape with vinyl plastic backing or rubber tape with protective friction tape for interior work.
   1. Splices in electrical cables of 600 volt insulation class in underground system duct shall be made only in accessible locations such as pullboxes, light pole handholes, etc., using a compression connector on the conductor and by insulating and waterproofing (for exterior and underground locations) by one of the following methods:
      a. Cast type splice insulation shall be provided by means of a molded casting process employing a thermosetting epoxy resin insulating material which shall be applied by a gravity poured method or by a pressure injected method. The component materials of the resin insulation shall be in a packaged form ready for convenient mixing after removing from the package. Do not allow the cables to be removed until after the splicing material has completely set.
      b. Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be applied. When the mold is in place around the joined conductors, the resin mix shall be prepared and poured into the mold. Do not allow cables to be moved until after the splicing materials have completely set.

L. Identification: Refer to Section 26 05 00.

M. Firestopping: as manufactured by 3M Fire Protection Products or equal.
   1. Fire-rated and smoke barrier construction: Maintain barrier and structural floor fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, an at other construction gaps.
   2. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

PART 3 - EXECUTION

3.01 REFER TO BASIC ELECTRICAL REQUIREMENTS - SECTION 26 05 00 FOR WORK UNDER THIS SECTION.

3.02 TESTS

A. Testing and Inspection: See Section 26 08 00 - Testing.

END OF SECTION