

TECHNICAL SPECIFICATIONS

PROJECT # 06317

**HESTER ELEMENTARY SCHOOL
RESTROOMS AND LIFE SKILLS LAB**

**1480 THE ALAMEDA
SAN JOSE, CA 95126**

OCTOBER 5TH, 2017

SANTA CLARA COUNTY OFFICE OF EDUCATION

**1290 RIDDER PARK DRIVE, MC254
SAN JOSE, CA 95131-2304**

Prepared by Architect:

Artik Art & Architecture
394-A Umbarger Road
San Jose, CA 95111
(408) 224-9890
Artik #02422

SIGNATURE SHEET

FOR

**HESTER SCHOOL
RESTROOMS & LIFE LAB ALTERATIONS**

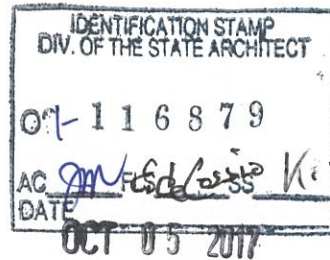
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SAN JOSE, CA 95126

SANTA CLARA COUNTY OFFICE OF EDUCATION

Project Number: 6317



ARTK ART AND ARCHITECTURE
Architect



DIVISION OF THE STATE ARCHITECT



PEOPLES ASSOCIATES, INC.
Structural Engineer



H & M MECHANICAL GROUP
Mechanical Engineer



ALIANCE ENGINEERING CONSULTANTS
Electrical Engineer

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SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Demolition and removal of selected portions of building or structure.

B. Related Requirements:

- 1. Section 01 11 00 "Summary of Work" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
- 2. Section 01 73 10 "Cutting and Patching" for cutting and patching procedures.
- 3. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Pre-demolition Photographs or Video: Submit before Work begins.

- C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
 - D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.
- 1.6 CLOSEOUT SUBMITTALS
- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- 1.7 QUALITY ASSURANCE
- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- 1.8 FIELD CONDITIONS
- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
 - C. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
 - D. Storage or sale of removed items or materials on-site is not permitted.
 - E. 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.

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 ANSI/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 record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

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.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 01 11 00 "Summary of Work."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated 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 fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated 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.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

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, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use 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. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

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, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
 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. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 01 74 10 "Demolition Waste Management."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

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 02 41 19

SECTION 06 10 00 – ROUGH CARPENTRY**PART I – GENERAL****1.01 DESCRIPTION OF WORK**

- A. Summary: The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation and facilities and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing rough carpentry, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom.
- B. Work included:
1. Furnishing and installing wood framing and sheathing systems including manufactured wood products and or trusses.
 2. Furnishing and installing glue-laminated beams
 3. Wood furring, blocking and nailers.
 4. Furnishing and installing light gage metal connectors
 5. Backing for wall mounted equipment, railings, toilet partitions, toilet accessories, etc.
 6. Rough hardware, including tie-downs, post caps, metal straps, etc.
 7. Acoustical sealant, where indicated, at wood plates and plywood.
 8. Prefabricated wood products
 9. Temporary bracing

1.02 REFERENCE STANDARDS (latest editions apply)

- A. AITC- American Institute of Timber Construction Standards
1. 103 – Standard for Structural Glued Laminated Timber
 2. 110 – Standard Appearance Grades for Structural Glued Laminated Timber.
 3. 111 – Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection.
 4. 113 – Standard for Dimensions of Glued Laminated Structural Members.
 5. 115 – Standard for Fabricated Structural Timber
- B. ANSI- American National Standards Institute
1. ANSI/AITC A190.1 Structural Glued Laminated Timber

2. ANSI/ASME B18.2.1 Square and Hex Bolts and Screws (Inch Series)
3. ANSI/ASME B18.6.1 Wood Screws (Inch Series)
- C. APA- American Plywood Association Product Standard PS 1-09.
- D. ASTM- American Society for Testing and Materials: D5055-05, Establishing and monitoring Structural Capacities of Prefabricated Wood I Joists.
- E. ASTM A307, "Specification for Carbon Steel Externally Threaded Standard Fasteners"
- F. ASTM F 1667-05, "Standard specification for Driven Fasteners: Nails, Spikes, and Staples".
- G. AWPA- American Wood Preservers Association Standards
- H. AWPI- American Wood Preservers Institute LP-2
- I. ICC- International Code Council, Inc.
 1. CBC- California Building Code, 2016 Edition
- H. FS- Federal Specifications
- I. TPI- Truss Plate Institute: Design Specification for Metal Plate Connected Wood Trusses.
- J. WCLIB- West Coast Lumber Inspection Bureau, Grading Rule No. 17
 1. ASTM A307, "Specification for Carbon Steel Externally Threaded Standard Fasteners"
 2. W.C.L.I.B., "Standard Grading and Dressing Rules No. 17"
 3. ASTM F 1667-00, "Standard Specification for Driven Fasteners: Nails, Spikes, and Staples"

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all Federal, State and Local Codes and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. "California Building Code", current governing edition.
 2. National Forest Products Association, "National Design Specification for Wood Construction".
 3. American Plywood Association, "U.S. Product Standard PS 2-10".
 4. Laminated Members should be in conformance with the Standard Specifications for Structural Glue-Laminated Timber per ANSI/AITC A190.1-2012.

- B. Grade Marks:
 - 1. All framing lumber shall be identified by the grade stamp of the West Coast Lumber Inspection Bureau.
 - 2. All sheathing shall be identified as to species, grade, and glue type and shall bear the identification grade mark of APA. All glu-lam beams shall be stamped with an AITC product quality mark.
- C. Certificates of Conformance: The Contractor shall provide AITC Certificate of Conformance for glu-lam beams in accordance with the requirements of Section 1.04, "Submittals", of this Specification Section.

1.04 SUBMITTALS

- A. Shop drawings of glue-laminated beams plus AITC or equal certificate of conformance with product standard ANSI/AITC 190.1
 - B. Shop drawings of prefabricated wood I joists including:
 - 1. Plan layout of members and bridging, design loads and installation instructions.
 - 2. Details of member connections, stiffeners, blocking and web openings.
 - 3. Structural calculations stamped and signed by California Registered Civil Engineer.
 - C. Product information for rough hardware.
- 1.05 Store lumber and plywood off ground in manner to insure proper ventilation and protection from weather; and to prevent damage by either decay or insects. Store plywood under cover and cover lumber as required to avoid twisting and warping.
- 1.06 Coordinate work of this Section with work by others. Check lines and levels indicated on such other work as has been completed, before commencing work of this Section. Report discrepancies in writing to the Owner for correction and adjustment, or in the event of failure to do so, correct errors without additional cost to the Owner.
- 1.07 Install temporary bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles of materials, erection equipment or other loads are carried by frame during its erection.

PART II – PRODUCTS

- 2.01 WOOD: Materials shall conform to grades and grading rules as hereinafter specified. Each piece of lumber and plywood shall be grade-stamped or certified by a competent agency approved by the Owner.
- A. Framing Lumber: Douglas Fir – Larch conforming to “WCLIB Standard Grading and Dressing Rules No. 17” as follows:
 - 1. Structural Light Framing: 2” to 4” thick 2” to 6” wide D.F. No. 1
 - 2. Structural Joists & Planks: 2” to 4” thick, 6” and wider D.F. No. 1 or better
 - 3. Beams & Stringers: 5” and thicker, Rectangular width more than 2” greater than thickness D.F. No. 1, free of heart centers
 - 4. Posts & Timbers: 5” x 5” and larger, width not more than 2” greater than thickness D.F. No. 1 free of heart centers
 - 5. Sills: Pressure treated D.F. No. 1, AWPB Stamped, Ammoniacal Copper Quat (ACQ) treated AWPA Standard C2, minimum 4/10” penetration, incised
 - B. Plywood: (APA Grade) Structural I, with exterior glue, 5-ply construction, all Group 1 wood, minimum span rating 24/0 for roof sheathing, 48/24 for floor sheathing, and 32/16 for wall sheathing.
 - C. Glued Laminated Timber
 - 1. Lumber; Douglas Fir (Laminating Grades), Grade Combination No. A ($F_B = 2,400$ psi) graded in accordance with the Standard Grading and Dressing Rules of WCLIB.
 - 2. Glues: Exterior type adhesive conforming to ASTM D2559, resin adhesive of phenol, or melamine base applied in accordance with the manufacturer's recommendation.
 - 3. Fabrication shall comply with the Standards established by the American Institute of Timber Construction, (AITC 103, 110, 113, 115 and ANSI / A190.1)
 - 4. Provide extra length of at least six (6) inches at each end for field trim of all members, or verify field dimensions prior to fabrication of members to ensure proper fit.
 - 5. Glu-lam beam fabrication shall be continuously inspected by a DSA certified inspector per 1705A.5.4 of the 2016 CBC, where required.
 - D. Laminated Strand Lumber (LSL): 1.55E “Timberstrand” as manufactured by Weyerhaeuser Co. or approved equal.
 - E. Laminated Veneer Lumber (LVL): 1.9E “Microlam” as manufactured by Weyerhaeuser Co. or approved equal.
 - F. Parallel Strand Lumber (PSL): 2.0E “Parallam” as manufactured by Weyerhaeuser Co. or approved equal.

G. Additional Grading Requirements

1. In order to qualify as "structural lumber", each piece including plywood, shall be marked with the grade of the lumber by some competent and reliable organization whose regular business is to establish lumber grades and whose trade-mark shall also appear on each piece; except that, a certificate from such an organization may be accepted in lieu of such grade and trade-marks. All plywood must be grade stamped on each piece with the APA trade-mark.
2. There shall be no boxed heart in any framing lumber 4" and larger in the least dimension.

2.02 PRESERVATIVE TREATMENT

- A. Use waterborne preservatives complying with AWPI LP-2.
- B. All preservative treated lumber shall be retreated where cut on site.

2.03 ROUGH HARDWARE

Nails, bolts, nuts, washers, lag bolts, screws, anchor and other fastenings as shown or as required for complete installation. Galvanized or cadmium-plate for exterior work. Comply with the following specifications:

- A. Wire Nails: Common. Plywood nails are acceptable at diaphragms and walls. Provide minimum penetration as required for common nails.
- B. Bolts, Nuts, ASTM A307, (upset threads are prohibited)
- C. Lag Screws and Lag Bolts: FF-B-561.
- D. Wood Screws: FF-S-111.
- E. Framing Clips, Boots, Hangers, hold-downs, straps etc.: by Simpson Strong Tie or approved equal.

- 2.04 GLUE: AFG – 01 approved. PL Premium" polyurethane construction adhesive by Chem Pex, Inc., or equal. Install adhesive per manufactures recommendations.

PART III – EXECUTION**3.01 GENERAL FRAMING**

- A. All framing operations shall conform to the requirements of the C.B.C.
- B. Joists, rafters and beams shall be cut as required to provide a full even and horizontal seating on the support, unless otherwise shown. Do not overcut.
- C. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.
- D. Notches and bored holes in joists and beams shall be limited as shown on the drawings.

3.02 FRAMING FOR PIPES

- A. Frame members for passage of pipes and ducts to avoid cutting structural members. Do not cut, notch or bore framing members for passage of pipes or conduits without architect's authorization and DSA's approval.
- B. Pipes 1" diameter or less may pass through a neatly bored hole in the center of the wall plates. Hole location is subject to the Architect's acceptance.

3.03 BLOCKING: Provide solid blocking in all walls for wall mounted items.

3.04 FIRE STOPS: Provide 2" nominal fire stops in conformance with Section 708.2 of the CBC.

3.05 FURRING: Provide furring, stripping, blocking, backing and grounds where necessary or indicated to support, or to furnish suitable spacings for finish materials and accessories.

3.06 NAILING:

- A. All nailing shall conform to CBC Table 2304.10.1, except where more stringent requirements are shown on drawings.
- B. Penetration of nails or spikes into piece receiving point shall be not less than 1/2 length of nail or spike, except that 16 penny nails may be used to connect pieces of 2" thickness.
- C. Drive nails and spikes no closer together than 2/3 their length nor closer to edge of member than 1/2 their length, except when detailed otherwise.
- D. Place nails without splitting wood. Pre-drill holes whenever nailing tends to split wood or plywood. Replace split members.
- E. Use of machine nailing is subject to a satisfactory job site demonstration. Authorization is subject to continued satisfactory performance. If nail heads penetrate the outer ply of plywood more than would be normal for a hand hammer or if the minimum allowable edge distances are not maintained the performance will be deemed unsatisfactory.

3.07 BOLTS AND LAG SCREWS:

- A. Provide bolts and lag screws, bearing on wood, with malleable iron or steel plate washers of sizes indicated under heads and nuts. All nuts and screws shall be tightened when placed and re-tightened at completion of the job or immediately prior to closing with finish construction. Nuts shall be secured against loosening.
- B. Except where otherwise indicated on the details, bore holes for bolts with a bit 1/32" to 1/16" larger than nominal diameter as the bolt.
- C. Bore lag screw holes the same diameter and depth as shank, continue hole to depth equal to length of lag screw and with a diameter equal to 40% to 70% of the diameter of the shank.
- D. Screw all lag screws; do not drive into place. Embed threaded portion of lag screws in each timber a minimum of seven (7) times their shank diameter.

3.08 PRESERVATIVE TREATMENT: Treat all framing in direct contact with concrete or masonry construction with wood preservative, as follows:

- A. Wood bucks and nailing blocks: Dip in preservative 15 minutes prior to incorporation in concrete.
 - B. All treated lumber shall be marked or branded.
- 3.09 Glue Plywood Floor Sheathing to supporting members
- 3.10 **PREFABRICATED WOOD:** Install prefabricated wood products in accordance with the recommendations of the manufacturer. All trusses and I-joists must be securely braced during erection and after permanent installation. Erection bracing shall hold trusses and I-joists straight and plumb and in safe condition until decking and permanent bracing has been fastened forming a structurally sound framing system. All erection and permanent bracing shall be installed and all trusses permanently fastened before application of any loads. Do not impose construction loads which cause stresses beyond design limits. Materials used in bracing are to be furnished by the erection contractor.
- 3.11 **REMOVAL OF DEBRIS:** Remove all wood, including form lumber, chips, shavings and sawdust in or on the ground from the area under the floor. No wood shall be buried in any fill.

END OF SECTION

SECTION 06 41 16**PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Plastic-laminate-faced architectural cabinets.
- 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

- 1. Section 12 36 23 "Plastic-Laminate-Clad Countertops".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative

- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

- 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- 2. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
- 3. Apply WI Certified Compliance Program label to Shop Drawings.

C. Samples for Initial Selection:

- 1. Plastic laminates.
- 2. PVC edge material.
- 3. Thermoset decorative panels.

- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each color, pattern, and surface finish, with sample applied to core material and specified edge material applied to one edge.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer and fabricator.
 - B. Product Certificates: For each type of product.
 - C. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.
- 1.5 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. Shop is a licensee of WI's Certified Compliance Program.
 - B. Installer Qualifications: Licensee of WI's Certified Compliance Program.
 - C. 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.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- 1.7 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.

PLASTIC LAMINATE-FACED ARCHITECTURAL CABINETS

- 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.

1.8 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-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "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 complies with requirements of grades specified.
 - 2. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Wilsonart International; Div. of Premark International, Inc.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.

PLASTIC LAMINATE-FACED ARCHITECTURAL CABINETS

4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 5. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
- G. Materials for Semi-exposed Surfaces:
1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
 2. Drawer Sides and Backs: Solid-hardwood lumber.
 3. Drawer Bottoms: Hardwood plywood.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from laminate manufacturer's full range of colors and patterns.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Composite Wood and Agrifiber Products: Products 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. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.

PLASTIC LAMINATE-FACED ARCHITECTURAL CABINETS

3. Particleboard: ANSI A208.1, .Grade M-2, made with binder containing no urea formaldehyde.
4. Softwood Plywood: DOC PS 1, medium-density overlay.
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
 1. Semi-concealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- B. Back-Mounted Pulls: BHMA A156.9, B02011.
- C. Wire Pulls: "U" shaped, back mounted, solid stainless steel, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9.
 1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 2. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 3. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Door and Drawer Silencers: BHMA A156.16, L03011.
- K. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.

PLASTIC LAMINATE-FACED ARCHITECTURAL CABINETS

- L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Satin Stainless Steel: BHMA 630.
 - M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- 2.4 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."
- 2.5 FABRICATION
- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
 - 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. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails[or finishing screws] for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends as indicated in Drawings.

3.3 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 06 41 16

SECTION 066400
PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Plastic sheet paneling.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Marlite.
 - b. Nudo Products, Inc.
 2. Low-Emitting Materials: Paneling shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 4. Nominal Thickness: Not less than 0.12 inch (3.0 mm).
 5. Surface Finish: Molded pebble texture.
 6. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
1. Color: Match panels.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Adhesive: As recommended by plastic paneling manufacturer and that complies with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."
1. Sealant shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.
 - 1. Mark plumb lines for accurate installation.
 - 2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation.
 - 2. Johns Manville.
 - 3. Owens Corning.
 - 4. Or equal.
- B. Un-faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 PROTECTION

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

3.5 INSULATION SCHEDULE

- A. Insulation Type: Un-faced, glass-fiber blanket insulation.
 - 1. Use at all interior walls (R13) for sound insulation.
- B. Insulation Type: Faced, glass-fiber blanket insulation.
 - 1. Use at all exterior walls (R19) and roof (R30) for thermal insulation.

END OF SECTION 07 21 00

SECTION 07 92 00**JOINT SEALANTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Silicone joint sealants.
2. Non-staining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Mildew-resistant joint sealants.
6. Butyl joint sealants.
7. Latex joint sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For special warranties.

1.5 FIELD CONDITIONS

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

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

1.6 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those 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.

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. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 NON-STAINING SILICONE JOINT SEALANTS

- A. Non-staining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Non-staining, S, NS, 50, NT: Non-staining, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, non-traffic use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 756 SMS.
 - b. GE Construction Sealants; SilPruf NB.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 295 FPS NB.
 - d. Pecora Corporation; 864NST.
 - e. Tremco Incorporated; Spectrem 2.
 - f. Or equal.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, non-sag, non-traffic use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonalastic TX1.
 - b. Bostik, Inc.; Chem-Calk GPS1.
 - c. ER Systems, an ITW Company; Pacific Polymers Elasto-Thane 230 MP.
 - d. Pecora Corporation; Dynatrol I-XL.
 - e. Polymeric Systems, Inc.; Flexiprene 1000.
 - f. Schnee-Morehead, Inc., an ITW company; Permthane SM7108.
 - g. Sika Corporation U.S.; Sikaflex Textured Sealant.
 - h. Tremco Incorporated; Dymonic.
 - i. Or equal.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. BASF Construction Chemicals, LLC, Building Systems; Sonolastic SL 1.
 - b. Pecora Corporation; NR-201.
 - c. Polymeric Systems, Inc.; Flexiprene 952.
 - d. Schnee-Morehead, Inc.; an ITW company; Permthane SM7101.
 - e. Or equal.
- C. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 555-SL.
 - b. LymTal International, Inc.; Iso-Flex 880 GB.
 - c. Pecora Corporation; Dynatrol II SG
 - d. Sherwin-Williams Company (The); Stampede-2SL.
 - e. Tremco Incorporated; THC 900/901.
 - f. Or equal.

2.4 IMMERSIBLE JOINT SEALANTS

- A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, Class 1; tested in deionized water unless otherwise indicated
- B. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T, NT, and I.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Meadows, W. R., Inc.; Pourthane SL.
 - b. Sika Corporation U.S.; Sikaflex 1c SL.
 - c. Tremco Incorporated; Vulkem 45.
 - d. Or Equal.

2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, non-sag, plus 25 percent and minus 25 percent movement capability, non-traffic use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 786-M White.
 - b. GE Construction Sealants; SCS1700 Sanitary.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 100 WF.
 - d. Soudal USA; RTV GP.
 - e. Tremco Incorporated; Tremsil 200.
 - f. Or equal.

2.6 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.
 - c. Or equal.

2.7 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
 - b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex 600.
 - c. Pecora Corporation; AC-20.
 - d. Sherwin-Williams Company (The); 850A.

- e. Tremco Incorporated; Tremflex 834.
- f. Or equal.

2.8 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Non-staining; 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), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.9 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: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- 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 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 Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

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

3.5 PROTECTION

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

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 1. Joint Locations:
 - a. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Joints in stone paving units, including steps.
 - e. Tile control and expansion joints.

- f. Joints between different materials listed above.
 - g. Other joints as indicated on Drawings.
2. Joint Sealant: Urethane, M, P, 25, T.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
1. Joint Locations:
 - a. Joints in pedestrian plazas.
 - b. Joints in swimming pool decks.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, immersible, S, P, 25, T, I.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Joints in glass unit masonry assemblies.
 - f. Joints in exterior insulation and finish systems.
 - g. Joints between metal panels.
 - h. Joints between different materials listed above.
 - i. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - j. Control and expansion joints in ceilings and other overhead surfaces.
 - k. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, non-staining, S, NS, 50, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in brick flooring.
 - d. Control and expansion joints in tile flooring.
 - e. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, P, 25, T.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of unit masonry, concrete walls and partitions.
 - d. Joints on underside of plant-precaster concrete beams and planks.
 - e. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces not subject to significant movement.
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- H. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 08 11 13**HOLLOW METAL DOORS AND FRAMES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following

- 1. Standard hollow metal steel doors.
- 2. Standard hollow metal steel frames.

- B. Related Requirements:

- 1. Section 08 71 00 "Door Hardware" for door hardware for hollow metal doors.
- 2. Section 09 91 23 "Interior Painting" for painting standard hollow metal doors and frames.

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.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 2. Locations of reinforcement and preparations for hardware.
 - 3. Details of each different wall opening condition.
 - 4. Details of anchorages, joints, field splices, and connections.
 - 5. Details of accessories.
 - 6. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.9 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
1. Amweld Building Products, LLC.
 2. Ceco Door Products; an ASSA ABLOY Group Company.
 3. Republic Builders Products Company.
 4. Steelcraft; an Ingersoll-Rand Company.

2.2 INTERIOR DOORS AND FRAMES

- A. Construct interior 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: SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Face: Uncoated, cold rolled steel sheet, minimum thickness 0.032 inch (0.8 mm).
 - b. Edge Construction: Model 2, Seamless
 - c. Core: Manufacturer's standard kraft-paper honeycomb.
 - d. Thickness: 1-3/4 inches (44.5 mm).
 3. Frames:
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Face welded.
 4. Exposed Finish: Prime.

2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4.
1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
 - a. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A40 (ZF120) coating.
 - b. Construction: Model 2 Seamless.
 - c. Core: Manufacturer's standard kraft-paper honeycomb.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
 - b. Construction: Face welded.
4. Exposed Finish: Prime.

2.4 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.5 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick or as indicated on drawings.
 2. Post-installed 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.

2.7 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: 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.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- 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. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 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 Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. 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. 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.
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.
- C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- D. 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 non-templated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 3. Provide loose stops and moldings on inside of hollow-metal work.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

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

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

2.10 ACCESSORIES

- A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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 non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. 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. At fire-rated openings, install frames according to NFPA 80.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.

- e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 3. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 4. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 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.

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. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. 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.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:

- 1. Mechanical door hardware for the following:
 - a. Swinging doors.
- 2. Cylinders for door hardware specified in other Sections.

- B. Related Sections:

- 1. Section 06 41 16 "Plastic-Laminate-Faced Architectural Cabinets" for cabinet door hardware provided with cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Other Action Submittals:

- 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. Content: Include the following information:

- 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
 - 7) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final keying schedule.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Source Limitations: Obtain each type of door hardware from a single manufacturer.
- C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- D. Means of Egress Doors: Latch mechanisms do not require more than 5 lbf (22.2 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:

- a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction, but not to exceed 15 lbf.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the leading edge of the door.
- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01. In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Requirements for access control.
 5. Address for delivery of keys.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
 - B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - C. Deliver keys to Owner by registered mail or overnight package service.
- 1.7 COORDINATION
- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
 - B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Five years from date of Substantial Completion, unless otherwise indicated.
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" to comply with requirements in this Section.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2.2 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Comply with ANSI A117.1 and California Building Code.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with CBC 2016. Locks shall not require use of a key, tool, or special knowledge for operation.

- C. Lock Trim:
 - 1. Levers: Schlage Rhodes
 - 2. Escutcheons (Roses): Cast.
 - 3. Dummy Trim: Match lever lock trim and escutcheons.
 - 4. Lockset Designs: Schlage Series ND
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- E. Rabbeted Meeting Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- F. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- G. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
 - 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
 - 4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 - 5. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 6. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 7. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
 - 1. Bored Locks: BHMA A156.2.
 - 2. Mortise Locks: BHMA A156.13.

3. Interconnected Locks: BHMA A156.12.
- B. Bored Locks: BHMA A156.2; Series 4000.
 1. Manufacturers:
 - a. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
- C. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13; Series 1000.
 1. Manufacturers:
 - a. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

2.4 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 1. Number of Pins: Six.
 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 4. Bored-Lock Type: Cylinders with tailpieces to suit locks.
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 1. Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.
 2. Deliver cores to Construction Manager.
- D. Construction Keying: Comply with the following:
 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- E. Manufacturers:
 1. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

2.5 THRESHOLDS

- A. Standard: BHMA A156.21.

- B. Accessibility Requirements: Thresholds to comply with ANSI A117.1 and California Building Code.
 - 1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
- C. Thresholds for Means of Egress Doors: Comply with CBC 2016. Maximum 1/2 inch (13 mm) high.
- D. Manufacturers:
 - 1. Pemko Manufacturing Co. (PEM).

2.6 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2.7 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Furnish permanent cores to Owner for installation.
- D. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 2. Door Closers: Adjust sweep period and force to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01.

3.7 DOOR HARDWARE SCHEDULE

HARDWARE GROUP NO. 1 – EXTERIOR (SINGLE) FROM CLASSROOM/HALLWAY

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	BB1191NRP	626	HGR
1	EA	LOCKSET	ND92PD RHO	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	CLOSER	4041	689	LCN
1	EA	STOP/HOLDER	1263	626	TRM
1	EA	KICK PLATE	KOO50 10" X 2LDW	630	TRM
1	EA	LATCH GUARD	LG 110Z	626	TRM
1	EA	DOOR DROP	430CRL	ALUM	PEM
1	EA	THRESHOLD	272A	ALUM	PEM

HARDWARE GROUP NO. 2 – INTERIOR (SINGLE) FROM STAFF RESTROOM - MULTI

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	BB1191NRP	626	HGR
1	EA	LOCKSET	ND70PD RHO	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	STOP	1270CVCP	626	TRM
1	EA	KICK PLATE	KOO50 10" X 2LDW	630	TRM
1	EA	STOP	1270CVPC	626	TRM
1	EA	DOOR SWEEP	216SNPK		PEM
1	EA	THRESHOLD	2748	ALUM	PEM

END OF SECTION 08 71 00

SECTION 09 29 00**GYPSUM BOARD**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 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. 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.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. 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-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying 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."

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.

4. Lafarge North America Inc.
 5. National Gypsum Company.
 6. PABCO Gypsum.
 7. Temple-Inland.
 8. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 5/8 inch (15.9 mm), Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
1. Thickness: 1/2 inch.
 2. Long Edges: Tapered.
- 2.4 TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. Thickness: 5/8".
 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- 2.5 TRIM ACCESSORIES
- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 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. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints 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 compound.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 1. Laminating adhesive 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. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - d. USG Corporation; SHEETROCK Acoustical Sealant.
 2. Acoustical joint sealant 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."
- F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."
- G. Vapor Retarder: 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 panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- 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, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- 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 recommendations 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. Type X: Vertical surfaces unless otherwise indicated.
 - 2. Ceiling Type: Ceiling surfaces.
 - 3. Moisture- and Mold-Resistant Type: Restrooms (above tile).
 - 4. Cementitious Backer Units: Restrooms (behind tile).
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
 2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.
 3. Board Thickness: 1/2 inch.
- 3.4 APPLYING TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
 - B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

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 according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. L-Bead: Use where indicated.
 - 3. U-Bead: Use at exposed panel edges.
 - 4. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

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, rounded or beveled edges, 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. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for acoustical tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
 - 4. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 51 13**ACOUSTICAL PANEL CEILINGS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 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 panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them 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. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and modifications by California Building Code 2013.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong 'Georgian High Washability - 793' or comparable product by one of the following:
1. CertainTeed Corp.
 2. USG Interiors, Inc.; Subsidiary of USG Corporation.
 3. Or equal.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type IX, mineral base with painted finish; Form 2, water felted.
 2. Pattern: G (unperforated).
- C. Color: White.
- D. LR: Not less than 0.80.
- E. CAC: Not less than 30.
- F. Edge/Joint Detail: Square.
- G. Thickness: 5/8 inch.
- H. Modular Size: 24 by 48 inches.
- I. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2.5 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Prelude XL or comparable product by one of the following:
 - 1. CertainTeed Corp.
 - 2. Chicago Metallic Corporation.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - 4. Or equal.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than 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: Steel cold-rolled sheet.
 - 5. Cap Finish: Painted white.

2.6 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. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - c. Or equal.
 2. Acoustical Sealant for Concealed Joints:
 - a. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
 - b. Pecora Corporation; AIS-919.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
 - d. Or equal.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 1. Exposed and Concealed Joints: Non-sag, paintable, non-staining latex sealant.
 2. Concealed Joints: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant.
 3. Acoustical sealant 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."

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as detailed on Drawings.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels 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 reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 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.

3.4 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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.
 - 3. Aluminum transition strips.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 RESILIENT BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 2. Or equal.
- B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
1. Group: I (solid, homogeneous).
 2. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Minimum Thickness: 0.125 inch.
- D. Height: 6 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors and Patterns: Black.

2.3 RESILIENT MOLDING ACCESSORIES

- A. Description: Vinyl carpet edge for glue-down applications, reducer strip for resilient flooring, and joiner for tile and carpet transition strips.
- B. Profile and Dimensions: As indicated.
- C. Locations: Provide vinyl molding accessories in areas indicated.
- D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 ALUMINUM TRANSITION STRIPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Schluter Systems 'RENO-TK'.
 - 2. Or equal.
- B. Description: Profile sloped exposed surface, ¼" (6 mm) deep channel below exposed surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
- C. Anchoring Leg:
 - 1. Provide with straight anchoring leg.
 - 2. Provide with special radius anchoring leg for radius applications.
- D. Material and Finish: Satin Anodized Aluminum (AE)
- E. Height: 5/16" (8 mm).

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

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

3.5 CLEANING AND PROTECTION

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

END OF SECTION 09 65 13

SECTION 09 65 16
RESILIENT SHEET FLOORING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

- 1. Linoleum sheet flooring.

- B. Related Sections include:

- 1. Section 09 65 13 "Resilient Wall Base and Accessories" for top set rubber wall base and aluminum transition strips.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For each type of resilient sheet flooring.

- 1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.

- C. Samples for Initial Selection: For each type of resilient sheet flooring indicated.

- D. Samples for Verification: For each type of resilient sheet flooring, in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each color, texture, and pattern required.

- E. Accessories:

- 1. Sealant: Polyurethane/Elastometric, traffic grade sealant.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring 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. Resilient Sheet Flooring: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.
- B. Slip-Resistance:
 - 1. Except where indicated otherwise, provide resilient flooring products with a minimum Coefficient of Friction of 0.6 as tested under dry conditions in accordance with ASTM D 2047 or by using the NBS-Brungraber device.
 - a. Application of floor polish is not to reduce Indicated Coefficient of Friction values below indicated minimums.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive resilient sheet flooring during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every [1] boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.
 - 2. Sheet Flooring: Furnish ten linear feet for every [500] linear feet, or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet flooring installed.
 - 3. Resilient Base: Not less than 10 linear feet for every [500] linear feet, or fraction thereof, of each type, color, pattern, and size of resilient base installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LINOLEUM SHEET FLOORING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Forbo Flooring, Inc. Marmoleum 'Real', or equal comparable product.
- B. Product Standard: ASTM F 2034.
- C. Thickness: 0.100 inch (2.5 mm).
- D. Static Load Limit: 450 psi per ASTM F 970.
- E. Wearing Surface: Smooth.
- F. Sheet Width: 79 inches (2 m).
- G. Critical Radiant Flux: 0.45 watts/sq cm or more, Class I, per ASTM E 648.
- H. Smoke Density: 450 or less per ASTM E 662.
- I. Coefficient of Friction: 0.6 minimum as tested under dry conditions in accordance with ASTM D 2047.
- J. Seaming Method: Standard, except as noted otherwise below:
 - 1. Food Preparation Areas: Heat-welded at horizontal surfaces, chemically-bonded at vertical surfaces.
- K. Colors and Patterns: As selected by Architect from manufacturer's full range of colors.
 - 1. For bidding purposes, assume (3) separate colors as follows:
 - a. Field Color: 60% of total area.
 - b. Accent Color No. 1: 20% of total area.
 - c. Accent Color No. 2: 20% of total area.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
 - 1. VOC Content: Provide adhesives that comply with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
 - a. In addition to local regulatory limits, comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Colors: Match color of floor covering material being joined.
2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
 - a. VOC Content: Provide adhesive that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
 - 1) In addition to local regulatory limits, comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 1. Maintain uniformity of flooring direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
 3. Match edges of flooring for color shading at seams.
 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
 1. Provide polyurethane/elastomeric, traffic grade sealant where gaps at vertical surfaces exceed 1/16", Sikaflex 1-A, or approved equal.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Installation:
 - 1. Underscribe Seams – Linoleum Sheet: Underscribe seams for a net fit. Scribes should be set so that there will be a hairline gap at the seam, fitting material into place with no pressure on the material. Roll seam with hand roller ensuring secure bond into adhesive.
 - 2. Seamless – Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - 3. Seamless – Chemically-Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces using cleaner recommended by resilient product manufacturers.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash floor until after time period recommended by manufacturer.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

- D. Cover resilient sheet flooring until Substantial Completion.
 - 1. Allow drying room film (yellow film caused by linseed oil oxidation) to disappear, before covering linoleum surfaces.

- E. Do not move heavy and/or sharp objects directly over surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 65 16

SECTION 09 67 23
RESINOUS FLOORING (EPOXY)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Resurfacing with decorative resinous flooring systems topcoat products.
- 2. New or replacement installations of trowel applied decorative resinous flooring systems.

B. Related Sections:

- 1. Section 07 92 00 "Joint Sealants" for sealants installed at joints in resinous flooring systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

- B. Samples for Initial Selection: For each type of exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

- B. Material Certificates: For each resinous flooring component, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. General: Provide products that are part of an integrated system from a single manufacturer.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide TERA-LITE TERA-GEM III DQ or comparable product.

2.2 DECORATIVE RESINOUS FLOORING

- A. Resinous Flooring: Trowel applied abrasion-, impact- and chemical-resistant, decorative-aggregate-filled, epoxy-resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.
- B. System Characteristics:
1. Color and Pattern: As selected by Architect from manufacturer's full range.
 2. Wearing Surface: Textured for slip resistance, designed for wet areas/kitchens.
 3. Overall System Thickness: 1/4 inch.
- C. Body Coats:
1. Resin: Epoxy.
 2. Formulation Description: Three-component polymer composite consisting of epoxy resin, curing agent and colored aggregate blend.
 3. Application Method: Troweled.
 - a. Thickness of Coats: 1/4 inch.
 - b. Number of Coats: One.
 4. Aggregates: Colored quartz (ceramic-coated silica).
- D. Topcoat: Sealing or finish coats.
1. Resin: Epoxy.
 2. Type: Pigmented.
 3. Color: As selected by Architect from manufacturer's full line.
 4. Finish: Gloss.
 5. Number of Coats: Two. Sand between coats.
- E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 10,500 per ASTM C 579.
 2. Tensile Strength: 2,500 per ASTM C 307.
 3. Flexural Modulus of Elasticity: 4,700 per ASTM C 580.
 4. Water Absorption: 0.25% per ASTM C 413.
 5. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
 6. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch per MIL-D-3134.
 7. Abrasion Resistance: 0.037 grams maximum weight loss per ASTM D 4060.
 8. Flammability: Self-extinguishing per ASTM D 635.
 9. Critical Radiant Flux: 0.45 W/sq. cm or greater per NFPA 253.
 10. Hardness: 82, Shore D per ASTM D 2240.

2.3 ACCESSORIES

- A. Primer: Type recommended by manufacturer for substrate and body coats indicated.
- B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 RESURFACING APPLICATION

- A. Remove finish coat of existing epoxy system by using sand blasting, steel shot-blasting, scarification, water blasting or other method recommended by system manufacturer for resurfacing.
- B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with subfloor filler.
- C. Examine surfaces to be refinished and report conditions that would adversely affect appearance or performance of system.
- D. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top-coating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: As shown on Drawings, or if not shown, 6 inches high.
 - 2. Apply troweled body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.
- F. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.
- G. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.2 PREPARATION FOR NEW AND REPLACEMENT INSTALLATIONS

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:

- a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup or by other method recommended by system manufacturer.
 - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 3. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with subfloor filler. Slope subfloor per manufacturer's requirements.
 4. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869 at the rate of 1 per 1,000 square feet. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 10 lb. of water/1000 sq. ft. of slab area in 24 hours.
 5. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.3 APPLICATION FOR NEW AND REPLACEMENT APPLICATIONS

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top-coating of cove base. Round internal and external corners.
1. Integral Cove Base: As shown on Drawings, or if not shown, 6 inches high.

- D. Apply troweled body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.
- E. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.
- F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.4 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

SECTION 09 68 00**CARPET**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Tufted carpet tiles.

- B. Related Requirements:

- 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 13 "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:

- 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Carpet Cushion: For each type indicated. Include manufacturer's written data on physical characteristics and durability.

- B. Shop Drawings: Show the following:

- 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Seam locations, types, and methods.
 - 3. Pattern type, repeat size, location, direction, and starting point.
 - 4. Pile direction.
 - 5. Type, color, and location of edge, transition, and other accessory strips.

6. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch long Sample(s).
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified Installer.
 - B. Product Test Reports: For carpet, for tests performed by a qualified testing agency.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
 - B. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Comply with CRI 104.
- 1.8 FIELD CONDITIONS
- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
 - B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
 - C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.9 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to provide labor and materials to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

- A. CALGreen Requirements:
 - 1. Carpet: Provide carpet tile products which meet at least one of the following:
 - a. Certified as complying with the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.
 - b. Compliant with the VOC-emission limits specified in the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010.
 - c. Meets requirements of NSF/ANSI 140 for certification at the Gold level or higher.
 - d. Meets requirements of Scientific Certifications Systems Sustainable Choice.
 - e. Compliant with Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) dated July 2012 and listed in the CHPS High Performance Database.
 - 2. Carpet Tile Adhesive: Use installation adhesives that comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.
- B. VOC Content of Installation Adhesives and Glues: Use installation adhesives and glues inside the weatherproofing system that comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

2.2 CARPET TILE

- A. Modular Carpet Tile: Modular carpet tile system designed for random installation, such that individual tiles may be installed without regard to pile direction, pattern, or orientation while maintaining a visually continuous and finished overall appearance without any tile appearing improperly positioned.
1. Product: Interface - Entropy
 - a. Color[s]: As selected by District.
- B. Construction: Tufted Textured Loop
- C. Fiber Content: 100 percent nylon Type 6, 6
- D. Fiber Type: Universal
- E. Dye Method: 100 percent solution dyed.
- F. Pile Thickness 2.7 mm
- G. Density: 6,729 oz. per cu yd.
- H. Primary Backing/Backcoating: Non-woven fiberglass-reinforced PVC.
- I. Secondary Backing: Fiberglass-reinforced thermoplastic composite; 100 percent recyclable.
1. Provide minimum 39 percent recycled content, post-consumer or post-industrial in secondary backing material.
- J. Size: 50 cm by 50 cm (19.69-inches square).
- K. Applied Soil-Resistance Treatment: Manufacturer's standard material; 8.0 on the Red 40 Stain Scale, per AATCC 175.
- L. Antimicrobial Treatment: Manufacturer's standard material; passes AATCC 174 (minimum 90 percent reduction of microorganisms according to Part 2; no macroscopic growth according to Part 3).
- M. Minimum Recycled Content: required in order to perform recycled content calculation as required by LEED MR Credit 4
1. Pre-Consumer: 68 percent. 45 percent is applicable to Interface Cubic product; if inserting other product, modify accordingly
- N. Performance Characteristics: As follows:
1. Critical Radiant Flux Classification: Not less than 0.45 W/sq cm.
 2. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
 3. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) per AATCC 16, Option E.

4. Electrostatic Propensity: Less than 3.0 kV per AATCC 134.

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Corner Connectors: Manufacturer's standard adhesively-surfaced 3-inch by 3-inch square tabs for connecting underside of corners of four adjacent carpet tile units to maintain a tight joint on all sides of tile, thereby maintaining an overall stable surface. Tabs are surfaced with pressure-sensitive acrylic adhesive on one side, only, of polyester backing, so as not to adhere tiles to substrate. corner connectors are a proprietary installation method used only with Interface carpet tile products; if specifying carpet tile by a manufacturer other than Interface, delete this paragraph and subparagraph below
 1. Product: Interface, Inc.; TacTiles.
- C. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 1. VOC Content: Provide adhesive that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Verify that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might show through surface or interfere with adhesion of carpet tile and accessories
- D. For painted subfloors, perform bond test recommended in writing by adhesive manufacturer. delete this paragraph and subparagraph below if not applicable
- E. For raised access flooring systems, verify the following:
 1. Access floor complies with requirements specified in Section 09 69 00 10270"Access Flooring."
 2. Access floor substrate is compatible with carpet tile and adhesive, if any.

3. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.

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

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Concrete substrates: Prepare according to ASTM F 710.

1. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturer.

2. Moisture and Alkalinity Testing: Perform tests recommended by carpet tile manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform concrete moisture testing, using the relative humidity in-situ probe test method, in accordance with ASTM F 2170.

- 1) Proceed with installation only after substrates show a moisture level of 75 percent relative humidity or less, or as recommended in writing by manufacturer of carpet tile to be installed.

b. Perform alkalinity testing in accordance with ASTM F 710.

- 1) Proceed with installation only after substrates show a pH level of not less than 7 and not greater than 9, or as recommended in writing by manufacturer of carpet tile to be installed.

C. Metal Substrates: Clean grease, oil, soil, and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive. delete if not applicable (normally applies to raised access floor systems)

D. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes, and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions. dimensions given in this paragraph are per CRI recommendations

E. Apply primer/sealer over gypsum-based cementitious underlayment in accordance with carpet manufacturer's written instructions and as required to ensure proper adhesion of carpet to underlayment surface. delete if no gypsum-based floor underlayment

F. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 CARPET TILE INSTALLATION

- A. General: Comply with with CRI's "Carpet Installation Standard," Section 18, "Modular Carpet," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer, and as follows:
 - 1. Free-lay; install carpet tiles without adhesive.
 - a. Use manufacturer's corner connectors with pressure-sensitive adhesive face on one side to hold corners of adjacent tiles together.
 - b. Use adhesive at areas at edges of rooms, terminations, or other areas where recommended by manufacturer of carpet tile to supplement free-lay method.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Maintain carpet tile patterns indicated on Drawings.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- H. Install pattern parallel to walls and borders.
- I. Do not bridge building expansion joints with carpet tiles.
- J. At access flooring, stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive. delete if not installing carpet tile over raised access floor system
- K. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet tiles that would otherwise be exposed.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.

- B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION 09 68 00

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel.
 - 2. Galvanized metal.
 - 3. Wood.
 - 4. Portland cement plaster (stucco).

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 1 gal. (3.8 L) of each material and color applied.

1.6 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 specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured or distributed by the Dunn-Edwards Corporation or comparable product by one of the following:
 - 1. Kelly-Moore Paints.
 - 2. ICI Paints.
 - 3. Or equal.
- B. Products: Subject to compliance with requirements, provide product listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. 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.

- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: To be selected by Architect.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

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: 11 percent.
 - 2. Wood: 8 percent.
 - 3. Portland Cement Plaster: 11 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. 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 and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. 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 3, "Power Tool Cleaning."
- E. 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.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove loose surface oxidation.
- H. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime 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. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- 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. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Plastic conduit.
 - f. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 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.

3.6 EXTERIOR PAINTING SCHEDULE

A. Ferrous Metal Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-2-WH).
- b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
- c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).

B. Non-Ferrous Metal Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: ULTRASHIELD, Multi-Surface Primer (ULGM00-WH).
- b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
- c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).

C. Wood Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: ULTRA-GRIP Premium, Multi-Surface Primer (UGPR00-1).
- b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
- c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).

D. Portland Cement Plaster (Stucco) Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: EFF-STOP Premium, Masonry Primer (ESPR00-1).
- b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
- c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).

END OF SECTION 09 91 13

SECTION 09 91 23
INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
- C. Samples for Initial Selection: For each type of topcoat product.

- D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 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 100 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 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 when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured or distributed by the Dunn-Edwards Corporation or comparable product by one of the following:
 1. Kelly-Moore Paints.
 2. ICI Paints.
 3. Or equal.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Material Emissions and Pollutant Control: Field-applied paints and coatings that are inside the weatherproofing system shall comply with the following:
 1. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Non-flat Coatings: 100 g/L.
 - c. Non-flat, High-Gloss Coatings: 150 g/L.

- d. Dry-Fog Coatings: 150 g/L.
 - e. Industrial Maintenance Coatings: 250 g/L.
 - f. Pretreatment Wash Primers: 420 g/L.
 - g. Primers, Sealers, and Undercoaters: 100 g/L.
 - h. Recycled Coatings: 250 g/L.
 - i. Rust-Preventive Coatings: 250 g/L.
- D. Color(s): Two (2) colors, to be selected by Architect.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
- 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

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: 11 percent.
 - 2. Masonry (Clay and CMUs): 11 percent.
 - 3. Wood: 8 percent.
 - 4. Gypsum Board: 5 percent.
 - 5. Plaster: 5 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- 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 Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. 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.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

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.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.

- 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. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 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.

3.6 INTERIOR PAINTING SCHEDULE

- A. Ferrous Metal Substrates:
 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: BLOC-RUST Premium, Rust Preventative Metal Primer (BRPR00-2-WH).
 - b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
 - c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).

- B. Non-Ferrous Metal Substrates:
 - 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: ULTRASHIELD, Multi-Surface Primer (ULGM00-WH).
 - b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
 - c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
- C. Wood Substrates:
 - 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: ULTRA-GRIP Premium, Multi-Surface Primer (UGPR00-1).
 - b. Intermediate Coat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
 - c. Topcoat: EVERSIELD, Exterior Semi-Gloss Paint (EVSH50-2).
- D. Gypsum Board Substrates (Classroom):
 - 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: VINYLASTIC Premium, Interior Pigmented Sealer (VNPR00)
 - b. Intermediate Coat: EVEREST, Interior Semi-Gloss Paint (EVER50).
 - c. Topcoat: EVEREST, Interior Semi-Gloss Paint (EVER50).
- E. Gypsum Board Substrates (Restrooms and Hallway):
 - 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: VINYLASTIC Premium, Interior Pigmented Sealer (VNPR00)
 - b. Intermediate Coat: ARISTOWALL, Interior Semi-Gloss Paint (AWLL50).
 - c. Topcoat: ARISTOWALL, Interior Semi-Gloss Paint (AWLL50).

END OF SECTION 09 91 23

SECTION 10 14 23

PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Room and Building identification signage.
 - 2. Exit signage.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the California Building Code Chapter 11B-703 for signs.

2.2 SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
- B. Room and Building Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: 0.25 inch.
 - b. Color(s): Match existing signs – Black Forest Green by Rowmark .
 - 2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Square.

3. Mounting: Surface mounted to wall with countersunk flathead through fasteners.
4. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 1. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant slots unless otherwise indicated.
 2. Sign Mounting Fasteners:
 - a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

2.5 FABRICATION

- A. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
 1. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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 signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated.
- C. Mounting Methods:
 - 1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23

SECTION 10 21 13
TOILET COMPARTMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY**A. Section Includes:**

- 1. Solid-color reinforced composite toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:

- 1. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

- 1. Show locations of cutouts for compartment-mounted toilet accessories.
- 2. Show locations of reinforcements for compartment-mounted grab bars.
- 3. Show locations of centerlines of toilet fixtures.
- 4. Show overhead support or bracing locations.

- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

- 1. Each type of material, color, and finish required for units, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
- 2. Each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Adhesives: Manufacturer's standard product that complies 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."

2.2 SOLID-COLOR REINFORCED COMPOSITE UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide:
 - 1. Bobrick Washroom Equipment, 1092.67 Sierra Series
 - 2. Or approved equal.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Overhead braced.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, solid-color reinforced composite panel material, not less than 3/4 inch thick, seamless, with eased edges and with homogenous color and pattern throughout thickness of material.
 - 1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.
- G. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
 - a. 18 gauge at toilet compartments, 11 gauge at urinal screens.
 - b. Provide through-bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs. per fastener.

2.3 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 - 1. Material: Stainless steel.
 - 2. Hinges: Manufacturer's standard continuous, 16 gauge, cam type that swings to a closed or partially open position.
 - a. Attach to door and stile with theft-resistant, pin-in-head Torx stainless steel machine screws into factory installed, threaded brass inserts. Threaded brass inserts shall withstand a direct pull force exceeding 1,500 lbs per insert.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted sliding latch unit requiring less than 5-lb of force to operate.

- a. Attach latch track to door with machine screws into factory installed threaded brass inserts. Threaded brass inserts shall be factory installed for door hinge and latch connections and shall withstand a direct pull exceeding 1,500 lbs. per insert.
 - b. Secure latch keeper to stile with through-bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Fasteners shall withstand direct pull force exceeding 1,500 lbs. per fastener.
4. Coat Hook: Secured to door by through-bolted, theft-resistant, pin-in-head Torx stainless steel screws. Through-bolted fasteners shall withstand a direct pull force exceeding 1,500 lbs. per fastener.
 5. Door Bumpers: Two 11-gauge (3mm) stainless steel door stop plates with attached rubber bumpers at each door.
 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Install below latch.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Unless otherwise noted, provide manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
 - C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
- 3.2 ADJUSTING
- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13

SECTION 10 28 00**TOILET, BATH, AND LAUNDRY ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Electric hand dryers.
 - 3. Under lavatory guards.

1.3 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. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Bobrick.
 - 2. Continental Commercial Products.
 - 3. Gamco, a Division of Bobrick.
 - 4. Georgia-Pacific.
 - 5. Or approved equal.
- B. Toilet Tissue (Roll) Dispenser – Single:
 - 1. Product: Continental RT22
 - 2. Description: Single-roll dispenser.
 - 3. Mounting: Surface mount.
 - 4. Material and Finish: Chrome.
- C. Toilet Tissue (Roll) Dispenser – Double:
 - 1. Product: Continental RT23.
 - 2. Description: Double-roll dispenser.
 - 3. Mounting: Surface mount.
 - 4. Material and Finish: Chrome.
- D. Grab Bar:
 - 1. Product: Bobrick B-6806.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin).
4. Outside Diameter: As indicated on Drawings.
5. Configuration and Length: As indicated on Drawings.

E. Mirror Unit:

1. Product: Bobrick B-165 2436
2. Frame: Stainless-steel channel.
 - a. Corners: Mitered and mechanically interlocked.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 18 inches by 30 inches.

F. Liquid-Soap Dispenser:

1. Product: Georgia-Pacific Carex 53221.
2. Mounting: Vertically oriented, surface mounted.
3. Soap Cartridge: Georgia-Pacific Carex 48027.

G. Sanitary-Napkin Receptacle

1. Product: Gamco ND-1.
2. Mounting: Surface mounted.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Seat-Cover Dispenser:

1. Product: Gamco TSC-1.
2. Mounting: Surface mounted.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

2.2 ELECTRIC HAND DRYERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Dyson or
2. World Hand Dryer.

B. Electric Hand Dryers:

1. Product: Dyson Airblade V Electric Hand Dryer Model AB12
2. Mounting: Wall Mounter.
3. Material and Finish: Stainless Steel
4. Power Source: 110/120 V. 12Amp.

2.3 ER LAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated. Provide solid blocking behind both Contractor-furnished and Owner-furnished accessories.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

SECTION 10 44 16
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to provide labor and materials to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Regular Dry-Chemical Type in Steel Container: UL-rated 10-B:C, 5-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 48 inches max. above finished floor to top of fire extinguisher. Mount so that bottom of the fire extinguisher is greater than 27 inches, for cane detect ability, if assembly projects further than 4 inches from the wall.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Kitchen exhaust ventilation.
 - 3. Refrigeration appliances.
 - 4. Cleaning appliances.

1.3 ALLOWANCES

- A. Furnish residential appliances as part of residential appliance allowance.
- B. Furnish clothes washer/dryer combination as part of residential appliance allowance.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

- B. Product Certificates: For each type of appliance.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturers' special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintains, within 10 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- B. Gas-Fuel Conversion: Provide gas-fueled appliances with manufacturer's conversion kit installed by a qualified service agency according to manufacturer's written instructions for Project location and type of fuel.

1.9 WARRANTY

- A. Electric Range: Limited warranty, including parts and labor for first year for on-site service on surface-burner elements.
- B. Refrigerator/Freezer, Sealed System: Limited warranty, including parts and labor for first year for on-site service on the product.
 - 1. Limited Warranty Period for Sealed Refrigeration System: Five years from date of original purchase, including labor pertaining to replacement of parts within sealed refrigeration system.
- C. Dishwasher: Limited warranty, including parts and labor for first year, for on-site service on the product.
- D. Clothes Washer: Full warranty, including parts and labor for on-site service on the product.
 - 1. Warranty Period: 10 years from date of original purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of residential appliance from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in California Building Code, 2016 Edition.

2.3 RANGES

- A. Electric Range [ER 1]: Freestanding range with one oven complying with AHAM ER-1.
 - 1. Manufacturer: LG, model # LRE4211ST Freestanding Electric Range Oven.
 - 2. Width: 30 inches (762 mm)
 - 3. Electric Burner Elements: Five.
 - a. Radiant Type: Two 1200 W, one 1400 W/ 3200 W expandable element, one 2500 W, and one 100 W.
 - b. Controls: Digital panel controls, located on splash panel at rear of rangetop.
 - 4. Oven Features:
 - a. Capacity: 6.3 cu. ft..
 - b. Operation: Convection.
 - c. Broiler: Located in top of oven.
 - d. Oven Door(s): Counterbalanced, removable, with observation window and full-width handle.
 - e. Electric Power Rating:
 - 1) Oven(s): Manufacturer's standard.
 - 2) Broiler: Manufacturer's standard.
 - f. Controls: Digital panel controls and timer display, located on splash panel at rear of rangetop.
 - 5. Anti-Tip Device: Manufacturer's standard.
 - 6. Electric Power Supply: As indicated on Drawings.
 - 7. Material: Stainless steel with manufacturer's standard ceramic-glass cooktop.
 - a. Color/Finish: Stainless Steel.

2.4 KITCHEN EXHAUST VENTILATION

- A. Overhead Exhaust Hood [EX 1]:
 - 1. Manufacturer: Broan, model #403004 Two-Speed Ducted Range Hood.
 - 2. Type: Wall-mounted exhaust-hood system.

3. Dimensions:
 - a. Width: 30 inches (762 mm).
 - b. Depth: 17-1/2 inches (445 mm).
4. Exhaust Fan: Two-speed fan built into hood and with manufacturer's standard capacity.
 - a. Venting: Vented to outside through roof with weatherproof roof cap, backdraft damper, and rodent-proof screening.
 - b. Fan Control: Hood-mounted fan switch, with separate hood-light control switch.
5. Duct Type: As indicated on Drawings.
6. Finish: Stainless steel.
7. Features:
 - a. Permanent, washable aluminum-mesh filter(s).
 - b. Built-in lighting.

2.5 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer [RF 1]: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
 1. Manufacturer: General Electric (GE) Café Series, model #CZS22MSKSS Counter-Depth Side-by-Side Refrigerator.
 2. Type: Freestanding.
 3. Dimensions:
 - a. Width: 35-3/4 inches (908 mm).
 - b. Depth: 30-3/4 inches (781 mm).
 - c. Height: 69-1/4 inches (1759 mm).
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 14.2 cu. ft. (0.40 cu. m).
 - b. Freezer Volume: 7.7 cu. ft. (0.22 cu. m).
 - c. Shelf Area: Three adjustable and one non-adjustable glass shelves in refrigerator.
 5. General Features:
 - a. Door Configuration: Overlay.
 - b. Dispenser in door for ice and cold water with dispenser lock.
 - c. Built-in water-filtration system.
 6. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Door Storage: Modular compartments, Gallon- (3.8-L) milk-container storage.
 7. Freezer Features: One freezer compartment with door.

- a. Interior light in freezer compartment.
 - b. Automatic icemaker and storage bin.
8. Front Panel(s): Stainless steel
 9. Appliance Color/Finish: Stainless steel

2.6 DISHWASHERS

A. Dishwasher [DW 1]: Complying with AHAM DW-1.

1. Manufacturer: General Electric (GE), model #GLDT696JSS Built-In Dishwasher with Hidden Controls.
2. Type: Built-in undercounter.
3. Dimensions:
 - a. Width: 24 inches (610 mm).
 - b. Depth: 24 inches (610 mm).
 - c. Height: 32-11/32 inches (813 mm).
4. Capacity:
 - a. International Place Settings of China: 12.
 - b. Water Consumption for Full Load: 3.8 gal. (14.4 L).
5. Sound Level: Maximum 57 dB.
6. Tub and Door Liner: Stainless steel with sealed detergent and automatic rinsing-aid dispensers.
7. Rack System: Towerless, one-piece molded silverware basket with cell cover, two plastic utility shelves with stem safe, ball-tipped tines.
8. Controls: Touch-pad controls with seven wash cycles.
9. Features:
 - a. Delay-wash option.
 - b. Digital display panel.
10. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
11. Front Panel: Stainless steel.
12. Appliance Color/Finish: Stainless steel.

2.7 CLOTHES WASHERS AND DRYERS

A. Clothes Washer [CW 1]: Complying with AHAM HLW-1.

1. Manufacturer: General Electric (GE), model #GTW810SSJWS.
2. Type: Freestanding, top-loading unit.

3. Dimensions:
 - a. Width: 28 inches (711 mm).
 - b. Depth: 29 inches (737 mm).
 - c. Height: 44-1/2 inches (1130 mm).
 4. Drum: Perforated stainless steel.
 - a. Capacity: 5.1 cu. ft. (0.14 cu. m).
 5. Controls: Touch-pad and rotary-dial controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: 13 wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: Six settings.
 - c. Speed Combinations: Variable.
 6. Electrical Power: 120 V, 60 Hz, 1 phase, 10 A.
 7. Motor: Manufacturer's standard with built-in overload protector.
 8. Features:
 - a. Wash Mechanism: Infuser.
 - b. Child Lock.
 - c. Vibration control.
 - d. Soft close clear glass lid.
 - e. Inlet Hoses: Minimum length 60 inches (1525 mm).
 - f. Drain Hoses: Minimum length 48 inches (1220 mm).
 - g. Self-leveling legs.
 - h. Automatic dispenser for bleach, fabric softener, and detergent.
 - i. End-of-cycle signal.
 - j. Extra-rinse option.
 - k. Delay-wash option, up to 9 hours.
 9. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 10. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
 11. Appliance Finish: White.
- B. Clothes Dryer [CD 1] : Complying with AHAM HLD-1.
1. Manufacturer: General Electric (GE), model #GTD81ESSJWS.
 2. Type: Freestanding, frontloading, electric unit.
 3. Dimensions:
 - a. Width: 28 inches (711 mm).
 - b. Depth: 32 inches (813 mm).
 - c. Height: 44-1/2 inches (1130 mm).
 4. Drum: Aluminized alloy.

- a. Capacity: 7.8 cu. ft. (0.22 cu. m).
5. Controls: Touch-pad controls for drying cycle, temperatures, and fabric selectors.
 - a. Dry Cycles: 11 dry cycles, including regular, delicates, and speed dry.
 - b. Heat Selections: Five settings.
6. Electric-Dryer Power: 240 V, 60 Hz, 1 phase, 25 A.
7. Features:
 - a. End-of-cycle signal.
 - b. Interior LED drum light.
 - c. Self-leveling legs.
 - d. Clean lint filter reminder light.
 - e. Cycle countdown and cycle status indicator.
 - f. Control lock.
 - g. Delay-dry option, up to 9 hours.
8. Appliance Finish: Manufacturer's standard finish.
 - a. Color: White.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 11 30 13

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Horizontal louver blinds with aluminum slats.

B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

- C. Samples for Initial Selection: For each type and color of horizontal louver blind.

- D. Samples for Verification: For each type and color of horizontal louver blind indicated.

- 1. Slat: Not less than 8 inches long.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide:
 - 1. Hunter Douglas Contract, H2TN (School Blind) 2" Aluminum Blind
 - 2. Or approved equal.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
 - 1. Width: 2 inches (51 mm).
 - 2. Thickness: Not less than 0.008 inch (0.20 mm).
 - 3. Spacing: Not less than 7.2 slats per foot.
 - 4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
 - 1. Capacity: Maximum three blinds per headrail unless otherwise indicated.
 - 2. Ends: Capped.
 - 3. Manual Lift Mechanism:
 - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
 - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.

4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - a. Tilt: Full.
 - b. Operator: Dual cord.
 5. Manual Lift-Operator and Tilt-Operator Lengths: Length required to extend to 48 inches (1219 mm) above floor level when blind is fully closed.
 6. Manual Lift-Operator and Tilt-Operator Locations: Right side and left side of headrail, respectively unless otherwise indicated.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
1. Type: Manufacturer's standard.
- E. Lift Cords: Manufacturer's standard braided cord.
- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
1. Type: Reinforced vinyl tape, manufacturer's standard width.
- G. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
1. Type: Overhead.
 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- H. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- I. Colors, Textures, Patterns, and Gloss:
1. Slats: As selected by Architect from manufacturer's full range.
 2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

- C. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
 - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 2 inches (51 mm) from interior faces of glass and not closer than 1-1/2 inches (38 mm) from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer, and that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 12 21 13

SECTION 12 36 23**PLASTIC-LAMINATE-CLAD COUNTERTOPS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes plastic-laminate countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, electrical switches and outlets and other items installed in plastic-laminate countertops.
 - 2. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples for Initial Selection:
 - 1. Plastic laminates.
- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches (200 by 250 mm) for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.

- B. Product Certificates: For the following:
 - 1. Composite wood and agrifiber products.
 - 2. High-pressure decorative laminate.
 - 3. Chemical-resistant, 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.

1.5 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. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Licensee of WI's Certified Compliance Program.
- C. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 17 and 50 percent during the remainder of the construction period.
- B. Field Measurements: Where countertops 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.

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

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
 - 1. Provide labels and certificates from WI certification program indicating that countertops, including installation, comply with requirements of grades specified.
- B. Grade: Custom.
- C. Certified Wood: Plastic-laminate countertops shall be made from wood products certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Wilsonart International; Div. of Premark International, Inc.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range in the following categories:
 - a. Patterns, matte finish.
- F. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- G. Core Material: Exterior-grade plywood.
- H. Core Material at Sinks: Exterior-grade plywood.
- I. Core Thickness: $\frac{3}{4}$ inch.
 - 1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.
- J. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 - 1. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Composite Wood and Agrifiber Products: Products 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. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 4. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

- A. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide " SG series" by Doug Mockett & Company, Inc.

2.4 MISCELLANEOUS MATERIALS

- A. 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."

2.5 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.

- C. Complete fabrication, including assembly, 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 12 36 23

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 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. 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.
 - 4. Hangers, anchors, sleeves, metal supports, and channels as required for work under this section including sound isolators where indicated.
 - 5. Piping and valve identification.
 - 6. Furnishing and installation of plumbing fixtures and trim.
 - 7. Final piping connections to all fixtures, equipment, including equipment furnished under other sections.
 - 8. Miscellaneous steel work including floor sleeves, slots, inserts, plates, supports, hangers, etc.
 - 9. Demolition work required for this section of work.

10. Testing, adjusting of completed work, inspections, and instructions.
11. Repair of damage done to premises as a result of this installation and removal of all debris left by those engaged in this installation.
12. Shop drawing, submittals, as-built drawings and operation and maintenance manuals.
13. Permits and connection fees.
14. Flashing and counter flashing.
15. All rigging hoisting, transportation and associated work necessary for placement of all equipment in the final location shown.
16. Concrete coring, cutting and patching as a of this work.
17. Trenching, and compacting for work under this section.
18. Painting of exposed piping and supports in accordance with Section 09900, Painting.

1.4 RELATED WORK ELSEWHERE

- A. Section 07 92 00, Sealants.
- B. 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 of 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 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, whether or not 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, in order 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 whether or not 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 within the building itself.
- E. Domestic Water: The Contractor shall be responsible for the domestic water service within the building itself.

1.9 NOISE AND VIBRATION

- A. Cooperate in reducing objectionable noise or vibration. If noise or vibration, as a result of 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.

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 Section 01600 Product Requirements 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 bound in a three ring binder, with table of contents and tab set for each system.
 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 properly 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).
10. Trap Primer Valves.
11. Water Hammer Arrestors (Shock Absorbers).
12. Drains, Cleanouts and Vent Caps.
13. Access Doors.
14. Pipe and equipment markers, and valve tags.
15. Flexible Connectors and Seismic Joints.
16. Plumbing Fixtures and Trim.

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 2000 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 sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and re-submittal 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 of 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

- 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 available for inspection at all times. 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. "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. Three copies of white bond as-built. 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.

- C. Submit in accordance with Section 01720 Project Record Drawings and Section 01725 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 shut-down 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. Drain body shall bear manufacturers name so as to be 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, horizontal discharge for narrow wall. 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. Accessible Fixtures
 - 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 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. 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 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.

2.5 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 where 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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 mils 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.

2.10 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. 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 where 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 supports 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.

2.11 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 and the project inspector.
- C. All mechanical equipment shall be braced or anchorage to resist horizontal force acting in any direction using the following criteria:
1. The total design lateral seismic force shall be determined from ASCE 7 Section 13.3.1, California Building Code (CBC) 2016. Forces shall be applied in their horizontal directions, which result in the most critical loadings for design. The value of a_p (component amplification factor) and R_p (component of modification factor) of Section 13.3.1 shall be selected from Table 13.6-1, ASCE 7. The value of I_p (seismic importance factor) and S_{DS} (special acceleration) shall be selected from Section 13.1.3 and Section 11.4.4, ASCE 7, respectively.
- D. For Supported Equipment:
1. Pre-approved isolator restraint system by the State of California and bear approval number.
 2. Submittal shall include load versus deflection curves up to 1/2" in the x, y, and z planes. Tests shall be conducted in an independent laboratory or under the signed supervision of an independent registered engineer. The snubber assemblies shall be bolted to the test machine as the snubber is normally installed. Test reports shall certify that neither the bridge bearing neoprene elements nor the snubber body has sustained any obvious deformation after release from the load.
 3. Submit calculations for each seismic restraint and vibration isolation signed by structural Registered Engineer.
- E. Seismic Restraint Systems for Piping:
1. All seismic bracing required shall be installed as per Chapter 13 of ASCE 7-05 except as modified by Section 1615A of the 2016 CBC.
 2. Piping distribution systems shall be braced to resist forces prescribed in ASCE 7-05 Section 13.6.7 and 13.6.8 respectively.

3. The bracing and attachments to the structure shall comply with one of the OSPD Pre-Approvals with OPA #, such as B-Line (OPA 0114), Mason Industries (OPA 349), ISAT (OPA 485) as modified to satisfy anchorage requirements of ACI 318 D.
4. Copies of the manual shall be on the jobsite prior to starting hanging and bracing of the pipe distribution systems.

2.12 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.

2.13 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. 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.
- G. All insulation shall be continuous through walls, sleeves, pipe supports and hangers, and other pipe penetrations.
- H. Finish insulation at supports, protrusions and interruptions. No hangers or supports shall be embedded in insulation.
- I. 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.
- J. 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.
- K. 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.

2.14 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. Adjustcrete, 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 Section 07 84 13, Fire Stopping and Smoke Seals. 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 1/4" 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.

2.15 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.

2.16 ACCESS DOORS AND PANELS

- A. Furnish under this Division where shown and required by Regulatory Agencies for access to all concealed valves, water arrestors, unions, etc. Doors shall be in accordance with requirements of Section 08 31 13. Doors in this Division, Section 08 31 13, 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 Section 08 31 13. Mark each door to accurately establish its location.

2.17 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. Above ground piping:
 1. All piping are 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. pipe lines 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
Domestic Cold Water	Green	White
Domestic Hot Water	Yellow	Black
Domestic Hot Water Return	Yellow	Black
Sanitary Sewer	Green	White
Sanitary Vent	Green	White

4. Size of Legend Letters:

OUTSIDE DIAMETER OF PIPE COVERING	MINIMUM LENGTH OF COLOR FIELD	MINIMUM SIZE OF TEXT
3/4" to 1-1/4"	8"	1/2"
1 1/2" to 2"	8"	3/4"
2 1/2" to 6"	12"	1 1/4"
8" to 10"	24"	2 1/2"
Over 10"	32"	3 1/2"

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
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. All gas pressure regulators shall be identified with proper signs. The upstream pressure shall be identified with a metal tag permanently attached to the regulator and state (with appropriate wording to state actual gas pressure conditions): 5psig natural gas pressure. DO NOT REMOVE, or similar.
8. Emergency Safety Equipment: Emergency units shall be with highly visible signs in accordance with ANSI 2358.1 and shall comply with the provisions of ANSI 2535.1 through ANSI 2535.5. Signs shall utilize a white background with green lettering. Graphics and lettering shall be of the correct size and format. Signs shall be furnished by manufacturer of the safety equipment and shall be in accordance with manufacturer's instructions and ANSI standards.
9. 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 Burns". Sign shall be approximately 12"high by 8" wide Semi-Rigid PVC and color shall be on White.

E. Valve and Equipment Identification Charts:

- F. 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:
 1. Location and function of each tagged valve.
 2. Type, size and essential features of each system.
- G. Submit drafts of valve schedule for review before preparing final sets.
- H. Frame five copies of reviewed schedule under glass, mount where directed.
- I. Provide typewritten list of equipment in triplicate, indicating location, service for each piece of equipment, suitably framed, with glass front.

2.18 STRAINERS

- A. Wye type, with Monel or stainless steel strainer cylinder and gasketed machined strainer cap, bronze body, threaded, 250 pound, C.M. Bailey No. 100-B, or equal.

2.19 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 $\pm X$, $\pm Y$ and $\pm Z$ 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 The Company, 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. Fire stop all pipes penetrating fire rated construction in accordance with specification Section 07 84 13, Fire Stopping and Smoke Seals.
- 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 ($\frac{1}{4}$ ") 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 (1/8") 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.

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 ANSI B2.1 requirements. 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. 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 3-1 & Table 3-2 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 Section 07 92 00, 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 wall 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. Test all systems in accordance with the Uniform Plumbing Code and local authorities having jurisdiction. Unless local authorities have more stringent requirements, testing shall conform to the following:
 - 1. Domestic water system: 2016 California Plumbing Code Section 609.4.
 - 2. Sanitary sewer system: 2016 California Plumbing Code Section 712.2.
- I. Apply tests for a minimum period of four (4) hours or tests are complete.
- J. 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.

- K. Furnish all labor and all other utilities required to make tests. Make compliance tests in the presence of the Owner's Representative.
- L. 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 609.9.1 through 609.9.4.
- 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 so as 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 pipe 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 Section 09 91 00-Painting.
- 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 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 bury 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 23 05 00**GENERAL MECHANICAL PROVISIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions, Supplementary General Conditions, and Division 1 - General Requirements, are hereby made a part of this Section as if repeated herein.
- B. These General Mechanical Provisions apply to the entire Division 23.

1.2 DESCRIPTION

- A. Work Included: Furnish all labor, materials, equipment and pay all fees required to complete all plumbing work shown on the drawings and specified herein.
- B. Related work included in other sections:
 - 1. Electrical.
 - 2. Painting.
 - 3. Access Panels.
 - 4. Concrete Work.
 - 5. Landscape Irrigation.
 - 6. Site Work.

1.3 INCORPORATED DOCUMENTS

- A. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work of this Section, including those noted below:
 - 1. Associated Air Balance Council (AABC).
 - 2. Air Diffusion Council (ADC).
 - 3. American Gas Standard (AGA).
 - 4. Air Moving and Conditioning Association (AMCA).
 - 5. American National Standards Institute (ANSI).
 - 6. Adhesive and Sealant Council (ASC),
 - 7. American Society of Mechanical Engineers (ASME).
 - 8. American Society for Testing and Materials (ASTM).

9. Air Conditioning and Refrigeration Institution (ARI).
10. American Society of Civil Engineers (ASCE).
11. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
12. National Environmental Balancing Standards (NEBB)
13. National Electrical Manufacturers Association (NEMA).
14. National Fire Protection Association (NFPA).
15. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
16. Underwriters' Laboratories, Inc. (UL).

1.4 LEGAL REQUIREMENTS AND STANDARDS

- A. General: Comply with applicable sections of state and local codes, laws ordinances, rules and regulations of authorities having jurisdiction.
- B. Codes and Standards: Conform to applicable sections of codes and standards, including:
 1. California Energy Conservation Code, Title 24.
 2. Occupational Safety and Health Administration (OSHA).
 3. State Fire Marshal requirements.
 4. California Building Code (CBC).
 5. California Electric Code (CEC).
 6. California Green Building Standards (CGBS).
 7. California Mechanical Code (CMC).
 8. California Plumbing Code (CPC).
 9. Division of the State Architect Offices of Regulation (DSA).
- C. Minimum Requirements:
 1. Comply with requirements of authorities as minimum acceptable work.
 2. The drawings and specifications take precedence when they call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations.

1.5 QUALITY ASSURANCE

- A. Products Criteria:
 1. Supply all equipment and accessories new, free from defects.
 2. Supply all equipment and accessories in compliance with the applicable standards listed in Article 1.4 of this sections and with all applicable national, state, and local codes.
 3. Electrical Equipment: Listed by UL and shall bear their label.

4. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
 5. Products shall be supported by a service organization that maintains a complete inventory of repair parts and is located reasonably close to the site.
 6. When two or more units of materials or equipment of the same type or class are required. These units shall be products of one manufacturer.
 7. Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 8. Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 9. Asbestos products or equipment or materials containing asbestos shall not be used.
 10. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Owner prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- B. Qualifications of Installers: For the actual fabrication, installation and testing of work under this Section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.
- C. Before any welding is performed, submit a copy of the Welding Procedure Specification (WPS) together with the Procedure Qualification Record as required by Section 9 of the ASME Boiler and Pressure Vessel Code.
1. Before any welder performs any welding, submit a copy of the Manufacturer's Record of Welder or Welding Operator Qualification Tests as required by Section 9 of The ASME Boiler and Pressure Vessel Code. The letter or symbol (as shown on the qualification test form) shall be used to identify the work of that welder and shall be affixed in accordance with appropriate construction code, to each completed weld.
 2. The types and extent of non-destructive examinations required for pipe welds are shown in Table 136.4 if the Code for Pressure Piping, ANSI/ASME.
- D. Requirements of Regulatory Agencies and Standards:
1. Permits: Obtain and pay for all fees, permits and inspections. Deliver all certificates of inspection to Architect.
 2. Arrange and pay all costs for utilities required to complete all work of this Division. Connection to all utility company or on-site services, payment of service charges and provision for and installation of temporary utilities is included.
 3. The requirements of authorities shall be minimum acceptable requirements for the work. When contract drawings or specifications call for materials or construction of better quality for larger size than required by codes, laws, rules and regulations, the drawings and specifications take precedence.

E. Drawings:

1. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. All scaled and figured dimensions are approximate and are given for estimating purposes only. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices that may be required to complete the installation. Before proceeding with any work, carefully check and verify all dimensions and sizes.
2. As far as possible the work has been indicated on the drawings in such position as to suit and adapt to the work of other trades, but the work as indicated is largely diagrammatic and shown primarily for clarity. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the work of all other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown.
3. When apparatus and equipment have been indicated on the drawings, dimensions have been taken from typical equipment of the class indicated. The locations of apparatus, piping, and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
4. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the rough-in of connections.
5. Be responsible for any cooperative work which 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 Architect and made to his satisfaction.
6. Special Note: 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 architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for submittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

1.6 DEFINITIONS

- A. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms, or completed work.
- B. Option or Optional: Contractor's choice of an alternate material or method.
- C. Install: To physically erect, mount and connect complete with related accessories.
- D. Supply: To purchase, procure, acquire and deliver complete with related accessories.
- E. Furnish or Provide: To supply, install, and connect up complete and ready for safe and regular operation of particular work referred to, unless specifically noted otherwise.

- F. Work: Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.
- G. Wiring: Raceway, conduit, fittings, wire, boxes, and related items.
- H. Concealed: Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures, and not exposed to view in the completed work.
- I. Reviewed, Satisfactory, Accepted, or Directed: As reviewed, satisfactory, accepted or directed, by or to Engineer.
- J. Motor Controllers: Manual or magnetic starters (with or without switches), individual pushbuttons or hand (HOA) switches controlling the operation of motors.
- K. Control or Actuating Devices: Automatic sensing and switching devices such as thermostats, pressure, switches and relays, etc., controlling operation of equipment.
- L. Indicated, as Shown, or Noted: As indicated, shown or noted on Drawings or Specifications.
- M. Similar or Equal: Of base bid manufacturer, equal in materials, weight, size, design and efficiency of specified product.
- N. Engineer: Mechanical Engineer of Record.
- O. Accessible: Capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

1.7 SITE EXAMINATION

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirement of the contract. Compare site and existing conditions to the mechanical, electrical, architectural, structural, civil, and other drawings and specifications. Call any discrepancies to the attention of the Architect during bidding period. Make allowances for them in preparing the bid.

1.8 ELECTRICAL WORK

- A. Quality: Work shall comply with requirements of Division 16 and applicable codes.
- B. Wiring: all wiring shall be in electrical conduit or as indicated on drawings.
- C. HVAC Control Wiring: Provide control wiring for starter holding coils, relays, interlock and temperature controls.
- D. Provide controls, controllers, relays, transformers, switches, duct mounted products of combustion detectors, time clocks, etc., required by work of this Division.

1.9 SUBSTITUTION OF MATERIALS:

- A. The design has been based on the manufacturer's name and product listed on the drawings or named first in these specifications. Other manufacturers' names or same manufacturer but different product line listed in these specifications may be selected and considered "as equal" for quality only; however, they must match the performance, construction, fit and features of those selected for design. The acceptance of these does not relieve the Contractor for responsibility of providing the required materials and providing a workable system.
1. In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and the submittal will not be allowed.
- B. Should the contractor wish to substitute equipment or material other than those considered for the basis of design, the contractor shall submit information as called for in "Submittal of Materials and Equipment" for both the specified or scheduled item and the substitute item. These submittals will show that both the specified and the substitute material match in quality, performance, construction, fit and features of those selected for design. Any equipment or material submitted for substitution without the comparison information will not be reviewed or acceptable.
- C. Liability of Substitutions:
1. Performance of substitutions must be equal to the item specified. If the substituted item fails to perform according to the specifications, replace with the originally specified item without extra compensation on request of the Architect any time within the guarantee period.
 2. The contractor is responsible for the cost of any changes to other trades and additional Architectural and Consulting fees resulting from approved substitutions in mechanical equipment.
 3. 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 ramifications of 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.
 4. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.10 SUBMITTAL OF MATERIALS AND EQUIPMENT

- A. Submittal:

1. Submittals for a product or material or area of work must be complete. **PIECEMEAL SUBMITTAL WILL NOT BE ACCEPTABLE.** All submittals shall be factory or manufacturer certified. Vendor's submittal data not acceptable.
 2. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
 - a. Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
 - b. Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
 3. Identify submittal with Architect's project name, number and with item designation as indicated on drawings, and referenced to applicable paragraphs of the specification. Submit in brochure form.
- B. Review of Submittal: These will be reviewed for general design only, and not for method of assembly, erection, construction, or detailed compliance with contract documents. All submittals shall be factory or manufacturer certified. Submittal technical data and dimensions by Vendor are not acceptable.
- C. Manufacturer's Data:
1. Include data for all material and equipment that will be installed.
 2. Include complete catalog information such as construction, capacities, types, fan curves, pump curves, sizes, etc. Also include dimensional data, and sufficient information to illustrate compliance with the specifications and list labeling and/or approving agencies and standards of design employed in manufacturer data.
- D. Shop Drawings:
1. Prepare dimensionally accurate floor plans and Sections in tight conditions as required of all equipment rooms and all floor plans. Show all equipment, complete ductwork, piping (including plumbing and sprinkler pipes), accessories, and also clearances for operating servicing and coordination with other systems. Indicate bottom elevation for both pipes and ductwork.
 2. Automatic temperature control systems, wiring diagrams, control panel boards. Include in wiring diagrams all low and line voltage wiring and equipment.
 3. Drawings clearly identified with the Architect's project name and number, and a sheet title identifying its contents.
 4. Show location of thermostat(s) and sensors.
- 1.11 SHOP, OFFICE AND STORAGE
- A. Provide temporary shop, office and storage space on site only at locations approved by Architect, as required for execution of work. Remove these facilities upon completion of work.
- 1.12 JOB CONDITIONS

- A. Where new pipes are to be connected to an existing pipe, verify location, size, elevation and all other information necessary for connection. This verification shall be done prior to installation of the new pipe. Should there be a problem, contact the Architect **[IOR]** immediately to resolve the problem.
- B. Interruption of Services:
 - 1. Before making any connections or doing any work which interrupts services to existing buildings, notify Owner in writing at least 72 hours in advance; and such work performed as quickly as possible and only at such times as designated by Owner.
 - 2. Length of time existing services is shutdown to be approved by Owner.
- C. Restoration of Damage: Repair or replace, as directed by Architect, materials and parts of premises which become damaged because of installation of work of this Division. Remove replaced parts from premises. Keep accumulation of dust and debris to a minimum. Remove and dispose of debris in a legal manner. Burning and/or selling material at the site is prohibited.
- D. Storing Mechanical material in Premises:
 - 1. Duct and mechanical equipment on site must be covered before installation.
- E. Cleaning Equipment and Premises:
 - 1. Clean equipment and materials: Remove all dirt, grease, splashed paint, plaster and similar foreign materials. Restore damaged finishes to original condition.
 - 2. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish resulting from operations.

1.13 REVIEW OF CONSTRUCTION

- A. Work may be reviewed at any time by representatives of Owner or representatives of Architect.
- B. Advise Architect that work is ready for review at following times:
 - 1. Prior to backfilling buried work.
 - 2. Prior to concealment of contract have been completed.
 - 3. When requirements of contract have been completed.
 - 4. Do not backfill or conceal work without Architect's consent.
- C. Maintain on job a set of specifications and drawings for use by Architect's representative.
- D. 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 Architect and at no additional cost to the school district.

1.14 MATERIALS

- A. In addition to material and equipment specified, also provide incidental materials required to effect complete installation. Such incidental materials and equipment shall be uniform throughout the installation. Equipment or fixtures of the same type shall be of same manufacturer.
- B. 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 the site.
 - 2. Cap openings in pipes and ends of valves with manufactured caps and 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.

1.15 TESTING

- A. Provide tests specified hereinafter, where applicable. Provide written verification that the tests have been successfully completed.

1.16 RECORD DRAWINGS (AS-BUILT DRAWINGS)

- A. Contractor shall provide and keep up-to-date a complete and accurate "as-built" record set of blue line prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. This record shall be kept up-to-date on blue line prints as the job progresses and shall be available for inspection at all times. Submit completed drawings to Architect in compliance with Division 1.
- 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 drain pipe below grade.

1.17 OPERATING AND MAINTENANCE DATA

- A. General: Submit to the Architect before acceptance of the installation, complete and at one time. Partial or separate data will not be accepted. Data shall consist of the following minimum submissions:
1. Piping Identification Schedule: Copy of charts as specified under valve tags and charts.
 2. Simplified and consolidated control drawings.
 3. Equipment: List of nameplates, including nameplate data and system served.
 4. Manufacturer's Literature: 3 copies of manufacturer's instructions for operation and maintenance of all mechanical equipment, including replacement parts list.
 5. Written Instructions: Typewritten instructions for operation and maintenance of these systems composed of Operating Instructions and Maintenance Schedule. 4 copies submitted to the Engineer for approval.
 6. Operating Instructions: A brief description of the system indicating proper setting of switches and other equipment furnished for providing control of the system and its components by the operator. Do not include adjustments requiring the technical knowledge of the service agency personnel.
 7. Maintenance Instructions: A list of each item of equipment requiring inspection or lubrication, describing the performance of such maintenance, and the month of the year when each item of equipment should be inspected, serviced, or lubricated.
 8. Maintenance Schedule: A list of each item of equipment requiring maintenance, showing the exact type of bearing on every component of each item of equipment, and the frequency when each item of equipment should be inspected or serviced.
 9. Verbal Instructions: Upon completion of the work, and at a time designated by the Architect, instruct the Owner's representative in the operation and maintenance of the equipment supplied by his company.
 10. Binders: Four complete sets of the above data in loose ring binders with permanent covers, with permanent identification on back and index.

1.18 COMPLETION

- A. Before Final Review: The work hereunder will not be reviewed for final acceptance until Operating and Maintenance Data, Manufacturer's Literature, Valve Directories, Piping Identification Code Directory and nameplates specified herein have been approved and properly posted in the building and final cleaning has been completed.
- B. Demonstration of Operations: When the installation is complete and adjustments specified herein have been made, operate the systems for one week, during which time demonstrate to the Architect that systems are completed and operating in conformance with these specifications.

1.19 GUARANTEE

- A. General: Conform to the GENERAL CONDITIONS of the specifications.
- B. Contractor shall guarantee the entire mechanical, plumbing and piping systems unconditionally for a period of two (2) years after final acceptance. If, during this period, any materials,

equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

- C. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of two (2) years after date of acceptance of his work.
- D. Parts Warranty: Provide standard warranty of manufacturer for replacement of parts to apply after expiration of above period. Furnish replacement parts to Owner or to his service agency as directed. Furnish Owner printed manufacturer's warranties' complete with material included and expiration dates upon completion of project.
- E. Warranty also applies to services including instructions, adjusting, testing, noise, balancing, etc.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Beyond material and equipment specified, also provide incidental materials required to effect complete installation. Such incidental materials include solders, tapes, caulking, mastic, gaskets, and similar items.
- B. Materials and equipment shall be uniform throughout the installation. Equipment of the same type shall be of same manufacturer.
- C. Products from other manufacturers not listed shall submit specifically in accordance with Specification Section 01630 – Product Substitution Procedures.

2.2 VALVES

- A. For Domestic Water Service refer to specification Section 22 00 00 Plumbing.

2.3 HANGERS AND SUPPORTS

- A. All required seismic bracing shall be installed as per Title 24, Part 2, 2013 CBC for total lateral forces prescribed in ASCE 7-10 Section 13.3 as defined in ASCE 7-10.
- B. Installation shall be as published by SMACNA or OSHPD anchorage pre-approved restraint system. All hanger material to be electroplated zinc or hot-dipped galvanized. No plain (black) finish allowed.
- C. Trapeze suspension (trapeze hangers may be used for parallel lines if pipes pitch same direction): Size channel assembly in accordance with manufacturer's published load ratings. No deflections shall exceed 1/360 of span (refer to Superstrut load tables).
- D. Support and laterally brace all ducts, pipes, and equipment per latest SMACNA Manual Standards.

- E. Do not support weight of piping from mechanical equipment, i.e., coil connections.
- F. Do not cut or weld to any structural steel without permission of Architect.
- G. Provide Semco, Trisolator, or equal pipe isolator at all hangers for non-insulated pipes.
- H. Schedule of hangers and supports:

INDIVIDUAL PIPE HANGERS		
Pipe Size - inches	Hanger	Minimum Rod Size - inches
½" thru 2"	Superstrut C711	3/8"
2½" thru 3"	Superstrut C711	½"
4" and 5"	Superstrut C711	5/8"
6"	Superstrut C711	¾"
8"	Superstrut C711	7/8"

TRAPEZE HANGERS	
Single or Double 12 Gauge Channel	Superstrut A1200 or A1202
Straps	Superstrut 70 or 702 series
Pipe Isolators	Superstrut 1-716 Cush-A-Clamp

WALL SUPPORT	
Individual pipe sizes up to 3"	Superstrut S250
Individual pipe sizes 4" thru 8"	Superstrut S251

- a. For plumbing hot and cold water 1" and smaller, see Section 22 00 00.

2.4 ROOF, WALL AND FLOOR PENETRATIONS

- A. All pipe penetration through poured concrete wall or floor shall be sealed with Metra-seal as shown on drawings. All other pipe penetration holes shall be sealed with a product that will seal against the spread of flame, smoke, gases and water, for up to a 3 hour rating. Product shall be as manufactured by 3M Brand (Fire Barrier Penetration Sealing Systems) or equal. Product must have been tested and classified by Underwriters' Laboratories and listed in the UL Building Materials Directory; "Through-Penetration Fire stop Systems (XHEZ)," and "Fill, Void or Cavity Materials (XHHW)." Submittal shall reflect product and manufacturers Spec-Data sheet reflecting approvals.
- B. Provide pipe sleeves as follows:

SLEEVE LOCATION	SLEEVE MATERIAL
Floor membrane waterproof	Duco cast iron body with floor and roof construction flashing device, under deck clamp as required, J.R. Smith 1720 or approved equal. Non membrane floor and Standard weight black steel exterior wall pipe with a continuously welded water stop of 1/4" steel plate extending from outside of sleeve a minimum of 2" all around.
Non membrane floor and continuously exterior wall	Standard weight black steel pipe with a welded water stop from outside of a sleeve, a minimum

SLEEVE LOCATION	SLEEVE MATERIAL
construction.	of 2" all around

- C. Length of sleeves as follows:

SLEEVE LOCATION	SLEEVE LENGTH
Floors	Equal to depth of floor construction including finish. Extend minimum 2" above floor level in unfinished area, and in pipe chases.

- D. Escutcheons: Provide 1" wide chrome or nickel plated plates on all pipes exposed to view, passing through floors, walls, partitions, etc. Escutcheons sized to fit pipe and pipe covering and give a finished appearance. Escutcheons held in place by set screws. Provide plates on pipes extending through sleeves.

2.5 ACCESS DOORS

- A. Furnished and installed under this Division.
- B. Install where shown or required by regulatory agencies and for access to all concealed valves, actuators, fire dampers, volume dampers, motors, equipment, etc.
- C. Access doors to be fire rated to match fire rating of wall or ceiling where door is to be installed.
- D. All doors shall have key operated lock.
- E. Door sizes shall be 24" x 24" minimum for ceilings and 12" x 12" minimum for walls.
- F. Non-rated door: 16 gauge frames, 14 gauge steel door, flange of door shall be 3/4" wide, hinge shall be concealed, continuous piano hinge, key operated cylinder lock, finish shall be prime coat of rust inhibitive grey baked enamel.
- G. Karp Model DSC-214M drywall type with key operated cylinder lock and tile with exact fit. Finish shall be prime coat of rust inhibitive grey baked enamel.
- H. Karp Model KDW for gypsum drywall with key operated cylinder lock and tile with exact fit. Finish shall be prime coat of rust inhibitive grey baked enamel.
- I. Coordinate all locations with Architect and 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 his requirements for equipment and material installation of any kind, whether or not 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.

2.6 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 and the field engineer of the Division of the State Architect.
- C. All mechanical equipment shall be braced or anchorage to resist horizontal force acting in any direction using the following criteria:
1. The total design lateral seismic force shall be determined from ASCE 7 Section 13.3.1, California Building Code (CBC) 2013. Forces shall be applied in their horizontal directions, which result in the most critical loadings for design. The value of a_p (component amplification factor) and R_p (component of modification factor) of Section 13.3.1 shall be selected from Table 13.6-1, ASCE 7. The value of I_p (seismic importance factor) and S_{DS} (special acceleration) shall be selected from Section 13.1.3 and Section 11.4.4, ASCE 7, respectively.
- D. For Supported Equipment:
1. Pre-approved isolator restraint system by the State of California and bear approval number.
 2. Submittal shall include load versus deflection curves up to 1/2" in the x, y, and z planes. Tests shall be conducted in an independent laboratory or under the signed supervision of an independent registered engineer. The snubber assemblies shall be bolted to the test machine as the snubber is normally installed. Test reports shall certify that neither the bridge bearing neoprene elements nor the snubber body has sustained any obvious deformation after release from the load.
 3. Submit calculations for each seismic restraint and vibration isolation signed by structural Registered Engineer.
- E. Seismic Restraint Systems for Ductwork and Piping:
1. All required seismic bracing shall be installed as per Chapter 13 of ASCE 7-10 except as modified by Section 1616A of the 2016 CBC.
 2. Ductwork and piping distribution systems shall be braced to resist forces prescribed in ASCE 7-10 Section 13.6.7 and 13.6.8 respectively.
 3. The bracing and attachments to the structure shall comply with one of the OSPD Pre-Approvals with OPM #, such as B-Line (OPM 0114-13), Mason Industries (OPM 0043-13), as modified to satisfy anchorage requirements of ACI 318 chapter 17.
 4. Copies of the OPM manual(s) shall be on the jobsite prior to starting hanging and bracing of the ductwork and pipe distribution systems.

2.7 IDENTIFICATIONS

- A. Piping:
1. Identify all piping with Brady Perma-Code, Stenton, or approved equal, self-sticking pipe markers consisting of pipe service content wording and arrow indicating directions of flow on A.S.A. color background.
 2. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other.

3. Markers to be 50 feet apart (maximum) on centers and shall occur where a pipe enters and leaves a concealed space.
4. Use 2" high letter size for pipe or insulation 3" or larger, and 1" size for pipe or insulation 2½" or smaller.
5. Provide at each end of each marker Brady or equal 2¼" wide self-sticking clear tape around the periphery of pipe or insulation to further secure the marker.
6. All markers shall be installed after finish painting is complete.

B. Piping Label Colors:

SERVICE	BACKGROUND COLOR	LETTER COLORS
Domestic Cold Water	Green	White
Domestic Hot Water Supply	Yellow	Black
Domestic Hot Water Return	Yellow	Black
Refrigerant Gas (Inherently Low Hazard)	Blue	White
Refrigerant Liquid (Inherently Low Hazard)	Green	White
Storm Drain	Green	White
Sanitary Sewer	Green	White
Sanitary Sewer Vent	Green	White

- C. Equipment: Each piece of motor-driven equipment shall be identified by engraved plastic-laminate signs. Signs shall be a minimum of 4½" x 1½" with minimum of ½" high white letters on a black background, mounted permanently on equipment. The names shall correspond to those given on the control panels be identified as to the area or space served by the equipment. Automatically started motors shall have warning sign: "THIS MOTOR MAY START AT ANY TIME." The equipment shall be further identified with the electrical panel and circuit.
- D. Valves: All valves shall have 1-½" diameter brass disc stamped with 3/8" high letters showing type of services and valve number. Tags shall be attached to valves with brass chain.
- E. Refrigerant piping shall be identified in accordance with the UMC Standard 11-2. Identification shall include: type of refrigerant, function and pressure.

2.8 MOTORS AND DRIVES

- A. Type: NEMA Standard open drip-proof, totally enclosed air over (TEAO) or totally enclosed fan cooled (TEFC) type, as specified or indicated on drawings. Class B insulation 1.15 service factor on all motors. All motors shall be of high efficiency.
- B. Manufacturer: General Electric, Gould, Baldor or approved equal.
- C. All motors designed to operate at full load continuously without exceeding NEMA standards. Motors 40 HP and larger shall be part winding type.

- D. V-belt type sized for 150% of the motor horsepower. A minimum of two belts provided for drives where motors are rated one horsepower and larger.
- E. V-belt drive package of adjustable pitch type for motors up to 10 HP, fixed pitch for motors 15 HP and larger.

2.9 TOOLS AND LUBRICANTS

- A. Furnish and turn over to the owner special tools, 2 sets minimum, for each type or size of tool not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease guns with attachments for applicable fittings: one for each type of grease required for each motor or other equipment.
- C. Tool containers: Hardwood or metal, permanently identified for intended service and mounted, or located where directed by the owner.
- D. Lubricants: A minimum of one quart of oil and one pound of grease, of equipment manufacturer's recommended grade and type in unopened containers and properly identified as to use for each different application.

PART 3 - EXECUTION

3.1 REVIEW OF CONSTRUCTION

- A. Work may be reviewed any time by representative of Architect.
- B. Advise Architect that work is ready for review at following times:
 - 1. Before concealment of work in walls and above ceilings.
 - 2. When requirements of Contract have been completed.
- C. Do not conceal work without Architect's consent.
- D. Maintain on project site a set of specifications and drawings for use by Architect's representative.

3.2 NOISE AND VIBRATION

- A. Correct conditions at no cost to the Owner if noise or vibrations because of improper material or installation occurs in the building.

3.3 GENERAL INSTALLATION METHODS

- A. Where pipe passes through seismic joint, install flexible connection as manufactured by Metraflex to allow vertical and horizontal movement during an earthquake.

- B. Carpentry, Cutting, Patching and Core Drilling:
1. Provide carpentry, cutting, patching, and core drilling required for installation of material and equipment specified in this Division.
 2. Do not cut, core or drill structural members without consent of Architect.
 3. All asphalt and concrete sawing shall not have any outside corners cut.
- C. Waterproof Construction:
1. Maintain waterproof integrity of penetration of materials intended to be waterproof. Caulk penetrations of foundation walls and floors watertight. Provide membrane clamps at penetrations of waterproof membranes.
 2. Provide weatherproof NEMA 3R enclosures for all equipment or devices mounted outside or otherwise exposed to the weather.
- D. Sleeves, Chases, and Concrete Inserts:
1. Provide all required sleeves, chases, concrete inserts, anchor bolts, etc., and be responsible for correct location, installation of same.
 2. Sleeves and chases are prohibited in structural members, except where approved in writing.
 3. Locating and sizing of openings for ductwork through walls, etc., under this Division.
 4. Provide sleeves for each pipe passing through walls, partitions, floors and roofs.
 5. Set all pipe sleeves and inserts in place before concrete is poured. Coordinate the placing of these items to avoid delaying concrete placing operations.
 6. Locate all chases, shafts, and openings required for the installation of the mechanical work during framing of the structure. Do any additional cutting and boring required due to improperly located or omitted openings without cost of the Owner under the supervision of the Architect.
 7. Sleeves for un-insulated pipe shall be two pipe sizes larger than pipe passing through or a minimum of 1/2" clearance between inside of sleeve and outside of pipe.
 8. Sleeves for insulated piping of adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking.
 9. Caulk space between sleeve and pipe or pipe covering with an incombustible, permanently plastic, water-proof non-staining compound leaving a finished, smooth appearance or pack with incombustible fibrous glass to within 1/2" of both wall faces and provide plastic, water-proof caulking compound.
 10. Finish and Plates: Smooth up rough edges around sleeve with plaster.
- E. Mechanical Equipment:
1. Where not otherwise indicated, basis for equipment and material installation is published recommendations of respective manufacturer.
 2. Equipment:
 - a. Accurately set and level with supports neatly placed and properly fastened. No allowance of any kind will be made for negligence on part of Contractor to foresee means of bringing in, installing equipment into position inside building.

- b. All equipment shall be installed accessible on all sides with operable areas having a minimum space clearance as recommended by the manufacturer.
 - c. Where the School District determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.
- F. Piping and/or Ductwork Systems:
- 1. Work into complete integrated arrangement, with like elements to make work neat appearing finish.
 - 2. Run concealed, except as shown otherwise.
 - 3. Exposed pipes and ductwork to run parallel with walls or structural element. Do not install any exposed pipe or ductwork without prior approval of Architect.
 - 4. Install with adequate passageways free from obstructions, as high as practicable to maintain adequate head room, as shown or as required. Coordinate with work of other Divisions to achieve proper head room as specified in this Division.
 - 5. Clearance: Do not obstruct spaces required by code in front of electrical equipment, access doors, etc.

3.4 TESTING AND ADJUSTING

- A. General: All defects disclosed as result of the following or other tests or operations shall be promptly repaired by and at expense of Contractor and to Architect's satisfaction. Test shall comply with all necessary codes, rules, and regulations as noted herein before. Contractor shall supply all instruments, labor and tools required by tests. Any defective material and/or equipment shall be repaired, adjusted and replace by new, like materials and equipment, and retested before acceptance.
- B. Clean and purge equipment and piping before each test.
- C. Test various mechanical systems in portions as work progresses. Any system or portion previously tested to become part of any repeated test when it becomes part of distribution or collection system.
- D. Maintain test pressures for periods stated, or as directed, without loss in pressure except that due to change in temperature or authorities having jurisdiction.
- E. Operational Tests: Operational tests shall be made on all machinery and devices to determine proper compliance with specifications. All equipment shall function quietly and efficiently; any undue noise or vibration caused by malfunctioning of piping and equipment shall be promptly repaired and/or corrected before acceptance.
- F. Timing of Tests: Two weeks before expected completion date, the Contractor shall put all systems and equipment into operation and shall continue operation of same during each working day, but not less than five 8-hour periods, until all adjusting, balancing, testing, demonstrations, instructions and cleaning of systems have been completed. Instructions and demonstrations required shall be given simultaneously with this operation.

- G. Duct Leakage Tests: All ductwork with 2" W.C. or higher static pressure shall be tested for leaks, using necessary instruments. Conduct tests as recommended in SMACNA balancing manual. Ductwork handling air pressure less than 2" W.C static pressure shall be sealed wherever visible or tactile observations reveal leakage.
- H. After completion of testing and adjustment, operate the different systems and equipment under normal working conditions for two days and show specified performance. If, in the opinion of the Architect, performance of equipment or systems is not according to specifications or submitted data, alter or replace equipment at no increase in contract sum. Contractor, at his option, may order tests from an independent approved laboratory to prove compliance. All such tests shall be at no increase in contract sum.
- I. At completion of work, perform and submit the Mechanical HVAC Acceptance Forms in accordance with Title 24, Part 6. Identification of which acceptance forms to be submitted are outlined on the NRCC-MCH-01-E form.

3.5 INSTALLATION OF PIPING AND EQUIPMENT

- A. Closing-In of un-inspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.
- B. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact locations and depth of existing utility and service lines to which he is going to connect. In event depth of existing sewer main or storm drain is not sufficient to permit installation of piping as detailed on drawings or to make connection in manner indicated; Contractor shall confer with the Architect, Owner's representative and Engineer for Direction.
- C. Conceal all piping within finished rooms, unless otherwise noted on drawings.
- D. Cut pipe accurately to measurements established at the building; work into place without springing or forcing; properly clear all windows, doors and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted.
- E. Make all changes in direction with fittings and changes in main sizes through eccentric reducing fittings. Unless otherwise noted, install water supply and return piping with straight side of eccentric fittings at top of pipe.
- F. Provide sufficient swing joints, ball joints, expansion loops, and devices necessary for a flexible piping system.
- G. Provide union and isolating valves on piping at all equipment or apparatus. Locate valves so that the equipment can be removed without dismantling any branch lines.
- H. Install drain valves at all low points of each system to enable complete drainage, and air vents at all high points in the piping system to enable complete air venting. Install automatic air vent at all high points in the main piping systems.

- I. Support piping independently at pumps, coils, tanks, and the like so that its weight will not be supported by the equipment.
 - J. Pipe all drains from pump glands, drip pans, relief valves, air vents, etc., to spill over an open sight drain, floor drain or other acceptable discharge points, and terminate with a plain end unthreaded pipe, 2" above the drain.
 - K. Securely bolt in place to building structures, all equipment, isolators, hangers, etc.
 - L. Pitch pipe line as required for proper drainage and elimination of air.
 - M. Wire for hanging or strapping pipes not permitted.
 - N. Support each run of piping independently from all other piping.
 - O. Install spring vibration isolation in mechanical rooms and penthouse for all pipes' elbows and also within 40 feet of pipe length.
 - P. Equipment Access
 - 1. Install all piping, equipment and accessories to permit access for maintenance. Relocate piping, equipment and accessories required to provide maintenance access at no additional cost.
 - 2. Furnish access doors where any valves and equipment requiring access for servicing, repairs or maintenance located in walls, chases or above ceilings. Coordinate the location of access doors with and install by the applicable Contractor installing walls or ceilings.
 - Q. Install gauges, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gauges to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- 3.6 PIPE JOINTS
- A. Copper Tubing:
 - 1. Cut square, remove burrs and clean pipe and inside of female fitting to a bright finish with steel wool, wire brush, sandpaper or emery cloths. Apply solder flux with brush to tubing. Remove internal parts of solder-end valves prior to soldering.
 - 2. Provide dielectric unions at points of connection of all copper tubing and any ferrous piping and equipment.
 - 3. Joining of Copper Pipes:
 - a. Piping 1 ½" and smaller: 95-5 solder
 - b. Piping larger than 1-½": Sil-Fos brazing 1000°F minimum.
 - c. All solder shall be lead free.
- 3.7 HANGERS AND SUPPORTS:

A. Piping:

1. Space hangers and supports for horizontal copper tubing according to the following schedule:

TUBE SIZE - inches	MAXIMUM SPACING
1" and smaller	6 feet on center
1¼" and 1½"	7 feet on center
2" and 2½"	8 feet on center
3" and larger	10 feet on center

2. Space hangers and supports for horizontal iron pipes according to the following schedule:

PIPE SIZE - inches	MAXIMUM SPACING
1¼" and smaller	8 feet on center
1½" thru 3"	10 feet on center
4" and larger	14 feet on center
All cast iron	5 feet on center*

- a. * Locate hangers within 18" of each joint per Uniform Building Code.

3. Safety Hanger Wires:

- a. For air diffusers and other mechanical units to be mounted on suspended-grid ceiling systems and weighing less than 20 pounds may be supported directly on the runners of a heavy duty grid system but, in addition, they must have a minimum of two (2) #12 gage slack safety wires attached to the fixture at diagonal corners and anchored to the structure above.
- b. In advance of ceiling hanger-wire work, provide to job site layouts and/or instruction necessary for proper installation of safety wires.
- c. Connect safety wires to mechanical diffusers and equipment.
- d. For diffusers and equipment units weighing 20 pounds or more must be independently supported by not less than four (4) taut #12 gage wires, each attached to the fixture and to the structure above. The four (4) taut #12 gage wires, including their attachment to the structure above, must be capable of supporting four (4) times the weight of the unit.

3.8 IDENTIFICATION OF VALVES

- A. Provide 3 typewritten charts assembled in 3-ring binders showing the valve numbers together with their locations and use. Mount on metal frames and installed as directed the Architect.

3.9 VIBRATION ISOLATION

- A. The entire system, including equipment, air ducts, pipes, motors, and all other parts must be noiseless and free of vibration transmission.
- B. The Contractor shall not install any equipment or pipe which makes rigid contact with the "building" unless it is approved in this specification or by the Architect. "Building" includes slabs, beams, studs, walls, lath, etc.

- C. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.
- D. The Contractor shall correct, at no additional cost, all installations which are deemed defective in workmanship or materials by the Architect.

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 final completion.
- B. During construction, properly cap all lines and equipment nozzles so as to prevent the entrance of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint or other work of other trades by covering it with polyethylene sheets.
- C. After installation has been completed, clean all systems.
- D. Piping, Ductwork and Equipment to be insulated: Clean exterior thoroughly to remove rust, plaster, cement, and dirt before insulation is applied.
- E. Piping, Ductwork and Equipment to be painted: Clean exterior of piping, ductwork 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 solvents. Touch up primer coat as required.
- F. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil and leave surfaces clean and polished.
- G. Plumbing Fixtures: Clean and polish fixtures immediately prior to final inspection or Owner's occupancy. Clean floor drain grates; check each fixture to insure against trap stoppage.

3.11 LUBRICATION

- A. Upon completion of the work and before turning over to the Owner, clean and lubricate all bearings except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

3.12 PAINTING

- A. Properly prepare work under this Division to be finish painted under SECTION 09900, "PAINTING".
- B. Paint duct black behind grilles and diffusers where duct is visible

3.13 COMPLETION

- A. Before Final Review: The work hereunder will not be reviewed for final acceptance until Operating and Maintenance Data, Manufacturer's Literature, Valve Directories, Piping Identification Code Directory and name plates specified herein have been approved and properly posted in the building and final cleaning has been completed.
- B. Demonstration of Operations: When the installation is complete and adjustments specified herein have been made, operate the systems for a period of one week, during which time demonstrate to the Architect that systems are completed and operating in conformance with these specifications.

3.14 ALTERATION WORK

- A. Existing installations are to be altered in the areas indicated. Disconnect, remove or relocate material and equipment required by removal of or changes to existing construction. Where the work of this trade or the work of other trades interrupts or interferes with existing services, all such service to be re-established in the manner directed by the Architect. Existing installations, and similar work, have been indicated on the drawings as accurately as possible. Accuracy of such information is not guaranteed and the Contractor to determine exact requirements as work progresses. Provide all alterations, extensions, additions, and related work required providing the finished project. Existing materials removed and not required for re-installation to remain the property of the Owner and to be delivered to the Owner. Materials which the Owner does not wish to retain shall become the property of the Contractor and to be removed from the site.
- B. At completion of alteration work, any existing work not required for proper operation of the completed system shall be removed.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions, Supplementary General Conditions, Division 1 - General Requirements, and Section 23 05 00 are hereby made a part of this Section as if repeated herein.

1.2 SECTION INCLUDES

- A. Air systems.

PART 2 - PRODUCTS - not used

PART 3 - EXECUTION

3.1 QUALIFICATION

- A. Balancing to be performed by independent balancing specialty firm.
- B. Certified member of Associated Air Balancing Council (AABC), in accordance with AABC guide and recommendations or
- C. Certified member of National Environmental Balance Bureau (NEBB), in accordance with NBBC performance and techniques and
- D. Follow recommended procedures by ASHRAE and SMACNA.
- E. Shall be under the direct supervision of the general contractor. Shall adjust and re-adjust this part of the work until the operation complies with the requirements of the drawings and specifications.

3.2 COORDINATION

- A. Coordinate required locations of duct test openings during construction period.
- B. Provide all necessary action and coordination with regard to ACCEPTANCE TESTING as outlined in Specification Section 23 05 00.

3.3 PROCEDURES - PRECONSTRUCTION PLAN CHECK & REVIEW

- A. Use instruments accurately calibrated and maintained in good working order. If requested, conduct tests in the presence of a representative of the Architect and/or a representative of the Owner.
- B. General: Submit to the Architect the following in accordance with conditions of the Contract and Division 1 specification sections.
 - 1. Review the project documents and contractor submittals for their effect on the test and balance process and overall performance of the HVAC system.
 - 2. Review location and type of volume dampers in the air distribution system.
 - 3. Review inlet conditions to HVAC equipment.
 - 4. Review locations, type and size of balancing valves, and automatic control valves in the water flow system.
 - 5. Review location of pressure sensors in the air and water distribution systems.
 - 6. Review automatic control systems as they affect the test and balance procedure and the final Acceptance Testing.

3.4 PROCEDURES - ONGOING JOB SITE INSPECTIONS

- A. During construction, the balancing agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times. (Typically this is performed when 60% of the duct work is installed and again when 90% of the total system is installed and prior to insulation of the piping.)
- B. The balancing agency shall submit a written report (3 copies) of each inspection to the Owner's representative, the consultant and the contractors responsible for correcting noted deficiencies.
- C. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer well, etc.) to determine if they are installed properly and readily accessible.
- D. Identify and evaluate any variations from system design.
- E. Identify and report possible restriction in systems (closed fire dampers, poorly designed duct fittings, etc.).
- F. Notify HVAC contractor of air or water system performance deficiencies by the test before balancing the system.
- G. Beginning of work means of acceptance existing conditions.

3.5 AIR SYSTEM TEST & BALANCE PROCEDURES

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by traverse of entire cross sectional area of duct.

- C. Measure air quantities at air inlets and outlets.
- D. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers.
- E. Vary total system air quantities first by adjustment of fan speeds. Provide drive changes as required. Vary branch air quantities by damper regulation as secondary adjustment.
- F. Balancing and adjusting air systems:
 - 1. Perform the following tests, compile information and submit on report form with suitable cover, index, etc.
 - 2. Air balance shall be performed with filters partially blocked to simulate a 90 percent loading of filters.
 - 3. Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements. Make any changes in pulley sheave, belts, and dampers or add dampers necessary to correct balance at no additional cost to owner.
 - 4. Current & Voltage: Measure and record motor current and voltage.
 - 5. Pitot Tube Traverse: Perform a Pitot tube traverse of main supply and return ducts to obtain total CFM. If a Pitot tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation of why a traverse was not made must appear on the appropriate data sheet.
 - 6. Outside Air: Test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperature. Make allowances for heat of compression and motor heat where applicable.
 - 7. Static Pressure: Test and record system static pressures, including suction and discharge static pressure profile of each fan.
 - 8. Air Temperature: Take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on the entering and leaving side of each heating coil and gas heater.
 - 9. Zone Ducts (Supply & Return): Adjust zone ducts to within design CFM requirements.
 - 10. Main Ducts: Adjust main ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - 11. Branch Ducts: Adjust branch ducts to within design CFM requirements.
 - 12. Tolerance: Test and balance each diffuser, grille, and register to within plus or minus 5 percent of design requirement.
 - 13. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
 - 14. Description: Record the size and type of each diffuser, grille, and register on air outlet data sheets.
 - 15. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

16. Exhaust, Supply and Transfer Fans.
 - a. Measure fan static pressures, total CFM, makeup air and fan RPM.
 - b. Measure motor operating voltage and amperage.
17. Record the specified, against the actual, supplied horsepower and electrical characteristics of all motors.
18. Verify capacities of all A.C. systems, make-up air units, and supply transfer and exhaust fans.

3.6 CONTROL SYSTEMS VERIFICATION

- A. Verify that all control devices are properly connected.
- B. Verify that all dampers and other controlled devices are operated by the intended controller.
- C. Verify that all dampers are in the position indicated by the controller (open, closed or modulating).
- D. Verify the integrity of dampers in terms of tightness of close-off and full-open positions.
- E. Check the location of all thermostats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
- F. Check the sequence of operation that any control mode is in accordance with approved shop drawings.
- G. Verify that all controller set points meet the design intent.
- H. Check all dampers for free travel.
- I. Verify the operation of all interlock systems.
- J. Perform all system verification to assure the safety of the system and its components.

3.7 SYSTEM PERFORMANCE VERIFICATION

- A. At the time of final inspection, the Test and Balance (TAB) Agency shall recheck, in the presence of the Owner's Representative, specific and random selection of data, air quantities, and air motion recorded in the Certified Report.
- B. Points and areas for recheck shall be selected by the Owner's Representative.
- C. Measurement and test procedures shall be the same as approved for work forming a basis of Certified Report.
- D. Selections for recheck, specific plus random, will not normally exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

- E. If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Certified Report listings, by ten percent or more of the selected recheck stations, the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspections tests made, all at no additional cost to Owner.
- F. Following system verification of the Certified Report by the Owner's Representative, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the TAB Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.

3.8 RECORDS

- A. Keep continuous record of all test reading and submit three (3) copies of typewritten balancing reports upon completion. Submit floor plan indicating location of all measurements including terminal units, air outlets, and fans.
- B. Upon completion of the work, submit all records and certifications approving the testing requirements to the Architect before final payment is made.
- C. Defective work or material replaced or repaired, as necessary and the inspection and test repeated. Repairs made with new materials. No caulking of screwed joints or holes will be acceptable.
- D. No part of any work shall be covered until after it is inspected, tested and approved.

END OF SECTION

SECTION 23 33 00

DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Ductwork.
 - 2. Back-draft dampers.
 - 3. Volume dampers.
 - 4. Damper regulator.
 - 5. Motorized Damper.
 - 6. Turning vanes.
 - 7. Flexible ducts.
 - 8. Duct accessory hardware.
 - 9. Duct Adhesives, Sealants, and Caulks
 - 10. Duct Cleaning.

1.3 SUBMITTALS

- A. Product data for the following:
 - 1. Back-draft dampers.
 - 2. Volume dampers.
 - 3. Damper regulator
 - 4. Motorized Damper.
 - 5. Turning Vanes.
 - 6. Flexible ducts.
 - 7. Duct Sealants.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required

clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.

- C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to the product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated on drawings and as herein specified.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A653 and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A480.
- D. Aluminum Sheets: ASTM B209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACK-DRAFT DAMPERS

A. Manufacturers

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. CESCO Products.
4. Duro Dyne Corp.
5. Greenheck.
6. Penn Ventilation Company, Inc.
7. Prefco Products, Inc.
8. Ruskin Company.
9. Vent Products Company, Inc.

- B. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

- C. Frame: 0.052-inch thick, galvanized sheet steel with welded corners and mounting flange.

- D. Blade Seals: Neoprene.

- E. Blade Axles: Galvanized steel.

- F. Tie Bars and Brackets: Galvanized steel.

- G. Return Spring: Adjustable tension.

2.4 VOLUME DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Flexmaster U.S.A., Inc.
4. McGill AirFlow Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.

8. Ruskin Company.
 9. Vent Products Company, Inc.
- B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
1. Pressure Classes of 3-inch w.g. or higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- C. Standard Volume Dampers: single-blade design as indicated, standard leakage rating, with linkage outside air stream, and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
 3. Blade Axles: Galvanized steel.
 4. Bearings: Molded synthetic.
 5. Bars and Brackets: Galvanized steel.
- D. Jackshaft: One-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 DAMPER REGULATORS

- A. Manufacturers:
1. Ventfabrics.
 2. Ventlock.
 3. Young.
- B. At inaccessible dampers, provide with remote operators.
1. Flush to Ceiling: Young 270-301-EZ mounting bracket for Bowden Cable Controls. Use with Young 5020CC round or 830ACC rectangular dampers OR 270-301-EZ-B kit for dampers furnished separately.
 2. Alternatively provide Young 270-275 for controller mounted in diffuser/register.

2.6 MOTORIZED CONTROL DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. CESCO Products.
4. Duro Dyne Corp.
5. Greenheck.
6. McGill AirFlow Corporation.
7. METALAIRE, Inc.
8. Nailor Industries Inc.
9. Penn Ventilation Company, Inc.
10. Ruskin Company.
11. Vent Products Company, Inc.

B. General Description: AMCA-rated, parallel-blade design; minimum of 0.1084-inch thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch thick, galvanized-steel damper blades with maximum blade width of 8 inches.

1. Secure blades to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200⁰F.
3. Provide closed-cell neoprene edging, opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch w.g. when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.
4. 120V 2-position motor(s) with spring return actuator.

2.7 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, [single] [double]-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.

1. Available Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Duro Dyne Corp.
 - c. METALAIRE, Inc.

- C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

1. Airsan Acoustiturn or equal.

2.8 DUCT MOUNTED ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.

- B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Available Manufacturers:

- a. American Warming and Ventilating.
- b. CESCO Products.
- c. Ductmate Industries, Inc.
- d. Flexmaster U.S.A., Inc.
- e. Greenheck.
- f. McGill AirFlow Corporation.
- g. Nailor Industries Inc.
- h. Ventfabrics, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Provide number of hinges and locks as follows:

- a. Less than 12 Inches Square: Secure with two sash locks.
- b. Up to 18 Inches Square: Two hinges and two sash locks.
- c. Up to 24 by 48 Inches: Three hinges and two compression latches [with outside and inside handles].
- d. Sizes 24 by 48 Inches and Larger: One additional hinge.

- C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

- D. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.9 FLEXIBLE CONNECTORS

- A. Available Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corp.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.

- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to

two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Select metal compatible with ducts.

- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200⁰F.
- E. Service Temperature: Minus 67 to plus 500⁰F.

2.10 ROOF AND WALL JACKS (CAPS) AND FLASHING

- A. Wall jacks, caps and dryer vents: Greenheck.
- B. Sloped roof: as manufactured by Greenheck, Low Pressure Roof Cap with integral backdraft damper; galvanized steel G-90.
- C. Flat roof: as manufactured by Greenheck, Spun Aluminum Roof Cap with screen, no damper.
- D. Metal roof flashing: Master Flash EDPM Rubber pipe and duct flashing boot.

2.11 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.12 FLUES

- A. Flues for condensing furnaces shall be CPVC, schedule 40. Terminate per manufacturer's instructions or with concentric vent where specified. Where flue must extend through return air plenums, the pipe shall be enclosed so as to isolate the flue from the plenum or use Category II flue.

2.13 DUCT ADHESIVES, SEALANTS AND CAULKS

- A. Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2. Such products also shall comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene), except for aerosol products specified in subsection B, below.

- B. Aerosol adhesives, and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of California Code of Regulations, Title 17, commencing with Section 94507.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.
- C. Verify all dimensions at the site making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Check plans showing work of other trades and consult with Architect in the event of any interference.

3.2 DISCREPANCIES

- A. In the event of discrepancy, immediately notify Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.3 APPLICATION AND INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install back draft dampers on outside air intakes, exhaust fans, or exhaust ducts nearest to outside and where indicated.
- D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

- F. Provide test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and fire/smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.
- H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
- I. Install the following sizes for duct-mounting, rectangular access doors:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body Plus Ladder Access: 25 by 17 inches.
- J. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- K. Install duct test holes where indicated and required for testing and balancing purposes.
- L. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.

3.4 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Section 23 05 93 Testing, Adjusting, and Balancing."

3.5 DUCTWORK AND ACCESSORIES

- A. Fabricate and support in accordance with 2013 California Mechanical Code, SMACNA HVAC Duct Construction Standards Metal and Flexible, and ASHRAE handbooks, except as indicated. Gages for galvanized steel ducts for low pressure systems up to 2" w.g. shall be as follows:

RECTANGULAR DUCT		ROUND DUCT		
Dimension of Largest (L) Side, in Inches	Ga.	Diameter (D) in Inches	Long Seam Ga.	Spiral Seam Ga.
L≤12	26	D<8	28	28

12<L≤30	24	8<D≤14	26	28
30<L≤54	22	14<D≤16	24	26
54<L≤84	20	16<D≤18	24	24
84<L	18	18<D≤26	22	24
		26<D≤36	20	22
		36<D≤50	20	20
		50<D≤60	18	18
		60<D≤84	16	18
Note: Exposed spiral ductwork shall be one (1) gauge heavier				

- B. Verify all dimensions at the site making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Lined ducts shall be fabricated so that new dimensions to inside of lining shall equal the sizes shown on drawings.
- C. Make allowances for beams, pipes or other obstructions in building construction and for work of other trades. Check plans showing work of other trades and consult with Architect in the event of any interference.
- D. Fittings: Manufactured fittings for all exposed ductwork. Use slop fit couplings for all pipe joints. All fittings are to be continuously welded. Where the zinc coating has been burned during fabrication, the fittings are to be painted by the manufacturer.
- E. Low Pressure Ductwork: Sheet metal gauges, transverse joint type and spacing, reinforcing type and spacing, In accordance with latest ASHRAE and SMACNA Schedules for low-pressure ductwork. Figures below are from the SMACNA Manual
- F. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- G. Elbows shall be standard radius or square with vanes as shown on Fig 2-2, 3, 4, 5, 6, & 7. Single vanes with 3/4" trailing edge are preferred. Adjust the vanes so that the railing edges are parallel with the downstream duct when entering and leaving duct sizes are not equal. Turning vanes used in acoustically lined duct shall use an acoustical noise reduction turning vane.
- H. Offsets & taper - Fig 2-9 & 10, branch connections - Fig 2-7 & 8 or as indicated on the plans.
- I. Round tees and laterals - Fig 3-4 & 5 except straight tees are not acceptable.
- J. Junctions between ducts: Branch take-off with 45° or 90° tapered spin-in. No branch duct to intersect main duct on bottom.
- K. Seal all longitudinal and transverse duct and plenum joints and field formed seams airtight (Seal Class B) with medium water based, low VOC, pressure duct sealant.
- L. Joints between ducts: Make with beaded sleeve joints. Apply duct sealer to male end. Mechanically fasten with sheet metal screws or pop rivets. Over joint and screw or rivet heads, apply coating of duct sealer. Cover entire joint with duct tape.

- M. Supports for ducts and plenums shall be band iron supports according to Section IV.
 - N. All ductwork shall be concealed behind finished wall, ceilings or floors unless specifically noted "exposed" on the drawings. Ductwork shown to be exposed shall be installed to provide maximum headroom and/or floor space.
 - O. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
 - P. Access Panels and Doors in Ductwork: Provide in ductwork as indicated and wherever necessary or required for proper access to all instruments, controls, fire and automatic dampers and equipment and for convenient inspection and maintenance. Size as approved by Architect.
 - Q. Install ductwork of sizes, runs and connections as shown on drawings.
 - R. Fabricate ductwork in workman-like manner with airtight joints; presenting smooth surfaces on inside, neatly finished on outside; construct with curves, bends; turning vanes to aid in easy flow of air. Make internal ends of slip joints in directions of air flow.
 - S. Install ductwork to provide maximum headroom.
 - T. Adjust ducts to suit local conditions. Alter duct sizes on basis of equal friction where required to facilitate installation.
 - U. Provide ductwork connected to air-handling equipment or air inlet and outlet devices, with all necessary transformation pieces, flexible fabric connections as required. Secure fabric connectors tightly to fans, casings and ducts. Allow at least 1" slack in connections. Do not paint fabric connectors. Provide galvanized steel weather shield over exterior top and sides of exposed flexible connections.
 - V. Diagonally or transversely cross break all panels on metal rectangular ducts over 18" in either direction.
 - W. Avoid penetration of ducts. Provide airtight rubber grommets at unavoidable penetrations of hanger rods.
 - X. Duct Openings: Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc.
 - Y. Provide pitot tube openings where required for testing of systems: Complete with metal cap with spring device or screw to ensure against air leakage.
 - Z. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
- 3.6 DUCT HANGERS AND SUPPORTS
- A. General: Attachment to structure, as specified in Section 23 05 00.

- B. Install hangers for ducts as specified in the SMACNA Manual.
- C. Upper Hanger Attachments:
1. Attachment to Existing Cast-In-Place Concrete:
 - a. Secure hangers to overhead construction with wedge anchor.
 - b. Secure hanger attachment required to be supported from wall to floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.
- D. Duct Riser Supports:
1. Unless otherwise specified or shown, support vertical ducts by means of two steel angles, riveted to duct and resting on floor slab or adjacent structural steel members and specified vibration isolators at every floor through which the duct passes. Size supports as follows (all dimensions in inches):

Max. Side Dimensions in Inches	Support Angle	Secure to Duct Width	Minimum Bearing Each End
36	1 x 1 x 1/8	Screws	2
48	1-1/2 x 1-1/2 x 1/8	Bolts	3
60	2 x 2 x 1/8	Bolts	3
Over 60	2-1/2 x 2-1/2 x 3/16	Bolts	4

3.7 FLEXIBLE DUCT

- A. Do not use flexible duct for duct connection through walls or gypsum board.
- B. Use insulated flex duct on run-outs to air outlets. Maximum flexible duct length duct length of 5-feet. Bends greater than 90-degrees not permitted.
- C. Flex duct on exhaust same as above but without insulation.
- D. Connect flexible ducts with liquid adhesive plus tape, draw band, or adhesive plus sheet metal screens.

3.8 DUCT CLEANING

- A. Oil film on sheet metal shall be removed prior to shipment to site. Ducts shall be inspected on site to confirm that no oil is present; remove oil if so detected. If ducts contain dust and dirt, clean the ducts immediately, prior to substantial completion and prior to using the ducts to circulate air.
- B. Clean duct system and force air at high velocity through duct to remove accumulated dust during construction. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.
- C. Clean duct systems with high power vacuum machines. Protect equipment that may be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access into ductwork

for cleaning purposes.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to this Section.
- B. Coordinate with Architect location of air outlets and inlets.

1.2 DESCRIPTION OF WORK

- A. Supply and return air grille

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00, COMMON WORK RESULTS FOR HVAC
- B. Section 23 33 00, DUCTWORK AND ACCESSORIES
- C. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING

1.4 QUALITY ASSURANCE

- A. Refer to article, QUALITY ASSURANCE, in Section 23 05 00
- B. Fire Safety Code: Comply with NFPA 90A.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Diffusers, registers, grilles and accessories.
- C. Coordination Drawings: Refer to article, SUBMITTALS, in Section 23 05 00.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air Diffusion Council Test Code:
 - 1. 1062 GRD-84 Certification, Rating, and Test Manual 4th Edition
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE7-98 Minimum Design Loads for Buildings and Other Structures
- D. American Society for Testing and Materials (ASTM):
 - 1. A167-99 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - 2. A653-01 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process
 - 3. A1011-02 Standard Specification for Steel Sheet and Strip Hot rolled Carbon structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
 - 4. B209-01 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 5. E84-01 Standard Test Method for Surface Burning Characteristics of Building Materials
- E. National Fire Protection Association (NFPA):
 - 1. 90A-99 Standard for the Installation of Air Conditioning and Ventilating Systems
 - 2. 96-01 Ventilation Control and Fire Protection of Commercial Cooking Operations
- F. Underwriters Laboratories, Inc. (UL):
 - 1. 33-93 UL Standard for Safety Heat Responsive Links for Fire Protection Service

PART 2 - PRODUCTS

2.1 AIR OUTLETS AND INLETS

- A. Materials:
 - 1. Aluminum. Provide manufacturer's standard gasket.
 - 2. Exposed Fastenings: The same material as the respective inlet.
 - 3. Contractor shall review all ceiling and wall drawings and details and provide all ceiling and wall mounted devices with appropriate dimensions and trim for the specific locations.

- B. Performance Test Data: In accordance with Air Diffusion Council Code 1062GRD.
- C. Air Supply Outlets:
 - 1. Ceiling Diffusers: Diffuser suitable lay-in ceiling mount, off-white finish, and square connection as shown on the drawings.
 - a. Face type: Louvered face with directional pattern.
- D. Exhaust Diffuser: Diffuser suitable lay-in ceiling mount, off-white finish, and square connection as shown on the drawings.
 - 1. Finish: Off-white baked enamel for ceiling mounted units.
 - 2. Eggcrate Face Type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with provisions of Section 23 05 00, particularly regarding coordination with other trades and work in existing buildings.
- B. Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair or replacement. Protect equipment during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting.

3.2 CUTTING, PATCHING AND DAMAGE

- A. All necessary cutting and patching of walls, partitions, ceilings, etc., as required for the proper installation of work under this section shall be done under this section. No cutting of structural members will be permitted without the written permission of the Architect.
- B. Any existing work or equipment damaged during the progress of construction or testing shall be replaced with like material, free of charge to the School District or other trades.

3.3 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.4 AIR OUTLETS

- A. Install inclined blade return and exhaust grilles and registers so that blades obstruct vision by inclining blades as follows:

1. Wall Outlets near Ceiling: Incline toward ceiling.

3.5 AIR BALANCING

- A. Refer to Section 23 05 93.

END OF SECTION

SECTION 26 05 00**BASIC ELECTRICAL MATERIALS AND METHODS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Electrical identification.
 - 2. Utility company electricity-metering components.
 - 3. Concrete equipment bases.
 - 4. Electrical demolition.
 - 5. Cutting and patching for electrical construction.
- B. Refer to drawings for applicable codes.
- C. Refer to Division 11 and Division 13 specifications for additional electrical work to be provided.
- D. Refer to TR, TL, AV and FS drawings for additional electrical work to be provided.

1.2 SUBMITTALS

- A. Product Data: For utility company electricity-metering components.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts and single-line diagram of electricity-metering component assemblies specific to this Project.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Devices for Utility Company Electricity Metering: Comply with utility company published standards.
- C. Comply with NFPA 70.

1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

BASIC ELECTRICAL MATERIALS AND METHODS

- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for service entrances and electricity-metering components.
- D.
- E. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- F. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.
- D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.
 - 1. Materials: Same as channels and angles, except metal items may be stainless steel.
- E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- H. Expansion Anchors: Carbon-steel wedge or sleeve type.
- I. Toggle Bolts: All-steel springhead type.
- J. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Embedded continuous metallic strip or core.
 - 3. Printed legend that indicates type of underground line.
- F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.
 - 1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
 - 2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch, galvanized-steel backing. 1/4-inch grommets in corners for mounting.
- H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A. Comply with requirements of electrical power utility company for all new service entrance equipment, raceways and structures.

2.4 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

BASIC ELECTRICAL MATERIALS AND METHODS

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.
- B. Dry Locations: Steel materials.
- C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

3.3 SUPPORT INSTALLATION

- A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.
- C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:
 - 1. Wood: Wood screws or screw-type nails.
 - 2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.
 - 3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
 - 4. New Concrete: Concrete inserts with machine screws and bolts.
 - 5. Existing Concrete: Expansion bolts.
 - 6. Structural Steel: Spring-tension clamps.
 - a. Comply with AWS D1.1 for field welding.
 - 7. Light Steel Framing: Sheet metal screws.

BASIC ELECTRICAL MATERIALS AND METHODS

8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
9. Light Steel: Sheet-metal screws.
10. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- G. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.5 ELECTRICITY-METERING EQUIPMENT

- A. Install utility company metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.6 FIRESTOPPING

- A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Division 7 Section "Through-Penetration Firestop Systems."

3.7 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.8 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.9 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION

SECTION 26 05 13
CONDUCTORS AND CABLES**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THW, THHN-THWN or XHHW complying with NEMA WC 5 or 7

2.3 CONNECTORS AND SPLICES

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. O-Z/Gedney; EGS Electrical Group LLC.
 - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway .
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Fire Alarm Circuits: Type THHN-THWN, in raceway.
- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 16 Section "Basic Electrical Materials and Methods."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 13

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.

ARTIK ART & ARCHITECTURE

- C. IMC: ANSI C80.6.
- D. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- E. FMC: Aluminum.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corp.
 - 4. Cantex Inc.
 - 5. Certainteed Corp.; Pipe & Plastics Group.
 - 6. Condux International.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; Division of Hubbell, Inc.
 - 12. Spiralduct, Inc./AFC Cable Systems, Inc.
 - 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
 - 1. Manufacturers:
 - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
 - b. Thomas & Betts Corporation.
 - c. Walker Systems, Inc.; Wiremold Company (The).
 - d. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
 - 1. Manufacturers:
 - a. Butler Manufacturing Co.; Walker Division.
 - b. Enduro Composite Systems.
 - c. Hubbell, Inc.; Wiring Device Division.

- d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.
- C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers:
- 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Emerson/General Signal; Appleton Electric Company.
 - 3. Erickson Electrical Equipment Co.
 - 4. Hoffman.
 - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - 6. O-Z/Gedney; Unit of General Signal.
 - 7. RACO; Division of Hubbell, Inc.
 - 8. Robroy Industries, Inc.; Enclosure Division.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
- 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

2.7 CABLE TRAY

- A. Cable tray shall be aluminum, rung type, 24"W x 4"H, with rung spacing of 6", per NEMA VE 1 requirements.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Concealed: Rigid steel or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
 - 1. Exposed: EMT.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Conduits used for fiber optic cable installation shall be provided with inner duct.
- E. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2

- 1. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.3 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.

- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Provide inner duct in conduit for all fiber optic cable installation.
- G. Provide flexible metal conduits for conduits installed inside cabinets.
- H. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- J. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- K. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- L. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- M. Tighten set screws of threadless fittings with suitable tools.
- N. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- P. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-

degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

- Q. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- R. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- S. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- T. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- U. Set floor boxes level and flush with finished floor surface.
- V. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- W. Install cable tray in accordance with NEMA VE 2 requirements.

3.4 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 24 16**PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

- B. Shop Drawings: For each panelboard and related equipment.

- 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

- a. Enclosure types and details for types other than NEMA 250, Type 1.
- b. Bus configuration, current, and voltage ratings.
- c. Short-circuit current rating of panelboards and overcurrent protective devices.
- d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

- 2. Wiring Diagrams: Power, signal, and control wiring.

- 3. Field quality-control test reports.

- 4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. Comply with NEMA PB 1.

- C. Comply with NFPA 70.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

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

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Protection Div.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D.

2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Kitchen Areas: NEMA 250, Type 4.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- C. Conductor Connectors: Suitable for use with conductor material.
 1. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. Provide 20% space in all panelboards
- F. Panelboard Short-Circuit Rating:
 1. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
 - 3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components for all NEMA 3R panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.
 - F. Install filler plates in unused spaces.
 - G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
 - H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."
 - I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
 - J. Ground equipment according to Division 16 Section "Grounding and Bonding."
 - K. Connect wiring according to Division 16 Section "Conductors and Cables."
- 3.2 FIELD QUALITY CONTROL
- A. Prepare for acceptance tests as follows:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
 - B. Perform the following field tests and inspections and prepare test reports:
 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 26 24 26

SECTION 26 27 26**WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.
 - 4. Floor service outlets, poke-through assemblies and multioutlet assemblies.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.

2. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).
 3. Poke-Through, Floor Service Outlets and Telephone/Power Poles:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand; Wiring Devices Div.
 - c. Square D/Groupe Schneider NA.
 - d. Thomas & Betts Corporation.
 - e. Wiremold Company (The).
- 2.2 RECEPTACLES
- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
 - B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
 - C. Straight-Blade Receptacles: Hospital grade.
 - D. GFCI Receptacles: Straight blade, non-feed-through type, Hospital or Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.
- 2.3 SWITCHES
- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
 - B. Snap Switches: Heavy-Duty grade, quiet type.
 - C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 1. Switch: 20 A, 120/277-V ac.
 2. Receptacle: NEMA WD 6, Configuration 5-15R.
 - D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
 2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.

3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces:
 - a. Steel with white baked enamel, suitable for field painting
 - b. 0.035-inch- thick, satin-finished stainless steel (above counters and in restrooms)
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type , dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-15R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: See telecommunication specifications for requirements.

2.6 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks.
 2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 5 voice and data communication cables.

2.7 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

- B. Raceway Material: PVC.
 - C. Wire: No. 12 AWG.
- 2.8 FINISHES
- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging.
- C. Install unshared neutral conductors on line and load side of dimmers.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division ~~26~~ Section "Basic Electrical Materials and Methods."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Connect wiring according to Division ~~26~~ Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide new direct/indirect lighting with average of 50 foot-candles horizontal and minimum of 5 foot-candles vertical.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with
1. CEC California Electric Code
 2. UL
 - a. UL 875 Light Emitting Diode (LED) Lighting Sources for Use in Lighting Products
 - b. UL 1598 Luminaires
 - c. UL 1012 Power Units Other Than Class 2
 - d. UL 1310 Class 2 Power Units
 - e. UL 2108 Low Voltage Lighting Systems
 3. ANSI
 - a. C78.377.2008 Specifications for the Chromaticity of Solid State Lighting Products
 4. IESNA
 - a. LM 79-80 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 - b. LM 80-08 Approved Method for lumen Maintenance Testing of LED Light Sources
 - c. TM 20-11 Projecting Long Term Lumen Maintenance of LED Light Sources
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.3 SUBMITTALS

- A. Manufacturer's Product Data:
1. List of Materials: For each item, Include:
 - a) Manufacturer
 - b) Model number
 - c) Listing: UL, City Lab or none

d) Quantity

2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Air-Handling Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 15 Section "Diffusers, Registers, and Grilles."
1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 2. Heat Removal Units: Air path leads through lamp cavity.
 3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
 4. Dampers: Operable from outside fixture for control of return-air volume.
 5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

2.3 LIGHTING FIXTURES

- A. Fixture: Energy efficient volumetric type meeting Title 24 and District standards.

2.4 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
1. Lamps for AC Operation: Light-emitting diodes with 25 years warranty..
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 EMERGENCY LIGHTING UNITS

- A. General: Self-contained units complying with UL 924.
 1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.
 5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.

2.6 LED LIGHTING

- A. Correlated color temperature (CCT): 3500 °K.
- B. Color rendering index (CRI): 75 minimum.
- C. Off-state power consumption: The power draw of the luminaire (including PE or remote monitoring unit) shall not exceed 2.50 watts when in the off state.
- D. Operating environment: Luminaire shall be able to operate normally in temperatures from -20° C to 50° C.
- E. Cooling system: Shall consist of a heat sink with no fans, pumps, or liquids, and shall be resistant to debris buildup that does not degrade heat dissipation performance.
- F. Lumen depreciation: LED module(s)/array(s) shall deliver at least 70% of initial lumens, when installed for a minimum of 100,000 hours.
- G. Lighting Distribution: Per lighting fixture schedule and in accordance with IESNA Lighting Distributions.
- H. Maximum amperage at LED: Maximum amperage at LED shall not exceed driver current to meet lumen depreciation value described above but shall not exceed 700 mA per mm² of chip. Multi-current (dimming) driver output shall be within the limits described in this Section. Provision only for dimming function controllable via networked control system.

- I. The Driver and LED arrays shall be designed for multi-current input operation, with adjustable ratings at 350 mA, 525 mA and 700 mA.
- J. Transient protection: Per IEEE C.62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100k HZ ring wave, Min. 10kV level, for both common mode and differential mode.
- K. Operating temperature: Power supply shall operate between -20° C and 50° C.
- L. Frequency: Output operating frequency must be \geq 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.
- M. Interference: Power supplies shall meet FCC 47 CFR Part 15/18 (Consumer Emission Limits).
- N. Noise: Power supply shall have a Class A sound rating per ANSI Standard C63.4.
- O. Fixture Warranty: Manufacturer shall warranty to replace defective light fixtures or parts thereof for a period of 5 years.

2.10 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- D. Single-Stem Hangers: 1/2-inch.
- E. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- F. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage.
- G. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- H. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- I. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.11 LIGHTING CONTROL DEVICES

- A. Dimming Driver Controls: Sliding-handle type with on/off control; compatible with driver and having light output and energy input over the full dimming range.
- J. Light Level Sensor: Detect changes in ambient lighting level and provide dimming range of 20 to 100 percent in response to change.
 - 1. Sensor Capacity: At least 40 electronic dimming driver.
 - 2. Adjustable Ambient Detection Range: 10 to 100 fc minimum

- K. Occupancy Sensors: Adjustable sensitivity and off delay time range of 5 to 15 minutes.
 - 1. Device Color:
 - a. Wall Mounted: White.
 - b. Ceiling Mounted: White.
 - 2. Occupancy detection indicator.
 - 3. Ultrasonic Sensors: Crystal controlled with circuitry that causes no detection interference between adjacent sensors.
 - 4. Infrared Sensors: With daylight filter and lens to afford coverage applicable to space to be controlled.
 - 5. Combination Sensors: Ultrasonic and infrared sensors combined.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Provide both grid and additional wire supports. Refer to DSA IR 25-2.13 for requirements.
 - 6. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
 - 7. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 8. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 9. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- L. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 - 4. Continuous Rows: Suspend from cable.
- M. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.
- N. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 26 51 00

SECTION 31 10 00**SITE CLEARING****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY**A. Section Includes:**

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, removing site utilities or abandoning site utilities in place.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

C. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

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

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.
- E. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.7 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and

equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 01 56 39 "Temporary Tree and Plant Protection."
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
- B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 01 56 39 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 01 56 39 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 01 56 39 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two (2) days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 02 41 19 "Selective Demolition."

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots larger than 3 inches (75 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

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

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

