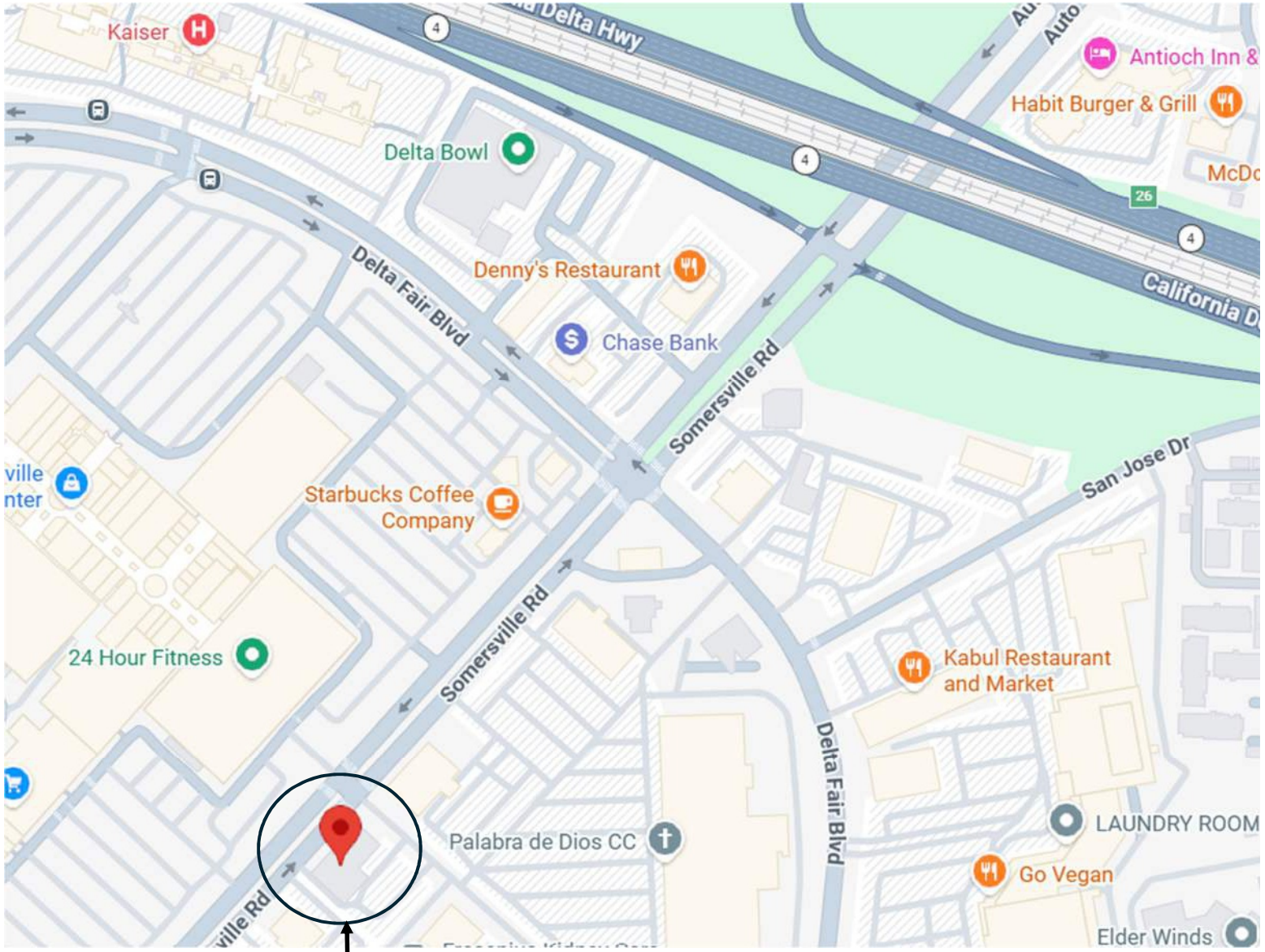
ATTACHMENT D

Site Specific Attachments

ATTACHMENT – 1

VICINITY MAP

VICINITY MAP



Contra Costa Housing Authority TI, 2601 Somersville Rd., Antioch, CA 94509

ATTACHMENT – 2

TECHNICAL SPECIFICATIONS

moniz
ARCHITECTURE

Mar. 19, 2026

ADDENDUM NO. 1
CONTRA COSTA HOUSING AUTHORITY
2601 SOMERSVILLE RD REMODEL

ITEM NO.	REFERENCE	DESCRIPTION
1	BIKE RACKS	On sheet A1.2, keynote 5, revise to read: "Provide (3) new bike racks. See sheet L1 for layout and see 14/A1.4 for mounting."
2	LAVATORY COUNTERS	A. On the Finish Schedule sheet A4.2, revise CW-3 to: "COUNTERTOP/LAVATORY SOLID SURFACE CORIAN QUARTZ PORTORO" B. On the Plumbing Fixture Schedule sheet P2, at Lavatory-1 and Lavatory-2, delete the color designation "CWH (White Cloud)" and replace with "POR (Portoro)"
3	LAVATORY FAUCET L-2	On the Plumbing Fixture Schedule sheet P2, at Lavatory-2, delete the finish designation "Matte Black" and replace with "Brushed Nickel"
4	HAND DRYERS	On sheet A2.5, at the last item on the LEGEND, revise "GB-36 Recessed Automatic Hand Dryer" to "HD Recessed Automatic Hand Dryer"
5	TOILET PAPER DISPENSER	At sheet A2.5 surface mounted toilet paper dispenser TP-2 shall be mounted with its bottom edge no higher than 26" above the floor.
6	FIRE EXTINGUISHERS	Provide (4) fire extinguishers complying with specification section 10 4400. Install in locations as directed by the Architect. Coordinate locations during rough framing of walls, prior to installation of gypsum board.
7	RANGE HOOD CONTROLS	Mount remote control for range hood within accessible reach range at location approved by the Architect.

2401 C STREET SACRAMENTO CA 95816 TELEPHONE 916.442.4032 FASCIMILE 916. 442.4004

8	ROOF/WALL DETAIL	For the bid alternate to remove and replace roofing, include Roof/Wall detail shown on sheet A2.4 around entire interior perimeter of the roof. Install metal siding over backing paper per specification section 07 4213.
9	SIGNAGE	At door numbers 1 and 25, provide the internation symbol or accessibility, complying with specification section 10 1400.
10	DOOR HARDWARE GROUPS	In lieu of hardware groups listed on the Door Schedule sheet A4.1, provide hardware per groups listed in specification section 08 7100.

END OF ADDENDUM NO.1

2 4 0 1 C STREET SACRAMENTO CA 95816 TELEPHONE 916.442.4032 FASCIMILE 916. 442.4004

Contra Costa Housing Authority
2601 Somersville Rd Remodel

ANTIOCH, CA

Technical Specifications

Prepared by Moniz Architecture

March 2026

Technical Specifications

Division 01 General Conditions Procurement and Contracting: Provided by Owner

Division 1 – General Requirements
- Section 01 5639 Tree Protection
- Section 01 5750 Temporary Erosion Control

Division 2 – Existing Conditions
- Section 02 4100 Selective Demolition

Division 3 – Concrete
- Section 03 2000 Concrete Reinforcement
- Section 03 3000 Cast-in-Place Concrete

Division 5 - Metals
- Section 05 4000 Cold-Formed Matal Framing
- Section 05 5000 Miscellaneous Metal Fabrications

Division 6 – Wood, Plastics and Composites
- Section 06 1000 Rough Carpentry
- Section 06 1600 Sheathing
- Section 06 4023 Interior Architectural Woodwork
- Section 06 6400 Fiberglass Reinforced Plastic Wall Panels (FRP)
- Section 06 6500 Solid Surfacing

Division 7 - Thermal and Moisture Protection
- Section 07 1326 Sefl-Adhering Sheet Waterproofing
- Section 07 2100 Thermal and Acoustical Insulation
- Section 07 4213 Metal Wall Panels
- Section 07 4523 Thermoplastic Polyolefin (TPO) Roofing
- Section 07 6000 Flashing and Sheet Metal
- Section 07 9200 Joint Sealants

Division 8 – Openings
- Section 08 1216 Interior Aluminum Frames
- Section 08 1400 Wood Doors
- Section 08 3113 Access Doors and Frames
- Section 08 3400 Special Function Doors
- Section 08 4113 Aluminum Framed Entrances and Storefronts
- Section 08 7100 Door Hardware
- Section 08 8000 Glazing
- Section 08 8700 Architectural Window Films
- Section 08 8856 Ballistic-Resistant Window System

Division 9 - Finishes
- Section 09 2400 Cement Plastering
- Section 09 2900 Gypsum Board
- Section 09 3000 Tile

Section 09 5100 Acoustical Ceilings
Section 09 6500 Resilient Flooring & Base
Section 09 7200 Wall Coverings
Section 09 9100 Painting

Division 10 - Specialties
Section 10 1400 Signage
Section 10 2113 Toilet Compartments
Section 10 2219 Demountable Partitions
Section 10 2800 Toilet Room Accessories
Section 10 4400 Fire Protection Specialties

Division 11 - Equipment
Section 11 3000 Residential Appliances

Division 12 - Furnishings
Section 12 2413 Window Roller Shades

Division 21 – Fire Suppression
Section 21 0000 Contractor shall provide Design/Build of system modifications—No specification included

Division 22 – Plumbing
Section 22 0000 Plumbing Requirements
Section 22 0100 Plumbing Materials and Methods
Section 22 0500 General Plumbing Systems
Section 22 05 12 Plumbing Pipe and Fittings
Section 22 05 23 General-Duty Valves for Plumbing Piping
Section 22 0529 Hangers and Supports for Plumbing Piping and Equipment
Section 22 0553 Identification for Plumbing Piping and Equipment
Section 22 0700 Plumbing Systems Insulation
Section 22 1000 General Plumbing Piping Systems
Section 22 1116 Domestic Water Piping
Section 22 1119 Domestic Water Piping Specialties
Section 22 1313 Facility Sanitary Sewers – Building
Section 22 1319 Sanitary Waste Piping Specialties
Section 22 3000 Plumbing Equipment
Section 22 4000 Plumbing Fixtures

Division 23 – Heating, Ventilation & Air Conditioning
Section 23 0000 Basic HVAC Requirements
Section 23 0100 Basic HVAC Materials and Methods
Section 23 0500 Heating, Ventilating and Air Conditioning
Section 23 0513 Common Motor Requirements for HVAC Equipment
Section 23 0529 Hangers and Supports for HVAC Piping and Equipment

Division 26 – Electrical
Section 26 0500 Common Work Results for Electrical
Section 26 0510 Basic Electrical Materials and Methods
Section 26 0800 Electrical Commissioning
Section 26 2726 Wiring Devices
Section 26 5000 Lighting

Division 28 – Electronic Safety and Security
Section 28 3100 Contractor shall provide Design/Build of system modifications—No specification included

Division 31 – Earthwork
Section 31 1000 Site Clearing
Section 31 2000 Earth Moving

Division 32 – Exterior Improvements
Section 32 1216 Asphalt Paving
Section 32 1313 Concrete Paving
Section 32 1540 Crushed Stone Pavement
Section 32 1723 Pavement Markings
Section 32 1726 Detectable Warning Surfaces
Section 32 3111 Gate Operators
Section 32 3119 Decorative Fences and Gates
Section 32 3313 Site Bicycle Racks
Section 32 8400 Planting Irrigation
Section 32 9000 Planting

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TREE PROTECTION
SECTION 01 5639

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes all services, labor, materials, transportation, and equipment necessary to perform the Work indicated on the Contract Drawings and specified herein this Section, as required to properly complete the Work and the following:

1. Protecting and maintaining existing trees and vegetation not specifically designated for removal, to remain.

2. Protection shall be extended to trees and/or vegetation located within or adjacent to the Project Site, whether or not the tree trunk and/or vegetation is located within the designated Limits of Work.

B. See related Sections within these Specifications.

1.2 RELATED WORK IN OTHER SECTIONS

A. 32 90 00 Planting;

1.3 PROJECT SITE CONDITIONS

A. Tree Flagging: Prior to commencement of Work, Contractor shall flag all existing trees and vegetation to remain and be protected throughout the duration of Work. Adequately flag tree trunks with bright-colored tape. Verify flagged trees and vegetation with the Owner Representative.

1.4 SCHEDULE

A. Install tree protection barricades before commencement of Work.

B. Work shall be done according to approved schedule.

1.5 GUARANTEE

A. Contractor shall guarantee that all plants covered by the Provisions of this Section shall be healthy and in a flourishing condition of active growth for one (1) year from the date of Substantial Completion.

B. Requirements of the guarantee shall apply if failure of the Contractor to take specified precautions and Work within restrictions of this Section contributes to the destruction, decline, or injury to a tree to remain, in the judgment of the Owner.

C. If a tree to remain is destroyed or injured so that in the judgment of the Project Arborist it should be replaced, it shall be removed at the expense of the Contractor. Contractor shall pay compensation

to the Owner of the property where the tree was located at the rate as specified herein this Section (see Compensation).

1.6 COMPENSATION

A. Contractor shall replace any existing tree that died or sustained injury from the result of the Contractor's negligence to provide adequate required tree protection, pruning, or maintenance during the course of construction operations. Compensation shall be awarded to the Owner as follows:

1. Contractor shall thoroughly remove damaged tree, including trunk, branches, and roots, at no cost to the Owner, and at the direction of the Owner Representative.

2. Contractor shall furnish and install per requirements in Section 329000 "Planting", with a minimum six-inch (6") caliper tree allowing Owner Representative, with the advice of the Landscape Architect, to determine requirements of replacement trees. Compensation shall include the actual cost of the item boxed out of the ground; transportation or delivery of boxed item to the site; unloading, planting and staking; maintenance, including watering, fertilizing, pruning, pest control, and other care to bring replacement to same general condition of the original item.

3. Contractor shall provide an additional cash settlement to the Owner, based on the following formula:

a. Tree caliper measurement of the damaged tree(s), where caliper is measured at the greatest trunk diameter 24" above the finished grade:

	Tree Trunk Caliper
$5,000.00	Less than 12"
$10,000.00	12" to 18"
$1,000.00	over 18", add for each caliper inch

B. Contractor shall replace any vegetation (other than trees) that died or sustained injury from the result of the Contractor's negligence to provide adequate required vegetation protection, pruning, or maintenance during the course of construction operations. Compensation shall be awarded to the Owner as follows:

1. Contractor shall thoroughly remove damaged vegetation at no cost to the Owner, and at the direction of the Owner Representative.

2. Contractor shall furnish and install per requirements in Section 02900 "Planting", with five (5) gallon container stock minimum (as applicable) of the same form, species, and in the same quantity as vegetation that was damaged, at the direction of the Owner Representative.

PART 2 - PRODUCTS

2.1 TREE PROTECTION MATERIALS

A. Barricade for Protection of Existing Trees Vegetation:

1. Fabric: Utility (snow) type fencing, minimum four feet (4'-0") high, consisting of a vinyl meshed fabric in a bright orange color. Fabric shall be approved by the City Representative.

2. Posts: Metal or wood, sufficient in gauge (as appropriate) and size to support the fabric material in a taut and plumb condition. Posts shall be subject to approval by the Owner Representative.

3. Signs: Posted plastic laminated signs, attached to fabric fencing, with words "WARNING-KEEP OUT-TREE PROTECTION ZONE".

B. Mulch: Where available, Contractor shall stockpile and reuse shredded wood chips produced from on-site tree removals and remedial work, if chips are grass and disease free and acceptable to the Owner Representative. Where on-site chips are not available, Contractor shall provide mulch as specified in Section 02900 "Planting".

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide erosion-control measures as needed to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

3.2 TREE AND VEGETATION PROTECTION

A. Protect existing trees and other vegetation indicated to remain in place against the following:

1. Storage or parking of automobiles or other vehicles.

2. Stockpiling of building materials, refuse, or excavated materials.

3. Use of trees as support posts, power posts, or sign posts, anchorage for ropes, guy wires, or power lines, or other similar functions.

4. Dumping of poisonous materials on or around plant roots, trunks, branches, or foliage. Such materials include, but are not limited to, paint, petroleum products, dirty water, or other deleterious materials.

5. Cutting or breaking of roots caused by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the Owner Representative.

6. Damage by skinning or bruising of bark on trunks or branches, caused by maneuvering vehicles or stacking material or equipment too close to the plant.

7. Compaction of the soil within the drip line of the plants due to movement of trucks or grading machines, pedestrian or vehicular traffic, storage of equipment or materials.

8. Excessive water or heat from equipment, utility line construction, or burning of trash under or near vegetation to remain.

9. Damage to root system from flooding, erosion, and excessive wetting and drying resulting from watering and other operations.

B. Prior to commencement of construction activities, the Contractor shall erect and maintain a temporary fenced barricade around the drip line of individual trees, around perimeter drip line of groups of trees, or around other vegetation to remain.

1. Prevent damage to roots during installation of barricade posts. Space posts approximately 4'-0" on center and securely attach fabric.

2. Barricades shall be installed plumb, taut, and sturdy to prevent unauthorized access around drip line of trees and protected vegetation. Repair sagging or damaged barricades immediately.

3. Immediately after barricade fencing is installed, cover entire soil area inside of the fence area with a four-inch (4") layer of mulch. Keep mulch 18" away from root crown. Irrigate protected trees and vegetation to a moist soil depth of 18" deep.

D. Do not excavate within drip line of trees, unless approved, in writing, by the Owner Representative.

E. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

F. Protect root systems of existing trees and vegetation from damage due to chemically injurious materials in solution caused by run-off or spillage during mixing or placement of construction materials, and drainage of stored materials.

G. Protect root systems from flooding, erosion, excessive wetting or drying resulting from de-watering or other operations.

H. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Owner Representative.

END OF SECTION 01 5639

TEMPORARY EROSION CONTROL
SECTION 01 5750

PART 1-GENERAL

1.1 GENERAL

A. Refer to Section 13 Water Pollution Control of Division II, General Construction, Caltrans Standard Specifications.

B. The Contractor shall prevent the pollution of storm drain systems and creeks in or near the construction project site(s) resulting from the construction operations. The Contractor shall keep pollution out of storm drains by reducing the possibility of discharge of materials and wastes, by reducing erosion and sedimentation and by complying with requirements contained in these Special Provisions. The Contractor shall train all employees and subcontractors concerning storm water pollution prevention requirements and shall ensure that they are aware of the consequences of non-compliance with these requirements. The Contractor shall include appropriate provisions in subcontracts to ensure that these requirements are met.

C. It is required that applicable construction site management guidelines contained in the "Blueprint for a Clean Bay", a guidance document distributed by the Bay Area Storm Water Management Agencies Association, be implemented as part of daily construction activities.

D. Temporary erosion control shall consist of, but not be limited to, constructing such facilities and taking such measures as are necessary to prevent, control, and abate water, mud, construction materials, hazardous materials and erosion damage to public and private property as a result of the Contractor's operations.

E. Conformance with the requirements of this section shall in no way relieve the Contractor from the Contractor's responsibilities, as provided in Section 5-1.36, "Property and Facility Preservation" of the Caltrans Standard Specifications.

F. Construction vehicles and equipment entering existing paved areas shall be free of mud, silt and other debris during all phases of work. No mud, silt and other debris shall be tracked on paved surfaces. If such materials are tracked on the streets or other paved areas both public and private, the Contractor shall immediately remove these materials prior to these materials entering into the storm drain system.

G. Stockpiling of materials on the site will not be allowed unless otherwise approved by the District's Engineer. The Contractor shall cover with plastic any construction or excavated materials which may possibly erode and enter the storm drain system of paved streets or other paved areas both public and private. Stockpiling of dirt on paved areas will not be allowed.

H. The Contractor shall sweep the work area and clean up the work site daily before leaving the site.

I. Temporary erosion control features as are necessary to prevent damage during forthcoming winter season shall be constructed and functioning.

Temporary erosion control measures shall include, but not be limited to, the following:

1. The Contractor shall conduct operations in such a manner that storm runoff will be contained within the site or channeled into the storm drain system which serves the runoff area. Storm runoff from one area shall not be allowed to divert to another runoff area.

2. Storm drain systems, toe of slope drains, and outlet structures shall be constructed and operating prior to commencing, or concurrently with placing an embankment. Temporary down drains, drainage structures, and other devices shall be provided to channel storm runoff water into the respective permanent storm drain systems during construction. Mud and silt shall be settled out of the storm runoff before the runoff enters the storm drain system.

3. Excavation areas, while being brought to grade, shall be protected from erosion and the resulting siltation of downstream facilities and adjacent areas by use of various temporary erosion control measures. These measures may include, but shall not be limited to: check dams; straw bales, confined ponding areas to desilt the runoff; and protection, such as sandbags around inlets which have not been brought up to grade.

4. Contour graded areas shall be protected against erosion and the resulting siltation of downstream facilities and adjacent areas during grading operations. Various measures may include, but shall not be limited to: the use of graded contour berms to control sheet flow; supplemental grading of large areas around temporary or unfinished inlet structures to provide desilting basins; and temporary ditch paving.

5. From October 15th to April 15th:
   a) During embankment construction, an earth berm or appropriate grading to direct drainage away from the edge of the top of the embankment shall be constructed and maintained on those embankments where earthwork operations are not in progress.

   b) Special attention will be required to protect areas, which have been cleared, and grubbed prior to excavation or embankment operations, and which are subject to runoff during the period from October 15th to April 15th. Temporary measures may include, but shall not be limited to: temporary desilting basins; contour graded ditches; temporary paved and unpaved ditches; and filter fabric fences to contain silt and sediment from runoff.

   c) After each storm, desilting basins shall be checked against their design capacity and if necessary, silt and sediment shall be removed to restore capacity.

1.2 INSPECTION AND MAINTENANCE

A. To ensure the proper implementation and functioning of temporary erosion control measures, the Contractor shall regularly inspect and maintain the construction site for the control measures. The Contractor shall identify corrective actions and time frames to address any damaged measures or reinitiate any measures that have been discontinued.

B. During the winter season defined as between October 15th to April 15th, inspections of the construction site shall be conducted by the Contractor to identify deficient measures, including but not limited to the following:
   1. Prior to a predicted storm;
   2. After all precipitation which causes runoff capable of carrying sediment from the construction site;
   3. At 24 hours intervals during extended precipitation events; and
   4. Routinely, on a minimum twice monthly basis.

1.3 DISPOSITION OF TEMPORARY MEASURES

A. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization is achieved or after the temporary measures are no longer needed as determined by COUNTY.

B. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.

END OF SECTION 01 5750

SELECTIVE DEMOLITION
SECTION 02 4100

1 PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. General: Submit the following in accordance with General Conditions of the Contract.

1. A written plan indicating type of work to be accomplished and calendar dates for expected work.

2. Proposed schedule of operations coordination for shutoff, capping, and continuation of utility services as required.

3. Photographs of existing areas of work

1.3 JOB CONDITIONS

A. Condition of Existing Facilities: Owner assumes no responsibility for actual condition of facilities to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within facilities may occur, by owner's removal and salvage operations prior to start of demolition work.

B. Salvaged Materials:

1. Items of salvable value to Contractor may be removed as work progresses. Transport salvaged items from site as they are removed.

a. Storage or sale of removed demolition items will not be permitted on site.

2. Items to be salvaged for incorporation into the work shall be stored by the contractor so as to prevent any damage to such salvaged items.

C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, driveways, walks, parking lot, access points and other adjacent occupied and used facilities.

1. Do not close or obstruct driveways, streets, walks, parking lot or other occupied or used facilities without permission from authorities having jurisdiction or from NVTA . Provide alternate routes around closed or obstructed traffic ways.

D. Protections:

1. Ensure safe passage of persons around the project site and the area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities and injury to persons.
2. Provide plastic containment with zippered entrance at location shown on drawings.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition operations.

F. Utility Services: Maintain existing utilities to stay in service and protect against damage during demolition operations. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

G. Regulatory Requirements:

1. Conform to applicable codes for demolition, safety of adjacent structures, dust control, and adjacent property owner safety.

H. Occupancy: Area to be remodeled will be vacated and use discontinued prior to start of work.

2 PRODUCTS (Not Applicable)

3 EXECUTION

3.1 DEMOLITION

A. Clean adjacent improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Demolition: Demolish portions of facilities completely and remove from site. Use such methods as required to complete work within limitations of governing regulations.

1. Proceed with demolition in systematic manner, from top of structure to ground. Complete demolition work above each floor or tier before disturbing supporting members on lower levels.

1. Demolish concrete and masonry in small sections

.

2. Remove structural framing members and lower to ground by hoists, derricks, or other suitable methods.

3. Break up and remove concrete slabs-on-grade, unless otherwise shown to remain.

4. Locate demolition equipment throughout structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

3.2 Below-Grade Construction: Demolish foundation walls and other below-grade construction, including concrete slabs, to a depth of not less than 12 inches below lowest foundation level.

3.3 Filling Voids: Completely fill below-grade areas and voids resulting from demolition of structures.

1. Use satisfactory soil materials as defined in ASTM D 2487, consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots, and other organic matter.

2. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash, and debris.

3. Place fill materials in horizontal layers not exceeding 6 inches in loose depth. Compact each layer at optimum moisture content of fill material to a density equal to original adjacent ground, but not less than 90 percent density when tested in accordance with ASTM D 1556, unless subsequent excavation for new work is required.

4. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

3.4 Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove weekly from site accumulated debris, rubbish, and other materials resulting from demolition operations.

1. Burning of combustible materials from demolished structures will not be permitted on site.

B. Removal: Transport materials removed from demolished structures and legally dispose off site.

END OF SECTION 02 4100

CONCRETE REINFORCEMENT
SECTION 03 2000

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-In-Place Concrete.

1.3 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010 (Errata 2012).

B. ACI 318 - Building Code Requirements For Structural Concrete and Commentary; American Concrete Institute International; 2019.

C. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International; 2004.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

E. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement; 2022.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

G. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; American Welding Society; 2018.

H. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2020.

I. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute; 2020.

1.4 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar sizes and material types, lengths, spacings and locations, and quantities of reinforcing steel; bar schedules, stirrup spacing, shapes of bent bars, spacing of bars, and types and location of splices. Include special reinforcement required at openings and flat slab shear reinforcing.

1. Coordinate placement of embedded items with rebar placement.

2. Coordinate and indicate provisions for construction access.
3. Do not reproduce construction documents for shop drawings.

C. Manufacturer's Certificate: Submit to the special inspector certificates that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Product Data: Submit for approval bar supports, chairs, and rebar couplers.

E. Reports: Submit to the special inspector certified copies of mill test report of reinforcement materials analysis.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store reinforcement in a manner that will prevent rusting or coating with grease, oil, dirt, and other objectionable materials.

B. Deliver reinforcement to the job site bundled, tagged and marked, using metal tags.

1.6 QUALITY ASSURANCE

A. Perform work of this section in accordance with CRSI (DA4), CRSI (P1), ACI 301, ACI SP-66, and ACI 318 in addition to applicable building code.

1. Maintain one copy of each document on project site.

B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) for #7 and smaller bars.

1. Deformed billet-steel bars.
2. Unfinished.

B. Reinforcing Steel: ASTM A 706/A 706M, Grade 60 (420) for #8 and larger bars and all bars to be welded. Permitted for bars #7 and smaller.

1. Deformed low-alloy steel bars
2. Unfinished.

C. High Strength Reinforcing Steel: ASTM A 615/A 615M, Grade 75, where noted on drawings.

1. Deformed low-alloy steel bars.
2. Unfinished.

D. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.

1. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).

2.2 REINFORCEMENT ACCESSORIES:

A. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch (1.29 mm).

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

C. Bar Supports placed against ground: Precast concrete blocks not less than 3 inches square with embedded wires.

D. Welding Electrodes: Conform to AWS D1.4.

E. Mechanical Couplers: Type 2 per ACI-318 with current ICC or IAPMO evaluation report.

1. Manufacturers:
   a. Headed Reinforcement Corporation (HRC); www.hrc-usa.com.
   b. Erico; www.erico.com.
   c. Dayton Superior; www.daytonsuperior.com.
   d. Or equal.
2. Couplers at formed construction joints may be
   a. Lenton Form Saver by Erico.
   b. HRC 520/525 Form Protector by HRC
   c. D51A DBR Form Saver by Dayton.
   d. Or equal.

F. T-Headed Reinforcement: In compliance with ACI 318, Section 12.6 and with current ICC or IAPMO evaluation report.

1. Manufacturers:
   a. Headed Reinforcement Corporation (HRC); www.hrc-usa.com.
   b. Erico; Product: www.erico.com.
   c. Or approved equivalent.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice, ACI SP-66 - ACI Detailing Manual, ACI 318, and ACI 301.

B. Welding of reinforcement is permitted only where indicated on drawings. Perform welding in accordance with AWS D1.4.

C. Mechanical couplers may be substituted for contact lap splices provided concrete cover and bar spacing requirements are met and when approved by SEOR.

D. Locate reinforcing splices not indicated on drawings at point of minimum stress.

1. Stagger splice locations so that no more than 50% of the bars are spliced at a section.
2. Locations of splices subject to approval by University's Representative.

2.4 SOURCE QUALITY CONTROL

A. An independent testing agency will perform source quality control review, as specified in Division 1.

B. Review mill test reports containing tensile and bend tests for type and grade of reinforcing steel.

C. Weld Metal and Procedures: Review the following for conformance:

1. Certificate of Compliance for weld metals used in work.
2. Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR).
3. Welder Certifications and re-qualification tests.

D. Visually inspect 100% of shop welding.

1. Butt Joint Welds: Perform radiographic examinations on 100 percent of welds.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position by more than the tolerances set forth in ACI 301.

B. Do not displace or damage vapor barrier or water proofing membrane.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as indicated on drawings.

E. Clean reinforcement of loose rust and mill scale, oil, grease, earth, ice, cement splatter and other materials which reduce or prevent bond with concrete.

F. Set wire ties so ends are directed into concrete, away from concrete surfaces.

G. Welding:

1. For existing bars to be welded, Contractor to perform chemical analysis to demonstrate compliance with AWS D1.4.
2. Welding shall not be done on or within two bar diameters of any bent portion of a bar.
3. Welding of crossing bars is not permitted.
4. Protect adjacent reinforcement against arc strikes during welding.

A. Do not bend or realign reinforcement after being embedded in hardened concrete.

1. Obtain approval from SEOR for bar repairs.

3.2 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Division 1, will inspect installed reinforcement for conformance to contract documents before concrete placement.

B. Visually inspect 100% of field welding.

1. Butt Joint Welds: Perform radiographic examinations on 100 percent of welds.
2. All other welds: Perform magnetic partical testing on at least 25 percent of welds. For each weld found to be defective, test 100 percent of the welds until 5 consecutive welds are found to have no defects.

C. Visually Inspect 100 percent of mechanical coupler installations.

D. Inspect placement, location, splices, spacing, size, cover and type of reinforcement for conformance with the contract documents.

END OF SECTION 03 2000

CAST-IN-PLACE CONCRETE
SECTION 03 3000

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Slabs on grade.

B. Concrete foundations.

C. Concrete walls, columns and beams.

D. Exposed concrete walls.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads and curbs.

G. Concrete curing.

1.2 RELATED REQUIREMENTS

A. Section 03 10 00 – Concrete Forms & Accessories: Forms and accessories for formwork.

B. Section 03 20 00 – Concrete Reinforcement.

1.3 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2020.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2015.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

E. ACI 304.2R - Placing Concrete by Pumping Methods; American Concrete Institute International; 2017..

F. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2016.

G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2019.

H. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2021.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021.

L. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2020.

M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

N. ASTM C150/C150M - Standard Specification for Portland Cement; 2020.

O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2020.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2021.

Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2022.

R. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

S. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2020.

T. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2020.

U. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2021.

V. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2022.

W. ASTM E1155 - Standard Test Method for Determining F (F) Floor Flatness and F(L) Floor Levelness Numbers; 12014 (Reapproved 2020).

X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.4 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data on manufactured products, curing material, slab treatments, evaporation reducing compound and joint fillers showing compliance with specified requirements.

1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Certified Mix Design: Submit for each type and strength of concrete, at least 4 weeks prior to placement.

1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
3. Include results of testing or test data used to establish mix proportions. This is to include unit weight, slump, shrinkage, and compression test reports. Mix designs to be prepared, stamped and signed by a Professional Engineer registered in the State of California.
4. Submit certificates of compliance for materials of mix.

D. Placement Schedule: Submit plans and schedule of concrete placement operations prior to commencement of work. Indicate locations of construction joints.

E. Coordination Drawings: Submit drawings showing size and location of all penetrations and embedded items in cast-in-place structural elements.

F. Construction Joint Layout: Submit drawings showing proposed construction joint locations.

G. Mock-ups for exposed concrete.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

1. Maintain one copy of each document on site.

B. Manufacturer Qualifications:

1. A firm experienced in manufacturing ready mixed concrete products complying with ASTM C94/C94M and requirements for production facilities and equipment.
2. Manufacturer to be certified according to the National Ready Mixed Concrete Association certification for ready mixed concrete production facilities.

C. Placement and Finishing contractor to have a minimum of five years' experience with similar types of projects.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.2 REINFORCEMENT

A. Comply with requirements of Section 03 20 00.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type II - Moderate Portland type.

1. Acquire all cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33 and as modified below.

1. Coarse Aggregates: Cleanness Value of not less than 75 as tested per California Test Method 227.
2. Fine Aggregates: Sand Equivalent of not less than 75 as tested per California Test Method 217.
3. Acquire all aggregates for entire project from same source.

C. Lightweight Aggregate: ASTM C330

1. Coarse Aggregate to be rotary kiln-expanded shale or clay having surface scaled by firing.
2. Fine Aggregate to be a blend of natural sand and lightweight fines.

D. Fly Ash: ASTM C618, Class F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

G. Water: Clean and not detrimental to concrete.

2.4 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Admixtures to be compatible with all other components in the mix.

C. Admixtures are to be included in the mix used to establish the mix design.

D. Air Entrainment Admixture: ASTM C260/C260M.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

F. Water Reducing Admixture: ASTM C494/C494M Type A.

G. Shrinkage Reducing Admixture:

1. ASTM C494/C494M, Type S.
2. Products:
   a. Grace Construction Products; Eclipse 4500: www.na.graceconstruction.com.
   b. Or equal. Submit product specification to University's Representative for approval.

H. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
1. Products:
   a. W.R. Meadows, Inc.; ADI-CON CW Plus: www.wrmeadows.com.
   b. Xypex Chemical Corporation; XYPEX Admix C-500: www.xypex.com.
   c. Or equal. Submit product specification to University's Representative for approval.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Barrier: Multi-layer plastic extrusion or equivalent, complying with ASTM E 1745, Class A, 0.38mm (15mil) or greater; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.

1. Permeance: 0.01 perms [grains/(ft2 x hr x inHg)] maximum as tested in accordance with ASTM E 1745 Section 7. Provide independent testing data showing compliance.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
3. Products:
   a. Fortifiber Building Systems Group; Moistop Ultra 15: www.fortifiber.com.
   b. Stego Industries, LLC: www.stegoindustries.com.
   c. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils (0.38mm): www.wrmeadows.com.
   d. Or equal. Submit product specification to University's Representative for approval.

B. Rock Base:

1. Interior slabs-on-grade: Free draining, clean crushed rock or gravel conforming to Caltrans Class 1, Type A permeable material

C. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. ASTM C1107/C1107M; Grade A, B, or C.
2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch (13.7 MPa).
3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).

D. Repair Mortar:

1. ASTM C1107/C1107M; Grade A, B, or C.
2. Minimum Compressive Strength at 24 Hours, ASTM C29/C39M: 2,000 pounds per square inch (13.7 MPa).
3. Minimum Compressive Strength at 28 Days, ASTM C39/C39M: 6,500 pounds per square inch (48 MPa).
4. Recommended products: Sikacrete 211 SCC Plus by Sika Corporation, or equal. Submit product specification to University's Representative for approval.

2.6 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
1. Use admixtures as necessary to produce concrete of a consistency that will allow thorough compaction of the concrete into corners and around reinforcing without excessive puddling, spading or vibration, and without permitting the materials to segregate or free water to collect on the surface. Produce dense and uniform concrete free from rock pockets, honeycomb and other irregularities.
2. Contractor to review and approve the proposed concrete mix designs for compatibility with placing requirements to ensure that the concrete as designed can be placed in accordance with the Drawings and Specifications.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI 301. Mix design to be prepared by a licensed Professional Engineer.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Cements and aggregates to have a proven history of successful use together. Alternatively submit evidence satisfactory to University's Representative that aggregate will not react harmfully in presence of alkalis in cement.

E. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: As indicated on drawings.
2. Fly Ash Content: Minimum 25 percent and maximum 50 percent of cementitious materials by weight.
3. Calcined Pozzolan Content: Maximum 20 percent of cementitious materials by weight.
4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
5. Water-Cement Ratio: Maximum 45 percent by weight; unless noted on the drawings.
6. Dry Unit Weight: Minimum 144 lbs per cubic foot and maximum of 150 lbs per cubic foot.
7. Total Air Content: 6 percent maximum, determined in accordance with ASTM C 173/C 173M.
8. Admixtures: High Range Water Reducer at contractor's option.
9. Maximum Slump at point of placement: 4 inches (100 mm).
    a. Maximum Slump With Water Reducing Admixture: 8 inches (200 mm).
10. Minimum Slump at point of placement: 1 inch (25 mm)
11. Maximum Aggregate Size: 1 inch (40 mm).
12. Drying Shrinkage:
    a. Typical: Maximum 0.050 percent unless otherwise indicated.
    b. Slabs-on-Grade: Maximum 0.045 percent.
    c. Shrinkage Reducing Admixture: Provide as required to attain maximum drying shrinkage when adequate shrinkage data for concrete mix design is not available.

F. Patching Mortar: Mix in proportions by volume of one-part cement to two parts water. Substitute white cement for part of cement as necessary to produce color matching surrounding concrete.

2.7 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

2.8 SOURCE QUALITY CONTROL

A. An independent testing agency will perform source quality control review, as specified in Division 1.

B. Review mix designs and certificates of compliance for materials Contractor proposes to use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of

form accessories.

C. Protect finished surfaces adjacent to concrete-receiving places.

D. Roughen surfaces of previously placed and existing concrete to 1/4 inch (7 mm) amplitude by heavy sand-blasting, waterblasting or bush-hammering. Prior to receiving concrete, clean surfaces of dust and debris using compressed air or water.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

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

G. Clean surfaces of reinforcement and forms previously coated with cementitious materials by wire brushing or other acceptable means.

H. Thoroughly wet all concrete and wood forms before application of concrete. Do not allow free water to remain on the surface.

I. Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches (150 mm) and seal watertight by taping edges and ends.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify University's Representative not less than 48 hours prior to commencement of placement operations.

D. Do not place concrete until testing agency has inspected reinforcing placement.

E. Water may be added once to each truckload in the field provided the specified water-cement ratio is maintained.

F. Ensure reinforcement, inserts, embedded parts, and formwork and subgrade will not be disturbed during concrete placement.

G. Consolidate concrete in accordance with ACI 309.

H. Maximum placement area for placing of concrete to be 10,000 square feet. Contractor to submit proposed construction joint locations.

I. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.4 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for conformance to specified tolerances.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Exposed to View and Foot Traffic: F(F) of 35; F(L) of 25.
2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15.
3. Under Carpeting: F(F) of 25; F(L) of 20.
4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.

C. Measure F(F) and F(L) in accordance with ASTM E1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.

D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.5 CONCRETE FINISHING

A. Drypack surface defects, including tie holes, immediately after removing formwork.

B. Finish concrete surfaces to match existing.

C. Exposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height. Provide smooth rubbed finish. Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Exposed concrete finishes shall be sealed (See Division 7).

E. For exposed architectural concrete where appearance is important, formwork design submittals and mock-ups are required. Establish tolerances for finish surfaces acceptance with architect in preconstruction meeting.

F. Concrete Walls, and Columns: Smooth formed.

G. Concealed Concrete Surfaces: Rough Formed

H. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows, unless otherwise noted on architectural drawings:

1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include ceramic tile with full bed setting system.
2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, thin set ceramic tile, and fluid applied waterproofing.
3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
    a. Chemical Hardener: After slab has cured, apply water-diluted hardener in three coats per manufacturer's instructions.
4. Float surfaces that will be left exposed in non-public areas

3.6 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal concrete: Not less than 7 days.

C. Formed Surfaces: Cure by moist curing with forms in place. Provide curing for remainder of curing period after form removal.

D. Surfaces Not in Contact with Forms:

1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
   b. Spraying: Spray water over floor slab areas and maintain wet.
   c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
3. Final Curing: Begin after initial curing but before surface is dry.
   a. Moisture-Retaining Sheet: Lap strips not less than 3 inches (75 mm) and seal with waterproof tape or adhesive; secure at edges.
   b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.
   c. Liquid curing compounds are not acceptable for use on the mat slab or floor slabs.

3.7 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Division 1.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Provide full time special inspection during concrete placement.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 150 cu yd (114 cu m) or less of each class of concrete placed in any one day. 1 specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

G. Concrete Temperature: Test hourly when air temperature is 40F (4C) and below, and when 80F (27C) and above; and each time a set of compression test specimens is made.

H. Review the ticket of each batch of concrete delivered to the site for conformance.

I. Verify proper curing procedure and applications at initial curing and final curing stages.

J. Verify within 72 hours after placement that floor tolerances are within the limits specified herein.

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Where deficiencies are noted, the testing agency or Contractor to report defective concrete in writing to University's Representative within 24 hours.

C. Repair or replacement of defective concrete will be determined by the University's Representative. The cost of additional testing, repair and design services to be borne by Contractor when defective concrete is identified.

D. Contractor to submit repair of defective concrete within 2 days of discovery.

E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of University's Representative for each individual area.

END OF SECTION 03 3000

COLD-FORMED METAL FRAMING SECTION
SECTION 05 4000

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Interior non-load bearing wall framing.
3. Ceiling joist framing.

1.2 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

B. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association or the Steel Stud Manufacturers Association.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
   b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
   c. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection

failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1 inch.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G60

B. Steel Sheet for Vertical Deflection & Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with

flanges designed to support horizontal loads and transfer them to the primary structure.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-3/8 inches.
3. Section Properties: As needed to resist 5 psf interior out-of-plane pressure loading.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.
3. Section Properties: As indicated.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193, ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

E. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Non-shrink Grout: Factory-packaged, nonmetallic, noncorrosive, non-staining grout, complying with ASTM C 1107, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, non-leaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.9 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
3. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection

stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing 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 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall- framing system.

3.4 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to building structure.
4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall- framing system.

3.5 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

END OF SECTION 05 4000

MISCELLANEOUS METAL FABRICATIONS
SECTION 05 5000

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Miscellaneous Metal Fabrications, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Shop Drawings: Submit manufacture and installation details, including fastenings, for review.

C. Samples: If specifically requested.

D. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

E. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY ASSURANCE

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. American Institute for Steel Construction (AISC):

a. AISC ASD Manual: Specification for Structural Steel Building—Allowable Stress Design and Plastic Design.

b. AISC ASD/LRFD: Manual of Steel Construction Volume II – Connections.

c. AISC LRFD Volume I and II: Manual of Steel Construction Load and Resistance Factor Design, Volume I: Structural Members, Specifications and Codes.

d. AISC S303: Code of Standard Practice for Steel Buildings and Bridges.

3. American Society of Testing Materials (ASTM): Materials and testing standards as identified throughout this Section.

4. American Welding Society (AWS):
    a. AWS D1.1 Structural Welding Code – steel.
    b. AWS D1.3: Structural Welding Code – sheet steel.
5. National Association of Architectural Metal Manufacturers (NAAMM): Standards.
6. Steel Structures Painting Counsel (SSPC): Painting Manual.

C. Qualifications:
1. General: Fabricator and installer specializing in the work of this Section with minimum three (3) years documented experience.
2. Welding: Performed by certified welders per AWS.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Steel Shapes:
1. General: ASTM A36.
2. Steel Tubing: ASTM A500, Grade B.
3. Steel Pipe: ASTM A35, Type E or S, Grade B.
4. Steel Sections: ASTM A36

C. Fastenings:
1. General: Bolts, nuts, screws, washers, and other various fastenings necessary for proper erection of work. Galvanized steel fastenings or other non-rusting types for exterior steel work.
2. Exposed in Finished Surface: Tamperproof countersunk Phillips flat head screws, unless otherwise shown; finish to match adjacent surfaces.
3. Plastic Screw Anchors:
    a. General: Type PSA, manufactured by Hilti, Inc.
    b. Alternate Manufacturers: Comparable products manufactured by Star Anchors and Specialty Fasteners, Inc., or accepted equal.
4. Drilled-in Concrete Anchors:
    a. General: Kwik Bolt II manufactured by Hilti Corp.; stainless or galvanized for exterior work.
    b. Alternate Manufacturers: Comparable products manufactured by ITW Ramset/ Red Head, or acceptable equal.

D. Galvanizing:

1. General: Hot-dip process per ASTM A123 or A153, as applicable. Minimum coating: 2 oz. per square foot.

2. Repair treatment:

a. Rod: Per ASTM A780.

b. Coating: Per MIL-P-46105.

E. Plastic Cement: FS SS-C-153, Type 1.

F. Non-Shrink Grout:

1. General: "Embeco 636" manufactured by Master Builders, inc.

2. Alternate manufacturers: Comparable products manufactured by W.R. Meadows, Inc, or accepted equal.

G. Primer: Per Section 09 3000 – PAINTING AND COATINGS.

2.2 FABRICATION

A. Workmanship:

1. General: Shop assemble work in largest practical sections; minimize field connections. Grind smooth parts exposed to view; grind smooth parts in undercounter knee spaces; remove burrs and sharp edges; remove weld marks and leave free of fabrication marks. Miter corners and edges unless otherwise shown. Make members true to length so assembling may be done without fillers. Bend, twist, open joints in finished members, or projecting edges or corners at connections will not be permitted. Miter, cope, and block carefully to produce tight hairline joints. Provide lugs, clips, connections, bolts, and fastenings necessary to complete fabrication.

2. Exposed Steel: Comply with ASIC Architecturally Exposed Structural Steel fabrication requirements.

3. Galvanizing: Treat all areas burned off or damaged during fabrication with specified repair compound.

4. Reinforcement: Provide proper reinforcement for hardware, and other fabricated metal work, as required.

5. Welding: Use sequence welding to minimize distortion and heat stresses. Weld by shielded electric arc process per AWS. Use continuous welding along entire area of contact, except where spot welding is permitted . Grind all welds smooth an exposed surfaces. Spot welding not permitted on exposed surfaces.

6. Shop Painting: Per SSPC standards.

B. Fabrications:

1. General: Fabricate the following items, complete as shown.

2. Countertop Supports: Fabricate from steel angles as shown.

3. Bollards: fabricate from steel pipe to height and diameter shown

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to section 01700 – EXECUTION REQUIREMENTS

3.2 PREPARATION

A. Examination: Examine conditions of work in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimension.

3.3 INSTALLATION

A. Performance:

1. General: Install with workmen skilled in the particular type of work required.

2. Coordination Deliver miscellaneous metal items to be installed in concrete or masonry, complete with all clips, anchors or bolts necessary to secure them in place.

3. Workmanship: Set work plumb and true; properly assemble and erect in a rigid and workmanlike manner. Do cutting, punching, drilling and taping for attachment of other work coming into contact with fabricated metal work where indicated or as directed. Do necessary cutting drilling and fitting for installation of fabricated metal work. Execute drilling, cutting, and fitting carefully; when required, fit work at job before finishing. No burning in field permitted. Replace or repair parts damaged or injured during erection in an acceptable manner. Drill holes for fasteners to exact diameter as recommended by fastener manufacturer. Oversized holes or holes not properly located that produce misalignment of fastener will be rejected.

4. Exposed Steel: Comply with ASIC Architecturally Exposed Structural Steel installation requirements.

5. Galvanizing: Treat areas burned off or damaged during fabrication or erection with specified repair compound.

6. Field Touch-up: Touch-up damaged surfaces and field welds of steel, scheduled to be painted, per SSPC standards.

7. Protection: After erection, provide proper protection for fabricated metal items from other construction operations.

B. Installation:

1. General: Install the metal items, complete as shown.

2. Counter Supports: Anchor to walls and install countertop as shown.

END OF SECTION 05 5000

ROUGH CARPENTRY
SECTION 06 1000

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. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Wood furring.
5. Plywood backing panels.

B. Related Sections include the following:

1. Division 6 Section "Sheathing."

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

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

C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.

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

1. WCLIB: West Coast Lumber Inspection Bureau.
2. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Engineered wood products.

1.5 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

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

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

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

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

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

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood floor plates that are installed over concrete slabs-on-grade.

E. Provide preservative treated wood in conjunction with roofing (nailers, curbs, etc.); any wood in contact with masonry, cement or the earth. Provide material safety data sheets for all wood preservative for review and approval by the UCD Office of Environmental Health & Safety.

F. Acceptable Wood Preservatives include: Copper Naphthenate and Zinc Naphthenate.

2.3 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: as specified in construction drawings.

B. Species and grades: as specified in construction drawings

C. Exposed Exterior Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

2.4 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

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

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

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

2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

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

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

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

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.7 METAL FRAMING ANCHORS

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

1. Alpine Engineered Products, Inc.
2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Simpson Strong-Tie Co., Inc.
6. Southeastern Metals Manufacturing Co., Inc.
7. USP Structural Connectors.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G185 coating designation.

1. Use for interior locations where stainless steel is not indicated.

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

1. Use for exterior locations and where indicated.

2.8 FORM RELEASE AGENTS

1. Form release agents used on wood concrete forms shall be biodegradable to enable the wood to be recycled.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

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

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

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

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

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

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

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

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

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

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

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated in the construction drawings.

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

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

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

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

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal size furring vertically at 16 inches o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Except as noted on drawings, provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction, unless otherwise indicated.

1. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers per the drawings. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

3.5 RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal size or 2-by-4-inch nominal size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.6 PROTECTION

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

END OF SECTION 06 1000

SHEATHING
SECTION 06 1600

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. Wall sheathing.
2. Roof sheathing.
3. Flooring.
4. Underlayment.
5. Flexible flashing at openings in sheathing.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

A. Plywood Wall Sheathing: as specified in construction drawings.

B. Oriented-Strand-Board Wall Sheathing: as specified in construction drawings.

1. Not permitted for use on walls to receive Manufactured Stone Veneer.

2.3 ROOF SHEATHING

A. Plywood Roof Sheathing: as specified in construction drawings.

B. Oriented-Strand-Board Roof Sheathing: as specified in construction drawings.

2.4 SUBFLOORING AND UNDERLAYMENT

A. Plywood Flooring:

1. Span Rating: as specified in construction drawings.
2. Nominal Thickness: as specified in construction drawings.
3. Edge Detail: as specified in construction drawings.

2.5 FASTENERS

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

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch (0.8 mm).

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
   b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing.

C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated in the construction drawings.

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

1. Wall, Floor, and Roof Sheathing:
   a. Nail to wood framing.
   b. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
4. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.4 PROTECTION

A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 06 1600

INTERIOR ARCHITECTURAL WOODWORK
SECTION 06 4023

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Casework, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Shop Drawings: Submit shop drawings indicating materials, wood species, component profiles, dimensions, fastenings, joining details, finishes, hardware and accessories, show drawer and door pull placements, with WIC Certified Compliance Label on drawings for review.

C. Samples:

1. Plastic Laminate: Sample three (3) samples for each color specified for plastic laminate faced cabinets, shelving and countertops, as indicated in the drawings Finish Schedule; alternate color if requested from manufacturer's standard plastic laminated colors; other products if specifically requested.

D. Product Data: Submit manufacturer's literature for manufactured items.

E. Certificates:

1. General: WIC Certified Compliance Certificate for fabrication and installation of casework in grade specified.

2. Hardwood:

a. General: Submit certification and documentation verifying that hardwood lumber and veneers were obtained from sustainably managed sources and that certified lumber was properly segregated from other materials while in storage and production.

b. Acceptable Certifying Agencies:

1. Rainforest Alliance: "Smart Wood Program".

2. Scientific Certification System: "Forest Conservation Program".

F. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY ASSURANCE

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. National Electrical Manufacturers Association (NEMA): Standards.

3. Hardwood Plywood and Veneer Association (HPVA): HPVA-01 – Hardwood and Decorative Plywood.

4. Woodwork Institute of California (WIC): Manual of Millwork.

C. Qualifications: Fabricator and installer having minimum of five (5) years experience with fabricating architectural woodwork similar ot that required for the Project; member of Woodwork Institute, requirements of grade specified.

PART 2- PRODUCTS

2.1 MATERIALS

A. Plastic Laminate Faced Casework:

1. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated

2. Quality: WI MoM/Premium Grade, Type II, Style A, flush overlay type.

3. Wood Products:

a. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide Medite Corp. (Sierrapine) Medite II or Rodman Industries/Resincore formaldehyde-free medium density fiberboare (MDF) or particle board products made with recycled postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

b. Hardboard: AHA A135.4

c. Medium Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.

4. High Pressure Decorative Laminate: NEMA LD 3, as required by woodwork quality standard; manufacturer and color as indicated on the drawings Finish Schedule

B. Plastic Laminate Countertops:

1. General: Class I high-pressure decorative laminate plastic

2. Plastic Veneer: NEMA Standard .039 inch postforming grade and .045 inch general purpose grade; satin finish.

3. Backing Sheets: .020 inch thick standard laminate.

4. Colors: As indicated on drawings Finish Schedule

C. Solid Surface Countertops: See specification section 06 6500 Solid Surfacing

D. Casework Hardware:

1. General: Per WIC Standards, and as follows.

2. Finish at Exposed Hardware: satin black

3. Hinges: Blum Clip 125+ hinge – 125 degree opening with zinc die cast base plate, or accepted equal fully concealed hinges.

4. Door and Drawer Pulls: Manufacturer: Mocket; Style 4B, 7-7/8" Chamfered edge drawer pull, satin black 90S; no known equal

5. Silencers: Manufactured by Ceco Building System Division of Robertson-Ceco., or accepted equal.

6. Drawer Guides:

a. General: Manufactured by Accuride International, Inc., or accepted equal.

b. Operation: Full extension, soft-self-closing

c. Small Drawer: 50 lbs. load capacity

d. Medium Drawer: 75 lbs. load capacity

e. Large Drawer: 100 lbs. load capacity

7. Adjustable Shelf Hardware: Lamp No. SS-323 manufactured by Sugatsune America, Inc., or accepted equal.

a. Alternate Manufacturers: No known equal.

8. Hole Plugs (Grommets) : Model No. MP-0500, black, manufactured by Outwater Plastic Industries, Inc., or accepted equal.

2.2 MISCELLANEOUS MATERIALS

A. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Contact Adhesive: 250 g/L.

B. Furring, blocking, shims, and hanging strips: softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

C. Anchors: Per WIC requirements, select material, types, size, and finish required for each substrate for secur4e anchorage. Provide nonferrous-meal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

D. Adhesive for bonding plastic laminate: Per WIC requirements, contact cement, for general use and for postforming. Use unpigmented product with through-color laminate

E. Adhesive for bonding edges: Per WIC requirements, hot-melt adhesive or adhesive specified above for faces

2.3 FABRICATION

A. General: Manufacture to Custom Grade standards, except where specifically noted otherwise, per Section 14 of the Manual of Millwork. Provide WIC Certified Compliance Label for grade specified, to each elevation of casework.

B. Construction:

1. General: Style A; Type II. Completely face exposed and semi-exposed surfaces, with specified hardwood species. As far as practical, fabricate casework complete as a unit in the shop; backs required.

2. Door and Drawer Fronts: Flush; Type I.

3. Shelves: Edge banded plywood faced to match cabinet exterior.

4. Open cubicle “cubbies” and open shelving: Completely faced at all faces, edges and back panels with specified plastic laminate

5. Inside Surfaces of Doors and Drawers: Either bamboo or White Birch stained to match general color of exterior veneers; melamine interior is not acceptable. Conflicts w/ other items in orig spec

6. Inside Cabinets except as noted elsewhere: White melamine

7. Filler Panels: As required; to match cabinets as shown.

8. Finish: Factory finish exposed, interior and semi-exposed surfaces, including drawer interiors, backs, sides and bottoms, and related wood trim, to WIC Custom Grade standards.

C. Plastic Laminate Countertops: In accordance with specified quality standards

D. Solid Surface Countertops: As specified in section 06 6500 Solid Surfacing

E. Hardware:

1. General: Pre-fit; remove for application of finish. Keep hardware with casework to which it has been pre-fit; reinstall after installation of unit at job site.

2. Hinges: Four (4) No. 8 screws into end panel and door panel; 1-1/2 pair on 7'-0” high cabinet doors; tall cabinet door must swing 180 degrees when adjacent to low cabinets without interference from counter top.

3. Magnetic Catches: One catch on cabinet doors up to 48 inches high; two catches (top and Bottom) on cabinet doors over 48 inches high.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS.

3.2 PREPARATION

A. Environmental Requirements: Store materials indoors in an area with a relative humidity 50 percent or less; temperature 70 degrees F minimum.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Measurements: Take field measurements prior to fabrication; report variance between plan and field dimensions.

D. Delivery: Use clean, nonstaining materials for blocking and packing. Carefully load and cover for shipment; do not transport during inclement weather.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Casework:

1. General: Install level, with tight joints between units; scribe edges to fit adjacent structure. Secure to blocking or plates in wall or to casework carriers with lag bolts with washers to permit removal. Screws shall penetrate not less than 1 inch into 2 inch nominal blocking or framing

2. Filler Panels: Scribe to cabinet and abutting structure.

C. Countertops

1. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.

2. Make corners in joints hairline; slightly bevel arises.

3. Locate butt joints at least 2'-0" from cutouts.

4. Provide for cutouts for inserts, fixtures, and fittings; verify locations from on-site dimensions

5. Install level, using concealed fasteners, with tight joints; scribe to fit wall surfaces.

6. Coordinate with owner for locations of hole plugs/grommets

D. Hardware:

1. General: Check hardware upon delivery to site; store in an orderly manner. Fit and install in place without marring or injuring either hardware or casework.

2. Seismic Restraint: As shown.

E. Solid Wood Trims:

1. Ease edges 1/8"

2. Sand all surfaces

3. Pre-prime and paint prior to installation

4. Miter corner joints and fit flush

5. Fit tightly and neatly to existing surfaces

6. Countersink and fill all nail or screw attachments; sand flush; paint to match solid wood trims.

F. Finish: Touch-up repair to factory-applied condition.

END OF SECTION 06 4023

3.4 CLEANING

A. General: Immediately following installation, clean casework to remove all dirt, stains, scratches, and abrasions. Protect casework against damage by other trades; repair or replace damaged and deface material at no cost to Owner.

3.5 JOBBING

A. General Six (6) months after final acceptance of the building, and at any time within a year after acceptance when so directed, examine all casework doors, drawers, fittings, etc., and perform such fitting and adjustments as necessary to put all items in good condition and working order.

END OF SECTION 06 4023

FIBERGLASS REINFORCED PLASTIC WALL PANELS
SECTION 06 6400

PART 1-GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section covers the installation of fiberglass reinforced plastic wall panels (FRP)

1.3 SUBMITTALS

A. Product Data: Manufacturer's Specifications and installation instructions for each material and accessory.

B. Shop Drawings: Show location and dimension of joints and fastener attachments.

C. Samples for Verification: Submit specified color and texture sample of wall panel and trim pieces for verification.

D. Closeout Submittal: Submit cleaning and maintenance instructions.

1.4 QUALITY ASSURANCE

A. Provide panels and accessories by one manufacturer to ensure warranty and color match.

B. ASTM International:
1. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
2. ASTM D5319 Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
3. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 SYSTEM DESCRIPTION

A. Performance Requirements: Provide fiberglass reinforced plastic (FRP) panels which have been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide wall panels and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Surface-Burning Characteristics: As follows, Class III per ASTM E 84:

a. Flame-Spread Index: 200 or less.

b. Smoke-Developed Index: 450 or less

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials clearly labeled to identify Manufacturer, brand name, quality or grade and fire hazard classification.

B. Store horizontally in original undamaged packages.

C. Remove foreign matter from face of panel with soft bristle brush, avoiding abrasive action.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Install materials when temperature and humidity conditions approximate conditions that will exist when building is occupied.

B. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE PRODUCTS.

1. Marlite FRP with Sani-Coat Sealer, Marlite, Dover, OH
2. Glasbord-P with Surfaseal, Kemlite Corporation
3. LascoBoard Sta-Clean Class III, Lasco Panel Products, Florence, KY

2.2 MATERIALS

A. Panels and Accessories: Provide the following:

1. Fiberglass reinforced plastic, 0.09 inches thick, minimum. Product shall meet or exceed the following:

Property	ASTM Test Method	Units
Bearing Strength	D 953	psi 20,000
Flexural Strength	D 790	psi 1.7×10^4
Flexural Modulus	D 790	psi 6.0×10^6
Tensile Strength	D 638	psi 8.0×10^3
Coefficient of Lineal Thermal Expansion	D 696	in/in□F 1.57×10^{-5}
Water Absorption	D 570	% < 0.5
Thermal Conductivity (K-factor)	C 177	BTU/in/1.2 hr/ft²/□F
Flame Spread	E 84	- <200
Smoke Developed	E 84	- <450

2. Color/Texture: White panel with smooth finish.

B . Adhesive: Manufacturer's recommended type for use with selected materials, waterproof, mildew resistant nonstaining type.

C. Sealant: Latex type as approved by adhesive and wall paneling manufacturer.

D. Moldings:
1. Use extruded aluminum molding trim pieces at internal and external corners, including end cap molding.
2. Use plastic molding at panel divisions.

E. Miscellaneous Items: Furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, whether or not specified or indicated.

PART 3- EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Examine substrate and conditions under which the material is to be installed.
2. Verify that surfaces, when tested with moisture meter, have proper moisture content.
3. Verify that nails and screws are recessed, with joints and depressions taped, finish and sealed.
4. Remove contaminants from areas to be covered.
5. Do not proceed with Work until work of other trades which passes through wall covering has been completed and unsatisfactory conditions have been corrected.
6. Start of Work indicates acceptance of responsibility for performance and any required remedial Work.

3.2 INSTALLATION

A. Install panels in accordance with manufacturer's printed instructions using full sheet mastic coverage method with no exposed fasteners or "buttons."

B. Make joints with 1/8 inch space for expansion and use moldings designed for each condition for the Project.

C. Bevel edges of panels with block plane to permit proper fit into moldings.

D. If one end of panel must be nailed, do not nail the other end.

E. Remove plumbing escutcheons, switchplates, wall plates, and surface-mounted fixtures, and cut wall paneling evenly to fit. Replace items after completion of Work.

F. Where applicable, install paneling before installation of plumbing, casings, bases, cabinets and other items to be applied over paneling.

G. Install panels as indicated. If not indicated install in vertical format and cut panels at inside corners. Arrange panels so that no panel is less than 1/2 panel size.

3.3 CLEANING

A. Remove excess adhesive and smudges with soft cloth and mineral spirits, or with product recommended by wall panel manufacturer.

END OF SECTION 06 6400

SOLID SURFACING
SECTION 06 6500

PART 1-GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUBMITTALS

A. Shop drawings: Indicate dimensions, component sizes, fabrication details and attachment provisions, indicate mounting locations and dimensions for faucets and deck-mounted accessories

B. Samples: Submit minimum 2" x 2" samples for each color/material indicated.

C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.

1.3 DELIVERY, STORAGE AND HANDLING

A. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation until accepted by owner.

1.4 WARRANTY

A. Provide manufacturer's 10 year warranty against defects in materials.

PART 2-PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIAL

A. Manufacturer and Color: As indicated on drawings in Finish Schedule, no know equals

B. Grade: Premium.

C. Solid-Surfacing-Material Thickness: 0.79" (2cm)

D. Joint adhesive: Manufacturer's standard adhesive to create inconspicuous, non-porous joints, with a chemical bond.

2.2 WALL HUNG LAVATORIES

A. Manufacturer and Color: Futrus Solid Surface Solutions, with plumbing enclosure and finished ends, model FNLM, size to fit location as shown, color as indicated in drawings Finish Schedule, no known equal.

2.3 FABRICATION

A. Fabricate components in shop to sizes and shapes indicated, in accordance with approved shop drawings and solid surface manufacturer requirements.

B. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance.

C. Provide holes and cutouts for plumbing and accessories

D. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, and sand all edges smooth. Repair or reject defective or inaccurate work.

PART 3-EXECUTION

3.1 INSTALLATION

A. Field Verifications: Prior to fabrication, field verify existing conditions, required clearances and fit for lavatories, countertops and backsplashes.

B. Fabricate tops in one piece, unless otherwise indicated. Comply with manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

C. Fabricate tops with shop-applied edges of materials and configuration indicated.

D. Drill holes in countertops for plumbing fittings and deck-mounted accessories

E. Anchor securely by screwing through blocks of base or steel supports into underside of countertop.

F. Align solid-surfacing-material countertops and backsplashes, and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Dress joints smoothly, remove surface scratches, and clean entire surface.

G. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, and then sand all edges smooth. Repair or reject defective or inaccurate work.

H. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" (50 mm) wide reinforcing strip of solid polymer material under each joint.

I. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

J. Caulk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

K. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.

L. Remove adhesives, sealants and other stains.

3.2 REPAIR & PROTECTION

A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work.

END OF SECTION 06 6500

SELF ADHERING SHEET WATERPROOFING

SECTION 07 1326

PART 1 - GENERAL

1.1 GENERAL

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

1.2 DESCRIPTION

A. This Section describes the requirements for furnishing and installing self-adhering sheet waterproofing at the following locations:

1. Where indicated on drawings as self-adhesive waterproofing membrane

1.3 SUBMITTALS

A. Product Data: Manufacturer's specifications, installation instructions, and general recommendations for each waterproofing material. Include data substantiating compliance with specified requirements.

B. Warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 3-years' experience in the installation of waterproofing of the type specified, and approved by the manufacturer of the waterproofing materials.

1.5 JOB CONDITIONS

A. Substrate: Proceed with waterproofing work only after substrate construction and penetrating work have been completed.

B. Coordinate finishing and curing of concrete surfaces to receive waterproofing with work of Section 03 3000.

C. Ventilation: Provide adequate ventilation to prevent accumulations of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until coatings have cured.

1.6 WARRANTY

A. Warrant sheet waterproofing to be free from defects in materials and workmanship for a period of 3-years from date of Substantial Completion. Warranty shall include removal and replacement of materials installed over sheet waterproofing, including but not limited to mortar setting bed and tile. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.1 SHEET WATERPROOFING MATERIALS

A. Sheet Membrane: Bituthene System 4000 membrane, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Concrete surfaces shall be smooth, clean, and be free from dirt and grease.

3.2 INSTALLATION

A. Comply with manufacturer's installation instructions using the fully-adhered method of installation.

B. Precut membrane allowing for overlap at seams and upturn at walls.

C. Form seams by either lapping membrane 3-inches at ends and sides, or by butting membrane sheets together and covering with a 6-inch wide cap. Lap joints in the direction of watershed. Clean lap and splice areas as recommended by membrane manufacturer prior to applying welding agent.

D. Extend membrane up walls a minimum of 6-inches above finished tile surface at wall.

E. Secure membrane to walls with sheet metal screws and washers 1/2-inch from top edge or use adhesive over solid backing. Where metal studs are used and no back-up is provided, secure to studs with sheet metal screws and washers. Fold material over 1-inch at the top and fasten to backing and studs.

F. Extended membrane into floor drain clamping rings. Apply heavy bead of sealant under sheet at clamping ring.

3.3 WATER TESTING

A. Upon completion of work, test for leaks by plugging the drain or damming areas and filling with 3-inches of water. Allow water to stand for 24-hours and inspect for leakage. Make necessary adjustments to stop leakage and retest until watertight.

3.4 PROTECTION

A. Do not permit traffic on completed membrane prior to application of surfacing material.

END OF SECTION 07 1326

THERMAL & ACOUSTICAL INSULATION

SECTION 07 2100

PART 1 - GENERAL

1.1 GENERAL

A. The requirements of the General Conditions Division 1 apply to the work of this Section.

1.2 DESCRIPTION

A. This Section describes the requirements for furnishing and installing thermal and acoustical insulation.

1.3 SUBMITTALS

A. General: Comply with General Conditions Division 1

B. Product Data: Manufacturer's specifications for each type of insulation required.

1.4 QUALITY ASSURANCE

A. Thermal Conductivity: Where insulation is indicated or specified by "R" value, provide thickness required to achieve indicated value. Use aged and settled values for thermal resistance factors (R-values), tested in accordance with ASTM C518 at 75-deg. F. and 50-percent relative humidity for at least 6-months.

B. Fire Ratings: Comply with fire-resistance and flammability ratings specified.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Comply with General Conditions Division 1

B. Protect insulation from physical damage and from becoming wet or soiled. Comply with manufacturer's recommendations for handling, storage and protection during installation.

1.6 TESTING AND INSPECTIONS

A. Inspect insulation for proper installation. Correct defects such as voids, gaps or insulation compressed behind pipes before accepting work.

1.7 INDOOR AIR QUALITY

A. Protect ducts and HVAC system from loose insulation particulates.

B. Provide temporary ventilation of building areas where building insulation is being installed.

PART 2 - PRODUCTS

2.1 THERMAL BATT AND BLANKET INSULATION

A. Unfaced Formaldehyde-Free Thermal Batt/Blanket Insulation:

1. Basis of Design: Johns Manville "Formaldehyde-free Unfaced" or a comparable product by one of the following manufacturers:
   a. Owens Corning
   b. CertainTeed Corporation.
   c. Guardian Building Products, Inc.
   d. Johns Manville.

2. Material: Thermal fiberglass insulation made from resilient glass fibers bonded with a formaldehyde-free acrylic thermosetting binder, complying with ASTM C665, Type I.

3. Surface Burning Characteristics: Flame spread 25 or less; smoke developed 50 or less, when tested in accordance with ASTM E84.

4. Thickness: As required to fill walls or achieve value indicated

2.2 ACOUSTIC BATT INSULATION

A. Basis of Design: Provide Select Sound Black Acoustic Blanket, by Owens Corning, Toledo, Ohio 43659, Tel: 1-800-GET-PINK, www.owenscorning.com. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:

1. Owens Corning
2. CertainTeed Corporation.
3. Guardian Building Products, Inc.
4. Johns Manville.
5. Knauf Insulation.

B. Sound Attenuation Batts, Unfaced 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. Thickness: Thickness indicated, or as required to fill walls or achieve value indicated

D. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.
3. Thickness as required to fill walls.

2.3 ACOUSTIC PUTTY PADS:

A. For electrical boxes: ATS Acoustic Putty Pads, or approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions for installation conditions.

B. Do not install insulation until building is sufficiently enclosed or protected against absorption of moisture by the insulation, and do not install insulation unless supporting framing and construction is in a thoroughly dry condition.

C. Install snugly between framing members with ends snugly fitted between units and against adjacent construction.

D. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.

E. Where door, window and skylight frames occur in framing, cut additional strips of insulation and hand-pack as required to fill voids in and around such frames.

F. Use insulation free of ripped backs and edges.

3.2 PROTECTION

A. Protect installed insulation from harmful exposures and from physical damage.

END OF SECTION 07 2100

METAL WALL PANELS
SECTION 07 4213

PART 1 – GENERAL

1.1 SUMMARY

Description: Provide preformed metal wall panels and accessories

1.2 SUBMITTALS

A. PRODUCT DATA

1. Submit Manufacturer's technical product data, installation instructions and recommendations for each type of roofing and wall panel required. Include data substantiating that materials comply with requirements.

B. SAMPLES

1. Prior to ordering products, submit Manufacturer's standard color Samples for Architect's/Engineer's selection.
2. Prior to starting work, submit (quantity) 12" long Panel Samples showing shape and a representative color chip

C. SHOP DRAWINGS

1. Show panel layout, trim installation, and panel attachment.

1.3 QUALITY ASSURANCE

A. INSTALLER'S QUALIFICATIONS

1. Installation of panels and accessories by installers with a minimum of 5 years experience on panel projects of this nature.

B. MANUFACTURER'S QUALIFICATIONS

1. Manufacturer shall have a minimum of 10 years experience supplying metal roofing/siding to the region where the work is to be done.

C. REGULATORY AGENCY REQUIREMENTS

1. Comply with UBC and local Building Code requirements if more restrictive than those specified herein.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect against damage and discoloration
B. Handle panels with non-marring slings.
C. Do not bend panels.
D. Store panels above ground, with one end elevated for drainage.
E. Protect panels against standing water and condensation between adjacent surfaces.
F. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and allow to air dry.
G. Remove any strippable film coating prior to installation and do not allow it to remain on the panels in extreme cold, heat or in direct sunlight.

1.5 WARRANTY

A. MANUFACTURER'S PRODUCT WARRANTY

1. Manufacturer's standard coating performance warranty, as available for specified installation and environmental conditions. (Contact an AEP Span representative to determine actual warranty criteria.)

B. WARRANTY

1. Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for two (2) years following Project Substantial Completion date.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. AEP Span, or approved equal

B. PANEL DESIGNATION: U-Panel, rib depth ¾", 24 gauge, net coverage 36"

2.2 MATERIALS

A. PANELS

1. Base Metal:
   a. Material:
      (1) Steel conforming to ASTM A792 Zincalume®/Galvalume®, minimum yield 50,000 psi, thickness [choose one] 24 gauge (standard), 22, 20, or 18 gauge (non-standard).
      (2) [For primers thicker than 0.5 mil or if gauge is 20 or 18] Steel conforming to ASTM A653 (formerly ASTM A446), G-90 Galvanized, minimum yield 40,000 psi, thickness [choose one] 24 gauge (standard), 22, 20, or 18 gauge (non-standard).
   b. Protective Coating:
      (1) Conform to ASTM A792, AZ50 (Zincalume/Galvalume).
      (2) [For primers thicker than 0.5 mil] Conform to ASTM A924 (formerly ASTM A525) G-90 Galvanized.
2. Exterior Finish:
   a. Cool DuraTech® 5000 (Polyvinylidine Fluoride), full 70% Kynar® 500/Hylar 5000® consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 10-30% when tested in accordance with ASTM D-523- 89 at 60°
   b. Color: Regal White
3. Interior Finish:
   a. Primer Coat Material: Corrosion-resistant primer; primer coat dry film thickness: 0.15 mils; finish coat material: polyester paint, finish coat dry film thickness: 0.35 mils.
   b. Color: Light Gray

B. FABRICATION

1. Panels shall be full length. Fabricate flashings and accessories in longest practical lengths.
2. Roofing panels shall be factory formed. Field formed panels are not acceptable.

C. BACKING PAPER: Two layers of No. 15 (ASTM D 226-97a) WVP Grade D paper over all sheathing substrates

PART 3 – EXECUTION

3.1 EXAMINATION

A. EXISTING CONDITIONS

1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.

3.2 PREPARATION

A. FIELD MEASUREMENTS

1. Verify prior to fabrication.
2. If field measurements differ from drawing dimensions, notify Architect/Engineer prior to fabrication.

B. PROTECTION

1. Treat, or isolate with protective material, and contacting surfaces of dissimilar materials to prevent electrolytic corrosion.
2. Require workmen who will be walking on Roofing Panels to wear clean, soft-soled work shoes that will not pick up stones or other abrasive material, which could cause damage or discoloration.
3. Protect work of other trades against damage and discoloration.

C. SURFACE PREPARATION

1. Clean and dry surfaces prior to applying sealant.

3.3 INSTALLATION

A. PANELS

1. Follow panel manufacturer's directions.
2. Install panel seams vertically
3. Lap panels away from prevailing wind direction.
4. Do not stretch or compress panel side-laps.
5. Secure panels without warp or deflection.

B. ALLOWABLE ERECTION TOLERANCE

1. Maximum Alignment Variation: 1/4 inch in 40 feet.

C. FLASHING

1. Follow manufacturer's directions and approved Shop Drawings.
2. Overlap roof panels at least 6 inches.
3. Install flashings to allow for thermal movement.
4. Remove strippable protective film, if used, immediately preceding flashing installation.

D. CUTTING AND FITTING
1. Neat, square and true. Torch cutting is prohibited where cut is exposed to final view.
2. Openings 6 inches and larger in any direction: Shop fabricate and reinforce to maintain original load capacity.
3. Where necessary to saw-cut panels, debur cut edges.

3.4 CLEAN UP AND CLOSE OUT

A. PANEL DAMAGE AND FINISH SCRATCHES
1. Do not apply touch-up paint to damaged paint areas that involve minor scratches.
2. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Architect's or Owner's representative.

B. CLEANING AND REPAIRING
1. At completion of each day's work and at work completion, sweep panels, flashings and gutters clean. Do not allow fasteners, cuttings, filings or scraps to accumulate.
2. Remove debris from project site upon work completion or sooner, if directed.

END OF SECTION 07 4213

THERMOPLASTIC POLYOLEFIN (TPO) ROOFING
SECTION 07 4523

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 Single Ply Roofing as follows:
   1. Adhered TPO membrane roofing system
   2. Roof Board
   3. Insulation at areas of repair/replacement
   4. Walkways
   5. Safety Strip
   6. Installation accessories

1.3 RELATED SECTIONS

A. Section 07 6000 "Flashing and Sheet Metal" for field manufactured metal edge flashings, roof penetration flashings, flashings, and counter-flashings.

B. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.4 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

C. Total System Warranty: Warranty of the entire roof system including items specified in all project specification sections in connection with the roofing system.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-60.
2. Hail Resistance: MH.

E. Energy Performance: Provide roofing system with initial emissivity not less than 0.75 when tested according to CRRC-1.

F. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

1.6 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Roof plan showing orientation of steel roof deck and orientation of membrane roofing.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Metal termination bars.

D. Qualification Data: For qualified Installer and manufacturer.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

G. Research/Evaluation Reports: For components of membrane roofing system, from 2007 CBC.

H. Field quality-control reports.

I. Maintenance Data: For roofing system to include in maintenance manuals.

J. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Total System Warranty includes membrane roofing, base flashings, substrate board, roofing accessories including other components of membrane roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, substrate boards, for the following warranty period:
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING (SINGLE PLY)

A. Basis of Design: Sure-Weld TPO, fabric-reinforced thermoplastic polyolefin sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet as manufactured by Carlisle SynTec Systems Incorporated, or subject to compliance with requirements and approval, provide products by one of the following:
   1. GAF
   2. Duro-Last Roofing, Inc.
   3. Or approved equal

B. Properties:
   1. Thickness: 60 mils (1.5 mm), nominal.
   2. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Plastic Foam Adhesives: 50 g/L.
   b. Gypsum Board and Panel Adhesives: 50 g/L.
   c. Multipurpose Construction Adhesives: 70 g/L.
   d. Fiberglass Adhesives: 80 g/L.
   e. Contact Adhesive: 80 g/L.
   f. Other Adhesives: 250 g/L.
   g. Single-Ply Roof Membrane Sealants: 450 g/L.
   h. Nonmembrane Roof Sealants: 300 g/L.
   i. Sealant Primers for Nonporous Substrates: 250 g/L.
   j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Metal Termination Bars: Predrilled stainless-steel or aluminum bars, in profiles shown, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors, Blok-Lok T1 and T2, or equal, confirm acceptance by roof membrane manufacturer.

E. Fasteners: Manufacturer's fastener/fastening plates, factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

H. Walkways: Protective surfacing for roof traffic shall be Sure-Weld TPO Walkway Rolls installed per manufacturer's requirements

I. Warning Strip: Reinforced PVC Yellow Warning Strip

J. Roof Board: Georgia Pacific DensDeck Roof Board, ¼" and ½" thicknesses as required by manufacturer
   1. Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck, acceptable to roof membrane system manufacturer.

K. Insulation: Match existing insulation in type and thickness, where replacement/repair is required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations.
3. Verify that surface plane flatness and fastening of roof deck complies with manufacturer's requirements

B. Testing: Conduct a pull-out test to confirm that existing decks comply with the manufacturer's requirements for pull-out strength.

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

3.2 PREPARATION

A. Cut and remove wet or damaged insulation and fill all voids with new insulation so it is flush with existing surfaces.

B. Cut, remove and replace dry-rotted sheathing

C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

D. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 ROOF BOARD INSTALLATION

A. Install new roof board as substrate for the roof membrane.

1. Substrate shall be installed even without high spots or depressions, and shall be free of accumulated water, ice or snow.
2. Mechanically fasten per manufacturer's instructions, and using fasteners and method acceptable to the roof membrane manufacturer.

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

C. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

D. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

F. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

G. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

I. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and attach to substrates according to membrane roofing system manufacturer's written instructions.

B. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

C. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

D. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAYS: Provide and install protective surfacing for roof traffic from roof access to all mechanical equipment, and around all mechanical equipment.

3.7 FIELD QUALITY CONTROL

A. Testing Agency

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner>.
2. Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Address: <Insert address>.
5. Area of Work: <Insert information>.
6. Acceptance Date: <Insert date>.
7. Warranty Period: <Insert time>.
8. Expiration Date: <Insert date>.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. Lightning;

b. Peak gust wind speed: Wind pressures exceeding design requirements identified in CBC 1609.5, and ASCE 7

c. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

d. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;

e. Vapor condensation on bottom of roofing; and

f. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. Provide Warranty: This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

Authorized Signature: <Insert signature>.

Name: <Insert name>.

Title: <Insert title>.

END OF SECTION

FLASHING AND SHEET METAL
SECTION 07 6000

PART 1-GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Detail & Project Notes Manual, and general provisions of Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. Description: Provide Flashing and Sheet Metal, as shown and specified per Contract documents.

1.3 SUBMITTALS

A. Shop Drawings: Provide shop drawings showing profiles, dimensions, gauges, materials, and finishes of sheet metal flashings

B. Samples: If specifically requested.

C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

1.4 QUALITY ASSURANCE

A. Reference Standards:

ASTM A-446	Specification for steel sheet
ASTM A792	Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
ASTM B32	Solder Metal
ASTM B486	Paste Solder
ASTM D226	Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D486	Asphalt Roof Cement, Asbestos-free
FS O-F-506	Flux, Soldering, Paste and Liquid
WH	Warnock Hersey International, Inc. Middleton, WI.
FM	Loss Prevention Data Sheet
NRCA	National Roofing Contractors Association - Roofing Manual
SMACNA	Architectural Sheet Metal Manual

B. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience; manufacturer approved.

PART 2- PRODUCTS

2.1 MATERIALS

A. Sheet Material:

1. Galvanized Sheet Metal: ASTM A446, Grade A, G90 zinc coating; 24 gage minimum, core steel.

B. Underlayment:

1. General: See Specification Section 09 2400, similar, and details

C. Fasteners:

1. General: Same metal as sheet metal flashing or other non-corrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

2. Nails:

a. General: FS FF-N-105.

b. Steel: Hot-dipped galvanized, annular thread, size as required.

c. Concrete: Flat head, size as required.

3. Rivets: 1/8 inch diameter; solid type.

4. Washers: Neoprene, where required.

D. Solder:

1. Galvanized Sheet Metal:

a. General: ASTM B32; 50/50 type; lead free.

b. Flux: FS O-F-506.

E. Galvanizing Repair Treatment:

1. Rod: Per ASTM A780.

2. Coating: Per MIL-P-46105.

F. Protective Coatings:

1. General: FS TT-C-494, Type II; bituminous.

2. Backing Paint: Zinc chromate, alkyd.

G. Plastic Cement: FS SS-C-153, Type I; asphaltic.

H. Sealing Tape:

1. General: No. 606 Architectural Sealant Tape manufactured by Protective Treatments, Inc.

2. Alternate Manufacturers: No known equal.

I. Sealants: FS TT-S-230, non-hardening, non-sagging.

2.2 FABRICATION

A. Manufacturer:

1. General: From sections, per referenced standards, true to shape, accurate in size, square, and free from distortion or defects. Form pieces in single length sheets, not to exceed 10'-0" in length. Hem exposed edges on underside ½ inch; miter and seam corners.

2. Seams: Flat lock.

3. Corners: One piece with minimum 18 inch long legs; solder for rigidity, seal with sealant.

4. Cleats: Minimum 2 inches wide, interlockable with sheet.
5. Vertical Faces: Bottom edge formed outward ¼ inch and hemmed to form drip.
6. Flashing Toe: Extend toe 2 inches over roofing; return and brake edges.
7. Soldering: Solder shop formed metal joints. After soldering, remove flux; wipe and wash solder joints clean. Weather seal joints.
8. Back Painting: Paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to General Conditions

3.2 PREPARATION

A. Examination: Examine conditions of work in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

C. Storage:

1. General: Stack preformed material to prevent twisting, bending or abrasion; slope to ensure drainage.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Underlayment:

1. General: Apply one (1) layer of underlayment; lap all edges 6 inches minimum, in direction of slope.

C. Application:

1. General: Make corners square, surfaces true and straight in planes, and lines accurate to profiles. Fit sheet metal tight in place; secure using concealed fasteners. Apply plastic cement compound between metal flashings. Seal metal joints watertight.
2. Expansion and Contraction: Allow for expansion and contraction over an ambient temperature range up to 150 degrees F; distortions resulting from fastening or expansion and contraction stresses not acceptable.
3. Dissimilar Metals: Isolate with heavy coat of bituminous paint. Coat all sheet metal in contact with roofing felts.

D. Assemblies:

1. Flashing:

a. General: Install flashings where shown; miter and solder joints at corners. Lap joints in counterflashing at least 6 inches and make watertight with sealing tape. Extend counterflashing down not less than 6 inches.

E. Sealants: As shown; per manufacturer's directions.

F. Galvanizing Repair Treatment: Repair damaged zinc coating with specified repair compound, as required.

3.4 CLEANING

A. General: Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris.

END OF SECTION 07 600

JOINT SEALANTS
SECTION 07 9200

PART 1 - GENERAL

1.1 GENERAL

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

1.2 DESCRIPTION

A. This Section describes the requirements for furnishing and installing joint sealants.

1.3 SUBMITTALS

A. General: Comply with Section 01 33 00.

B. Product Data: Manufacturer's technical data for each product required, including instructions for joint preparation and sealant application. Include certification by joint sealant manufacturer that sealants, primers, and cleaners comply with local regulations controlling the use of volatile organic compounds (VOC). Include tested physical and performance properties. Include data sheets for substrate cleaners and substrate primers recommended by sealant manufacturer for specific substrate surface conditions.

C. Joint Sealant Schedule: Include the following information:

1. Joint sealant application and typical joint locations to receive sealants.

2. Joint sealant manufacturer and product name.

3. Joint sealant formulation and color.

D. Samples: Manufacturer's bead samples of actual products showing full range of colors for each product exposed to view, including custom colors if required.

E. Test Reports:

1. Certified test results of elastomeric sealants showing compliance with specified requirements. Include results of aged performances including hardness, stain-resistance, adhesion and cohesion under cyclic movement, low temperature flexibility, modulus of elasticity at 100-percent strain, affects of heat and aging, and affects of accelerated weathering.

2. Preconstruction field test results indicating which products and joint preparation methods demonstrated acceptable adhesion to joint substrates.

F. Certificates: Manufacturer's certification that joint sealants comply with specified requirements and are suitable for uses indicated.

G. Installer qualifications.

H. Warranty.

1.4 QUALITY ASSURANCE

A. Installer's Qualifications: Approved by the sealant manufacturer with a minimum of 5-years' experience on Projects of similar scope and scale.

B. Obtain joint sealant materials from a single manufacturer for each product required unless otherwise approved.

C. Preconstruction Field Testing: Prior to installation of joint sealants, field-test adhesion to joint substrates.

2. Install joint sealants in 5-foot joint lengths. Allow to cure before testing. Test adhesion by pulling sealant out of joint according to “Method A, Field-Applied Sealant Joint Hand Pull Tab”, in Appendix X1 in ASTM C1193. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Perform field tests for each type of elastomeric sealant and joint substrate.

4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.

5. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.

6. Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrate during testing.

D. Pre-installation Meeting: Conduct at the Project site to review requirements for sealant work.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Section 01 60 00.

B. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, color, expiration period, curing time and mixing instructions for multi-component materials.

C. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturers. Store materials in a clean, dry protected location on raised platforms with weather-protective coverings, within temperature range required by sealant manufacturer.

D. Protect stored materials from direct sunlight.

E. Sealant manufacturer’s standard packaging and covering is not considered adequate protection.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not install sealants when ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer, or to wet joint substrates.

B. Joint Width Conditions: Do not install sealants when joint widths are less than permitted by sealant manufacturer.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.7 WARRANTY

A. Exterior Sealants: Furnish a written warranty against leaks or other defects of materials and workmanship for a period of 10-years. Defects include but are not limited to changes in the structural, physical or chemical properties of the sealant materials that impair function or require abnormal maintenance, changes in surface finish, color or texture, failure in adhesion, weather resistance or durability, failure to prevent entry of water, or failure to comply with specified requirements.

B. This warranty shall not cover formation of cracks or defects in substrate materials adjacent to the seal, joint movement in excess of movement rating of sealant, or physical damage caused by others.

C. Repair or replace defective materials and workmanship during warranty period without expense to Owner, including removal and replacement of other items as required.

D. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide color of exposed joint sealants as selected by Architect. Custom colors may be used.

B. Provide joint sealers, joint fillers and other materials that are compatible with one another and with joint substrates, as demonstrated by testing and field experience.

2.2 ELASTOMERIC JOINT SEALANTS

A. Exterior Building Sealant: Either one-part silicone complying with ASTM C920, Type S, Grade NS, Class 25, 50 or 100 depending on product used, Use NT, M, A, and O or multi-component polyurethane complying with ASTM C920, Type M, Grade NS, Class 25, Use NT, M, A, and O. Dow Corning Corp. "790" or “795”, Tremco “Spectrem 1” or approved equal. Sealant shall resist ultra-violet, heat, ozone and moisture exposure and shall withstand substrate surface temperatures as high as 250-deg. F. and a surface temperature range of 150-deg. F.

B. Sanitary Sealant: One-part mildew-resistant silicone; ASTM C920 Type S; Grade NS; Class 25; Uses NT, G, A and O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures; Dow Corning Corp. "786 Mildew Resistant", General Electric Co. "Sanitary 1700", Sonneborn Building Product Div. "Sonolastic Omniplus", Tremco Tremsil 200 or approved equal.

C. Horizontal Joint Sealant: Two-part pourable urethane; ASTM C920, Type M; Grade P; Class 25; Uses T, M, A and O; Pecora Corp. "NR-200 Urexpan", Sonneborn "Sonolastic Paving Joint Sealant", Tremco, Inc. "THC-900/901" or approved equal. Horizontal joint sealant shall have a minimum Shore A hardness of 30.

2.3 LATEX JOINT SEALANTS

A. Interior Building Sealant: Acrylic-emulsion; one-part, nonsag, mildew-resistant, complying with ASTM C834, formulated to be paintable; Pecora Corp. "AC-20", Sonneborn "Sonolac", Tremco Inc. "Tremco Acrylic Latex 834" or approved equal.

2.4 JOINT FILLERS FOR CONCRETE PAVING

A. Joint Filler: Preformed cork strips complying with ASTM D1752 for Type II or preformed sponge rubber strips complying with ASTM D1752 for Type I.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved by sealant manufacturer.

B. Plastic Foam Joint-Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam, of size, shape and density to control sealant depth.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: As recommended by joint sealant manufacturer for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.

C. Masking Tape: Non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.

1. Remove foreign material from joint substrates which could interfere with adhesion of joint sealant, including dust, paints, oil, grease, waterproofing, water repellents, water, and surface dirt.

2. Clean porous surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or acid washing to produce a clean, sound substrate. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints.

3. Remove laitance and form release agents from concrete.

4. Clean non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants.

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

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply. Provide temporary ventilation during installation of interior joint sealants.

B. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint-fillers to provide sealant support for optimum performance cross-sectional shapes and depths.

a. Do not leave gaps between ends of joint-fillers.

b. Do not stretch, twist, puncture or tear joint-fillers.

c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.

D. Installation of Sealants: Install sealants by proven techniques to contact and fully wet joint substrates, completely filling recesses provided for each joint configuration and providing uniform, optimum performance cross-sectional shapes and depths.

E. Tooling of Non-sag Sealants: Tool sealants to form smooth, uniform beads of slightly concave profile that is slightly below the adjacent surfaces unless otherwise indicated. Tool to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents.

3.3 PROTECTION AND CLEANING

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage.

B. Cut out and remove damaged or deteriorated joint sealers and reseal joints with matching new materials.

C. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. Conduct field adhesion testing in accordance with ASTM C1521 with the sealant manufacturer's representative present. Conduct 10 tests in the first 1,000-feet of each sealant type and substrate followed by 1 test for every 1,000-feet thereafter if no test failure occurs.

END OF SECTION 07 9200

INTERIOR ALUMINUM FRAMES
SECTION 08 4213

PART 1 - GENERAL

1.1 GENERAL

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior aluminum frames for doors.
   2. Interior aluminum frames for glazing.
   3. Interior aluminum end caps for walls.

1.3 RELATED SECTIONS

A. Section 07 9200 "Joint Sealants" for joint sealants installed with interior aluminum frames and for sealants to the extent not specified in this Section.

B. Section 08 1400 "Wood Doors" for wood doors installed in interior aluminum frames.

C. Section 08 7111 "Door Hardware" for door hardware.

D. Section 08 8000 "Glazing" for glass in interior aluminum frames.

E. Section 09 2900 "Gypsum Board" for partitions.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of interior aluminum frame indicated.

B. Shop Drawings: For interior aluminum frames. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: 12-inch- (300-mm-) long framing member with factory-applied finish for each type of interior aluminum frame indicated. Color as indicated within this section.

D. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and are based on the specific system indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Interior Door and Window Frames: Basis of Design Product: The design is based on interior aluminum frames manufactured by Western Integrated Materials, Inc, 300 System, 302 (1") reveal trim, widths as required for wall assembly, with recessed pocket glazing.

B. U-Channel Glazing System (at interview rooms): Basis of Design: CRL Black Powder Coat U-Channel, black vinyl gasket, sizes as shown on drawings, custom lengths

C. Products demonstrated to be equal will be accepted.

2.2 COMPONENTS

A. Aluminum Framing, General: ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

B. Door Frames: Reinforced for hinges and strikes.

C. Glazing Frames: For glazing thickness indicated.

D. Glazing Vinyl: Manufacturer's standard glazing vinyl, black

E. Wall End Caps: Mull-it-Over 60 Wide, aluminum wall end cap to match existing bronze anodized window system framing, with sound deadening composite, compressible gasket and snap covers, https://www.mullitoverproducts.com, or approved equal

2.3 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Sound Seals: Manufacturer's standard continuous mohair, wool pile, or vinyl seals., black

C. Glazing: Comply with requirements in Division 8 Section "Glazing."

D. Hardware: Comply with requirements in Division 8 door hardware Sections.

2.4 FABRICATION

A. Machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

B. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.

C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.

D. Fabricate all components to allow secure installation without exposed fasteners.

2.5 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Black Anodized Finish: AAMA 608.1, AA-M12C22A34, Class II, 0.4 mil min or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of work.
1. Verify that wall thickness does not exceed standard tolerances allowed by throat size required.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with frame manufacturer's written installation instructions.

B. Install frames plumb and square, securely anchored to substrates.

C. Install frame components in the longest possible lengths; components up to 72 inches (1830 mm) long must be 1 piece.
1. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
2. Secure clips to main structural extrusion components and not to snap-in or trim members.
3. Do not leave screws or other fasteners exposed to view when installation is complete.

3.3 CLEANING

A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.

B. Touch up marred frame surfaces so touchup is not visible from a distance of 24 inches (610 mm). Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 08 1216

WOOD DOORS
SECTION 08 1400

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Wood Doors, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Samples:

1. Provide samples of manufacturer's standard finish for species specified.

2. Provide sample of finished stain

C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

D. Certificates:

1. General: Submit WIC Certified Compliance Certificate for Installation.

2. Hardwood:

a. General: Submit certification and documentation verifying that hardwood lumber and veneers were obtained from sustainably managed sources and that certified lumber was properly segregated from other materials while in storage and production.

b. Acceptable Certifying Agencies:

a. Rainforest Alliance: "Smart Wood Program".

b. Scientific Certification Systems: "Forest Conservation Program".

E. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Guarantee: Provide in required form for a period of two (2) years from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. National Wood Window and Door Association (NWWDA): NWWDA I.S.1A – Architectural Wood Flush Doors.

3. Underwriters Laboratories Inc. (UL): UL 10C, Fire Test for Door Assemblies.
4. Uniform Building Code (UBC): Standard 7-2.
5. Woodwork Institute of California (WIC): Manual of Millwork; Section 20.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS.

B. Wood Doors:

1. General: WICMM Custom Grade, 5-ply, made up of face veneers, cross-banding, and core unit, or 7-ply made up of face veneers, cross-bands, back veneers, and core unit; securely bonded together by hot plate process.
2. Flush Type:
   a. Interior: 1-3/4 inch thick, solid stock.
   b. General Construction: Solid core; stain grade Birch veneer.
   c. Adhesive: Type II water resistant adhesive for bonding core unit strips and edge banding.
   d. Core: Bonded core filed may be particle board per ANSI A208.1 and CS 236-66, or any combination of blocks or strip, with end joints tight, well staggered in adjacent rows, and with blocks or strips securely edge glued together under pressure. No open spaces shall occur between core blocks or strips. No defects shall be allowed in core blocks or strips that show through face or materially affect the strength of the door.
   e. Banding: Provide vertical edge bands, not less that 1.5 inch thick, any hardwood species closely matching face veneer in density and appearance. Securely glue edge bands to core. Provide top and bottom edge bands four (4) inches thick with hardwood edge band, any species having density same as core species. Top and bottom bands may be secured in place with machine joint. Biscuiting of vertical to horizontal edge bands for oversize doors is preferred.
   f. Blocking: Provide solid blocking at all locations for mounting of hardware.
   g. Finish: Manufacturer's standard finish as selected by Architect.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS.

3.2 PREPARATION

A. Examination: Examine conditions of work in place before beginning work; report defects. Verify that door frames are the type required for door and are properly installed. Install fire rated doors only in corresponding fire rated frames.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

C. Delivery:

1. General: Pack and protect doors against damage during shipment and storage. Do not use packing materials that will stain or discolor door surface.

2. Storage: Per WIC Technical Bulletin No. 420-R for flush doors and No. 416-R for fire rated doors. Store materials under cover, in heated rooms and protected from damage, including exposure to excess humidity.

3.3 INSTALLATION

A. General: Install in strict conformance with NFPA Pamphlet No. 80 “installation of Fir Doors”, other referenced standards, the manufacturer’s written directions, as shown, and as herein specified. Make manufacturer’s instructions available to the inspecting authorities.

B. Tolerances:

1. General: Maximum distortion measured with straight edge or taught string, corner to corner, over an imaginary 36 inch x 84 inch surface area.

2. Diagonal (Wrap), Vertical (Bow) and Width (Cup): 1/8 inch.

C. Hardware: Per Section 08 7111 – DOOR HARDWARE. Fit doors to specified clearances; do not trim job fitted doors more than ¼ inch from any edge.

3.4 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer’s instructions.

END OF SECTION 08 1400

ACCESS DOORS AND FRAMES
SECTION 08 3113

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Access Doors and Frames, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

C. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Labeled Door and Frames: Conform to requirements of State Fire Marshal Standard 12-7-4 and Underwriters Laboratory.

C. Design Requirements: Exterior glazed frame member designed to withstand a wind load of 24 lbs. per square foot, minimum.

D. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. National Fire Protection Association (NFPA): Standards.

3. Underwriters Laboratories Inc. (UL): Standards.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Access Doors and Panels:

1. General: Steel frame with continuous hinge, manufactured by Milcor LP

2. Alternate Manufacturers: Comparable products manufactured by J. L. Industries, or accepted equal.

3. Sizes: Minimum sizes shall be 16 inch by 16 inch for walls and 24 inch by 24 inch for ceilings, or as shown, or as required for specific equipment.

4. Materials:

   a. Door and Trim: 14 gauge cold rolled steel

   b. Return Frame: 16 gauge steel

   c. Insulation: 1-7/8 inch thick mineral wool between 22 gauge steel.

   d. Hinges: concealed continuous piano hinges to 180 degree opening.

   e. Latches: Self-latching screwdriver locks.

3. Walls: Style M, with standard cam lock.

C. Fasteners: As recommended by manufacturer.

D. Primer: Rust inhibiting as recommended by the manufacturer.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS.

3.2 PREPARATION

A. Examination: Examine conditions of work in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Access Panels: Locate access doors as required for access to and operation of mechanical and electrical devices, and as required to comply with all applicable codes regarding access to required conditions, valves, and related items that are concealed; see also Division 15 – MECHANICAL and Division 16 – ELECTRCAL.

3.4 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.5 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instructions.

END OF SECTION 08 3113

ALUMINUM FRAMED ENTRANCES AND STOREFRONTS
SECTION 08 4113

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Aluminum Entrance, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS

B. Shop Drawings: Furnish shop drawings for each system showing layout and installation details, including relationship to adjacent work, elevations, detail sections of typical members, anchors, reinforcement, hardware mounting, provisions for expansion and contraction, and glazing details.

C. Samples: Submit samples if specifically requested.

D. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

E. Certification: Storefront shall bear a permanently installed "AAMA Prime and Replacement Label" bearing the manufacturer's name, product series number, grade and class designations. Do not install label in exposed location.

F. Closeout:

1. General: Refer to GENERAL CONDITIONS

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: Provide in required form for a period of three (3) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. Aluminum Association (AA): Standards

3 Aluminum Anodizers Council (AAC): Standards

4. Architectural Aluminum Manufacturer's Association (AAMA):

a. General: Metal Curtainwall, Window, Store Front and Entrance Guide

b. SFM-1: Aluminum Storefront and Entrance Manual

c. AAMA 501 and 503: Standards for field testing storefront systems.

5. American Society of Testing Materials (ASTM): Materials and testing standards as identified throughout this Section.

6. Door Hardware Institute (DHI): Installation Builder's Hardware.

7. National Fire Protection Association (NFPA):

   a. NFPA 80: Fire Doors and Windows

   b. NFPA 252: Fire Tests for Door Assemblies

8. Tempered Glass and Safety Glazing: Comply with United States Consumer Product Safety Commissions' "Safety Standards for Architectural Glazing Materials" (16 CFR part 1201) category I or II, as applicable; CBC Standard 24-2 and Section 2402A and 2406.

9. American National Standards Institute (ANSI): ANSI/ASTM E330, ANSI Z97.1.

10. Flat Glass Marketing Association (FGMA): "Glazing Manual" and "Glazing Sealing Systems Manual".

11. Glass Association of North America (GANA): "Engineering Standards Manual" and "Glazing Manual".

12. Insulating Glass Certification Council (IGCC): Rating standards

13. Sealed Insulated Glass Manufacturers Association (SIGMA): SIGMA No. 64-7-2 Specification for Sealed Insulating Glass Units.

C. Design Requirements: Aluminum frame members must span vertically to withstand 25 psf wind load, minimum, per CBC; provide internal reinforcing as required; maximum deflection of L/175 of clear span or maximum of ¾ inch.

D. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience; manufacturer approved.

PART 2- PRODUCTS

2.1 MANUFACTURER

A. Manufacturer:

1. Basis of Design is Oldcastle Building Envelope Architectural Glazing Systems.

2. Alternate Manufacturers: Comparable products manufactured by Kawneer Co., Inc., or accepted equal.

2.2 MATERIALS

A. Aluminum:

1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

B. Internal Reinforcing:

1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.

2. Shapes and sizes to suit installation.

3. Steel components factory coated with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:

1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

2. Hot-dip galvanize steel assemblies after fabrication, comply with ASTM A123, 2.0 ounce minimum coating.

D. Fasteners:

1. Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.

2. Provide concealed fasteners wherever possible.

3. For exposed locations, provide Phillips flathead screws with finish matching item fastened.

4. For concealed locations, provide manufacturer's standard fasteners.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

1. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

2. Touch-Up Primer for Galvanized Components: Zinc oxide conforming with FS TT-P-641.

F. Glazing Gaskets:

1. Compression type design, replaceable, molded or extruded, of neoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).

2. Profile and hardness as required to maintain uniform pressure for watertight seal.

G. Weatherstripping:

1. Wool pile conforming to AAMA 701.2.

2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

H. Finish:

1. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

2. Bronze anodized to match existing system

2.3 COMPONENTS

A. Storefront Framing Systems: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile to match existing system. Include subframes and other reinforcing members as required. Provide for glazing placement in storefront from the exterior on all

sides without projecting stops to match existing. Shop-fabricate and pre-assemble frame components where possible. Provide storefront frame sections without exposed seams.

1. Mullion Configuration: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.

2. No exposed weep holes are permitted

B. Stile-and-Rail Type Entrance Doors: Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds.

1. Glazing: Fabricate doors to facilitate replacement of glass or aluminum panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.
2. Design: 1-3/4-inch thick, stile and rail dimensions as indicated.
3. Each door leaf shall be equipped with an adjusting mechanism located in the top rail near the lock stile, which provides for minor clearance adjustments after installation
4. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
5. Door Design: Medium stile width; 4 1/2 inch, per door schedule.
6. Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.
7. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets. Provide nonremovable glazing stops on outside of door.
8. Hardware: As specified in Division 8 Section "Door Hardware."
9. Weather Stripping: Manufacturer's standard replaceable components. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
10. Reinforcement: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
11. Fasteners: Conceal wherever possible

C. Glass:

a. General: Per section 08 8000 GLAZING

b. Match existing glazing system and color

PART 3- EXECUTION

3.1 PREPARATION

A. Environmental Requirements: Do not install sealants when temperature is less than 40 degrees F.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Measurements: Take field measurements; report variance between plan and field dimensions.

D. Protection: Protect pre-finished components with wrapping or strippable coating; adhesive papers and sprayed coatings are not acceptable.

3.2 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines. Provide proper support and anchor securely in place

C. Installation Tolerances:

1. Variation from Plane: Do not exceed 1/8-inch in 12-feet of length or 1/4-inch in any total length.

2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end-to-end in line shall not exceed 1/16-inch.

3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8-inch.

4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32-inch.

D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

1. Paint dissimilar metals where drainage from them passes over aluminum.

2. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali-resistant coating.

3. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subjected to wetting, with 2-coats of aluminum house paint. Seal joints between the materials with sealant.

E. Drill and tap frames and doors and apply surface-mounted hardware in compliance with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

F. Set sill members and other members in bed of sealant, or use joint fillers or gaskets to provide weathertight construction. Comply with requirements of Section 07 9200.

G. Where flashings are indicated adjacent to work specified in this Section, provide flashings in 0.040-inch aluminum, finished to match entrances and storefronts.

H. Glazing:

1. General: As specified under Section 08 8000 –GLAZING.

2. Glazing Stops: Anchor Glass holding assemblies with frame clips and machine screws.

I. Doors:

1. General: Hang doors level, plumb, straight in vertical plane, with proper fit and alignment and moving parts operating freely without bind.

2. Weatherstripping: Seal doors, meeting stiles of pair doors, door tubing, and stops on frames and astragals.

3. Thresholds: Set in bed of sealant and secure.

4. Hardware: Install per manufacturer's instructions.

J. Dissimilar Materials: Isolate from other materials, plaster or concrete.

K. Sealant: Install per Section 07901 – JOINT SEALERS.

3.3 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.4 CLEANING

A. General: Upon completion, remove labels and thoroughly clean glass surfaces.

B. Aluminum: Remove protective covering per manufacturer's instructions. Clean aluminum surfaces of stains, marks, or other defects, using soap and clean water.

END OF SECTON 08 4113

DOOR HARDWARE
SECTION 087100

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 commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 05 Section " Cold-Formed Metal Framing
3. Division 06 Section "Rough Carpentry".
4. Division 08 Section " Interior Aluminum Frames
5. Division 08 Section "Wood Doors".
6. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
7. Division 26 Section "Electrical"

D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. California Building Code: Provide hardware that complies with CBC Section 11B.

1. All openings as a part of an accessible route shall comply with CBC Section 11B-404.
2. The clear opening width for a door shall be 32" minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. CBC Section 11B-404.2.3.
3. Operable hardware on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.
4. Hardware (including panic hardware) shall not be provided with "nightlatch" function for any accessible doors or gates unless the following conditions are met:

    a. Such hardware has a 'dogging' feature and is dogged during the time the facility is open.
    b. All 'dogging' operation is performed only by employees as their job function (non-public use).

5. The force for pushing or pulling open a door shall be in accordance with CBC Section 11B-404.2.9.

    a. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
    b. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.
    c. The 5 pound (22.2 N) maximum force shall be validated for the size of the door used. The Building Materials Listing of the California State Fire Marshal shall indicate that the door hardware meets the 5 pound (22.2 N) force and shall also list the largest door that can be used.

6. Door closing speed shall comply with CBC Section 11B-404.2.8. Closers shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
7. Floor stops shall not be located in the path of travel and 4" maximum from walls.
8. Thresholds shall comply with CBC Section 11B-404.2.5.

G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.

3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
   b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

    a. Rockwood (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Rockwood (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 8200 Series.

2.8 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 10X Line.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds

of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

    a. HES (HS) - 1500/1600 Series.

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

    a. HES (HS) - 9400/9500/9600/9700/9800 Series.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
c. No catch points: addition of applied deflectors or other added components are not allowed.
d. No visible plastic.
e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
f. Constructed of all stainless steel.
g. Stainless steel pullman type latch with deadlock feature.
h. Narrow or wide style exterior trim as specified in the hardware sets.
i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
j. Ten-year limited warranty for mechanical features.

2. Manufacturers:

a. Sargent Manufacturing (SA) - PE80 Series.

C. Conventional Push Rail Exit Devices, Aluminum Entrances: ANSI/BHMA A156.3, Grade 1 panic devices furnished in the functions specified in the Hardware Sets. Push bar to be made of extruded aluminum, maximum projection of 3”, available in clad or anodized architectural finishes. Exit device design to fit narrow (minimum 2"), medium, or wide stile aluminum door applications.

1. Manufacturers:

a. Adams Rite Manufacturing (AD) - 8000 Series.

2.12 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are

indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:

   a. Norton Rixson (NO) - 8500 Series.
   b. Sargent Manufacturing (SA) - 1431 Series.

2.13 ELECTROMECHANICAL DOOR OPERATORS

A. Electromechanical Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 250 pounds and 48" wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48" wide. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide operators with features as follows:

   a. Non-handed with push and pull side mounting.
   b. Activation by push button, hands-free or radio frequency devices.
   c. Adjustable opening force and closing power.
   d. Two-year limited warranty.
   e. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
      1) Simple setup with no app required.
      2) View status and make adjustments without removing the cover.
      3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
   f. Mounting backplate to simplify and speed up installation.
   g. Integration with access control systems.

2. Operators shall have the following functionality:

   a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
   b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.

c. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
d. Infinite Hold Open: Door will hold open at set position until power is turned off.
e. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
f. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
g. Open Delay: Delays operator opening for locking hardware.
h. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
i. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
j. Power Close: Additional force to assist door closing between 7° and 2°.
k. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
l. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
m. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
n. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
o. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.

3. Manufacturers:

a. Norton Rixson (NO) - 6300 Series.

2.14 DOOR STOPS AND HOLDERS

A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

B. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (NO).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.16 BOLLARDS AND PEDESTALS

A. Bollards, pedestals, housings, and accessories used to contain access control devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide products with functions and features as follows:

a. Compliant with the Americans with Disabilities Act (ADA) and all local building codes and standards.
b. All seams and edges continuously welded and closed to prevent water intrusion.
c. Removable panels for access to areas that require mounting, wire pass, and otherwise inaccessible areas.
d. Tapered weather shroud on housings.
e. Removable access door gasketed using EPDM rubber seals or equivalent.
f. Stainless steel hinges.
g. Powder coat or hot dipped galvanized with stainless steel or polycarbonate finish as specified.

2. Manufacturers:

a. Pedestal PRO (PP).
b. No Substitution.

2.17 ELECTRONIC ACCESSORIES

A. Request to Exit Motion Sensor: Passive infrared request to exit (REX) motion sensor designed for detecting exiting through a door from the secure area to a non-secure area.

1. Provide devices with functions and features as follows:

   a. Adjustable infrared beam and relock time.
   b. UL listed.
   c. 12VDC or 24VDC power.
   d. Single pole, double throw (SPDT) switch.

2. Manufacturers:

   a. Alarm Controls (AK) - SREX Series.
   b. Securitron (SU) - XMS2 Series.

B. Linear Power Supplies: Filtered and regulated power for electrified hardware. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide power supplies with functions and features as follows:

   a. 120VAC input with selectable output at 12VDC (6 amp) or 24VDC (3 amp).
   b. Internal back-up battery (batteries not included) charging circuit.
   c. Regulated and filtered, fuse protected outputs.
   d. Each output can be individually turned on and off via a jumper.
   e. Power status of each output is shown by an LED.
   f. Fire alarm interface; dry contacts NO/NC, 9-33VDC, 3-15mA.

2. Manufacturers:

   a. Sargent (SA) - LSP Series.

C. Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

   a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
   b. Tolerates brownout or overvoltage input ± 15% of nominal voltage.
   c. Thermal shutdown protection with auto restart.
   d. Circuit breaker protection against overcurrent and reverse battery faults.
   e. Integrated battery charging circuit to prevent overvoltage on locking devices.
   f. Available with a single relay fire trigger or individually triggered relayed outputs.
   g. Monitoring options as specified.

2. Manufacturers:

   a. Securitron (SU) - AQD Series.

2.18 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 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.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. OT - Other
3. PE - Pemko
4. RO - Rockwood
5. SA - SARGENT
6. AD - Adams Rite
7. HS - HES
8. NO - Norton Rixson
9. PP - Pedestal PRO
10. SU - Securitron

Hardware Sets

Set: 1

Doors: 1

2	Continuous Hinge	DFM_SLF-HD1 EL-CEPTx10B		PE	ϟ
2	Concealed Vert Rod Exit	8600 MLR M CA ELX	313	AD	ϟ
1	Cylinder Escutcheon	8650	121	AD	
1	Cylinder	Key to Match New System		OT	

2	Pull	RM201 Mtg-Type 12XHD	10BE	RO
1	Gasket	By Door Manufacturer		
2	Frame Harness	QC-C__x (length as required)		MK
2	Door Harness	QC-C__x (length as required)		MK
1	Power Supply	PS-EXIT		AD
1	Card Reader	By Security Contractor		
1	Balance of Hardware	Existing to Remain		OT

Notes: Presenting authorized credential to reader on wall retracts latchbolts on both panics allowing doors to be pulled open.
REX switch in panic rails signals access control system of authorized egress.
Free egress at all times via exit device.
During loss of power, door remains locked.

Set: 2

Doors: 2A

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Passage Latch	10XU15 LL	BSP	SA
1	Surface Closer	8501	BSP	NO
1	Kickplate	K1050 10" High CSK	BSP	RO
1	Door Stop	471 EXP	BSP	RO
1	Gasket	By Frame Manufacturer		OT

Set: 3A

Doors: 2B, 5

1	Cylinder	Key to Match New System		OT
2	Pull	RM201 Mtg-Type 12XHD	10BE	RO
1	Balance of Hardware	Existing to Remain		OT

Set: 3B

Doors: 4

1	Cylinder	Key to Match New System		OT
1	Balance of Hardware	Existing to Remain		OT

Set: 4

Doors: 6, 9

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Entry Lock	10XG24 LL	BSP	SA
1	Wall Stop	403	BSP	RO
1	Gasket	By Frame Manufacturer		OT

Set: 5

Doors: 7, 8

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Pull Plate	107x70C	BSP	RO
1	Push Plate	70C-RKW	BSP	RO
1	Surface Closer	8501	BSP	NO
1	Kickplate	K1050 10" High CSK	BSP	RO
1	Wall Stop	403	BSP	RO
1	Gasket	By Frame Manufacturer		OT

Set: 6

Doors: 10

6	Hinge, Full Mortise	TA2714	BSP	MK
2	Roller Latch	594	BSP	RO
2	Dummy Trim	10XU94-2 LL	BSP	SA
2	Door Stop	471 EXP	BSP	RO
2	Astragal	29324BSPNB		PE
1	Gasket	By Frame Manufacturer		OT

Set: 7

Doors: 11, 12

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Privacy Lock	LB V21 8265 LNL	BSP	SA
1	Wall Stop	403	BSP	RO
1	Gasket	By Frame Manufacturer		OT

Set: 8

Doors: 13A, 13B

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Storeroom Lock	10XG04 LL	BSP	SA
1	Electric Strike	1500C	BSP	HS

1	ElectroLynx Adaptor	2004M		HS	ϟ
1	SMART Pac Bridge Rectifier	2005M3		HS	ϟ
1	Surface Closer	8501	BSP	NO	
1	Kickplate	K1050 10" High CSK	BSP	RO	
1	Door Stop	471 EXP	BSP	RO	
3	Silencer	608		RO	
1	Frame Harness	QC-C__x (length as required)		MK	ϟ
1	Motion Sensor (REX)	XMS2		SU	ϟ
1	Power Supply	AQDx (size as reqd)		SU	ϟ
1	Card Reader	By Security Contractor			

Notes: Presenting authorized credential to reader on wall releases electric strike allowing door to be opened.
Motion sensor switch signals access control system of authorized egress.
Free egress at all times via inside lever.
During loss of power, door remains locked.

Set: 9

Doors: 14A, 15A, 16A

3	Hinge, Full Mortise	TA2714	BSP	MK
1	Passage Latch	10XU15 LL	BSP	SA
1	Concealed Overhead Stop	2-x36	BSP	NO
1	Wall Stop	403 @ door 16A	BSP	RO
1	Gasket	By Frame Manufacturer		OT

Set: 10

Doors: 14B, 15B, 16B

1	Sliding Door System	AD Systems Access Control Package		OT
2	Card Reader	By Security Contractor		

Set: 11

Doors: 17A, 21

3	Hinge, Full Mortise	TA2714	BSP	MK	
1	Storeroom Lock	10XG04 LL	BSP	SA	
1	Electric Strike	1500C	BSP	HS	ϟ
1	ElectroLynx Adaptor	2004M		HS	ϟ
1	SMART Pac Bridge Rectifier	2005M3		HS	ϟ

1	Surface Closer	8501	BSP	NO	
1	Kickplate	K1050 10" High CSK	BSP	RO	
1	Wall Stop	403	BSP	RO	
1	Gasket	By Frame Manufacturer		OT	
1	Frame Harness	QC-C__x (length as required)		MK	ϟ
1	Motion Sensor (REX)	XMS2		SU	ϟ
1	Power Supply	AQDx (size as reqd)		SU	ϟ
1	Card Reader	By Security Contractor			

Notes: Presenting authorized credential to reader on wall releases electric strike allowing door to be opened.
Motion sensor switch signals access control system of authorized egress.
Free egress at all times via inside lever.
During loss of power, door remains locked.

Set: 12

Doors: 17B

1	Continuous Hinge	DFM_SLF-HD1		PE	
1	Rim Exit Device	8800 C CA	313	AD	
1	Cylinder Escutcheon	8650	121	AD	
1	Cylinder	Key to Match New System		OT	
1	Pull	RM201 Mtg-Type 12XHD	10BE	RO	
1	Surface Closer	PR8501	613E	NO	
1	Door Stop	471 EXP	10BE	RO	
1	Gasket	By Door Manufacturer			
1	Sweep	315-10BE-N		PE	
1	Threshold	Per Detail x 10BE x FHSL14		PE	

Set: 13

Doors: 20

1	Electric Strike	1500C	BSP	HS	ϟ
1	ElectroLynx Adaptor	2004M		HS	ϟ
1	SMART Pac Bridge Rectifier	2005M3		HS	ϟ
1	Frame Harness	QC-C__x (length as required)		MK	ϟ
1	Motion Sensor (REX)	XMS2		SU	ϟ
1	Power Supply	AQDx (size as reqd)		SU	ϟ
1	Card Reader	By Security Contractor			
1	Balance of Hardware	Existing to Remain		OT	

Notes: Presenting authorized credential to reader on wall releases electric strike allowing door to be opened.
Motion sensor switch signals access control system of authorized egress.
Free egress at all times via inside lever.
During loss of power, door remains locked.

Set: 14

Doors: 18, 19

3	Hinge, Full Mortise	TA2714		BSP	MK
1	Storeroom Lock	10XG04 LL		BSP	SA
1	Wall Stop	403		BSP	RO
1	Gasket	By Frame Manufacturer			OT

Set: 15

Doors: 22

3	Hinge, Full Mortise	TA2714		BSP	MK
1	Storeroom Lock	10XG04 LL		BSP	SA
1	Wall Stop	403		BSP	RO
1	Gasket	By Frame Manufacturer			OT

Set: 16

Doors: 23, 24

3	Hinge, Full Mortise	TA2714		BSP	MK
1	Privacy Lock	LB V21 8265 LNL		BSP	SA
1	Surface Closer	8501		BSP	NO
1	Kickplate	K1050 10" High CSK		BSP	RO
1	Wall Stop	403		BSP	RO
1	Gasket	By Frame Manufacturer			OT

Set: 17

Doors: 25

2	Continuous Hinge	DFM_SLF-HD1 EL-CEPTx10B		PE	ϟ
2	Concealed Vert Rod Exit	8600 MLR M CA ELX	313	AD	ϟ
1	Cylinder Escutcheon	8650	121	AD	
1	Cylinder	Match New Facility Standard		OT	

2	Pull	RM201 Mtg-Type 12XHD	10BE	RO	
1	Automatic Opener	6331	690	NO	ϟ
2	Door Stop	471 EXP	10BE	RO	
1	Gasket	By Door Manufacturer			
2	Sweep	315-10BE-N		PE	
2	Frame Harness	QC-C__x (length as required)		MK	ϟ
2	Door Harness	QC-C__x (length as required)		MK	ϟ
1	Pedestal / Bollard	ADA-SS-TWR-47x4x6		PP	
4	Auto Door Push Plate	502		NO	ϟ
1	Power Supply	PS-EXIT		AD	ϟ
1	Card Reader	By Security Contractor			
1	Balance of Hardware	Existing to Remain		OT	

Notes: Presenting authorized credential to reader on wall retracts latchbolts on both panics allowing doors to be pulled open.
Authorized card swipe also allows auto operator switches to be used on exterior side. Interior switches always activated.
REX switch in panic rails signals access control system of authorized egress.
Free egress at all times via exit device.
During loss of power, door remains locked.
Card reader / actuator switch integration required – by Security Contractor.

Set: 18

Doors: 26A

3	Hinge, Full Mortise	TA2714	BSP	MK	
1	Storeroom Lock	10XG04 LL	BSP	SA	
1	Electric Strike	1500C	BSP	HS	ϟ
1	ElectroLynx Adaptor	2004M		HS	ϟ
1	SMART Pac Bridge Rectifier	2005M3		HS	ϟ
1	Surface Closer	8501	BSP	NO	
1	Kickplate	K1050 10" High CSK	BSP	RO	
1	Wall Stop	403	BSP	RO	
1	Gasket	By Frame Manufacturer		OT	
1	Frame Harness	QC-C__x (length as required)		MK	ϟ
1	Motion Sensor (REX)	XMS2		SU	ϟ
1	Power Supply	AQDx (size as reqd)		SU	ϟ
1	Card Reader	By Security Contractor			
1	Remote Release	By Security Contractor		OT	

Set: 19

Doors: 26B

3	Hinge, Full Mortise	TA2714	BSP	MK	
1	Institutional Lock	10XG17 LL	BSP	SA	
1	Electric Strike	1500C	BSP	HS	⚡
1	ElectroLynx Adaptor	2004M		HS	⚡
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Surface Closer	8501	BSP	NO	
1	Kickplate	K1050 10" High CSK	BSP	RO	
1	Wall Stop	403	BSP	RO	
1	Gasket	By Frame Manufacturer		OT	
1	Frame Harness	QC-C__x (length as required)		MK	⚡
1	Power Supply	AQDx (size as reqd)		SU	⚡
2	Card Reader	By Security Contractor			
1	Remote Release	By Security Contractor		OT	

Notes: Card reader both sides of door - no free egress from this door.

Set: 20

Doors: 27

3	Hinge (heavy weight)	T4A3786	BSP	MK	
1	Rim Exit Device	5CH LD PE8806 WEL	BSP	SA	
1	Electric Strike	9600	BSP	HS	⚡
1	ElectroLynx Adaptor	2004M		HS	⚡
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Automatic Opener	6331	BSP	NO	⚡
1	Kickplate	K1050 10" High CSK	BSP	RO	
1	Wall Stop	403	BSP	RO	
1	Gasket	By Frame Manufacturer		OT	
1	Frame Harness	QC-C__x (length as required)		MK	⚡
1	Auto Door Push Plate	502		NO	⚡
1	Motion Sensor (REX)	XMS2		SU	⚡
1	Power Supply	AQDx (size as reqd)		SU	⚡
1	Card Reader	By Security Contractor			
1	Remote Release	By Security Contractor		OT	

Notes: Presenting authorized credential to reader on wall releases electric strike allowing door to be opened.
Motion sensor switch signals access control system of authorized egress.
Free egress at all times via exit device.
During loss of power, door remains locked.

Set: 21

Doors: GATE

1	Gate Hinge / Closer	Locinox Mammoth 180		OT
1	Rim Exit Device	5CH PE8813 WEL	US32D	SA

END OF SECTION 087100

GLAZING
SECTION 08 8000

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Glass and Glazing, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Shop Drawings: Submit list of materials proposed for use; identify each glazing condition.

C. Samples: If specifically requested.

D. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

E. Certificates: Certify that products installed comply with U.S. Consumer Product Safety Commission Standards, or show that standards do not apply.

F. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee:

a. General: Provide in required form for stated period from date of final acceptance by Owner.

b. Float Glass: Per requirements of ASTM C1036 and ASTM C1048.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. American National Standards Institute (ANSI):

a. ANSI Z97.1: Safety Performance Specifications and Methods of Test or Safety Glazing Used in Buildings.

3. Flat Glass Marketing Association (FGMA): "Glazing Manual" and "Glazing Sealing Systems Manual".

4. Glass Association of North America (GANA): "Engineering Standards Manual" and "Glazing Manual".

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Manufacture:

1. General: Manufactured by Vitro Architectural Glass, Guardian Industries, AFGD Glass, Pilkington Glass Ltd, or approved equal

3. Tempered Glass and Safety Glazing: Comply with United States Consumer Product Safety Commission's "Safety Standards for Architectural Glazing Materials" (16 CFR part 1201) category I or II, as applicable; CBC Standard 24-2 and Section 240A and 2406.

C. Flat Glass:

1. Interior Glazing

a. General: Clear 1/4 inch thick unless otherwise indicated; size as shown.

b. Float Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, quality q3 glazing select.

c. Tempered Glass: ASTM C1048, fully tempered with horizontal tempering; ¼ inch thick.

d. At U-channels: 3/8", verify and coordinate for channel and glazing installation tolerances

2. Exterior Glazing: Match existing glazing type and installation

D. Glazing Materials:

1. General: Factory mixed materials recommended by glass manufacturer for each glazing condition. Provide glazing and bedding putties to match color of frame sealants, tapes, and other materials necessary to perform glazing work. Provide setting blocks, shims, compression seals, felt and neoprene or vinyl glazing channels as required.

2. Butyl Glazing Tape

a. General: As manufactured by 3M Building Materials, or approved equal.

3. Manufacturer's Glazing Vinyl: Manufactured by aluminum frame manufacture as specified in Section 08 1216 and 08 4113

E. Accessories:

1. General: Materials recommended by glass or glazing material manufacturer.

2. Setting Blocks and Spacers: Neoprene chemically compatible with specified sealants.

3. Glazing Points and Spring Wire Clips: Corrosion resistant.

4. Filler Rod: Compressible synthetic rubber or foam.

5. Prime-Sealers and Cleaners: As recommended by glass manufacturer.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS

3.2 PREPARATION

A. Environmental Requirements: Glaze in dry conditions; minimum temperature 40 degrees F during and 48 hours after installation of glazing compounds.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Measurements: Take field measurements; report variance between plan and field dimensions.

D. Delivery: Deliver with manufacture's labels intact; do not remove until completion of final inspection.

E. Protection: Protect glass from damage until occupancy of building; replace glass damaged or broken before final acceptance.

F. Surface Preparation: Clean contact surfaces with solvent and wipe dry. Seal porous glazing channels or recesses with material compatible with sealer. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Glass:

1. Dimensions: As shown; tolerances as recommended by manufacturer.

2. Edges: Per referenced standards; nipped edges, or edges treated with abrasives, not acceptable.

C. Glazing:

1. General: Use glass as shown; glaze with glazing compound or glazing gaskets as required.

2. Float Glass: Type and thickness, as shown.

3. Tempered Glass: Type and thickness, as shown.

3.4 CLEANING

A. General: At the completion of work remove surplus materials, rubbish, debris, and thoroughly clean exposed surfaces per manufacturer's instructions.

END OF SECTION 08 8000

ARCHITECTURAL WINDOW FILMS
SECTION 08 8700

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Interior Window Film as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Shop Drawings: Submit drawings showing the locations and configuration of each application; identify each glazing condition.

C. Samples: Provide (3) samples 4” x4” of each material specified

D. Product Data: Submit manufacturer’s specifications, data, and installation instructions for review.

F. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer’s instructions.

3. Warranty

a. General: Submit manufacturer’s warranty

1.3 REFERENCES

A. ASTM International (ASTM) 1. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres. 2. ASTM E 3

1.5 QUALITY ASSURANCE

A. Obtain all products in this section from a single Manufacturer with a minimum of 10 years’ experience.

B. Installer: Installation shall be performed by a trained and qualified installer, specialized and experienced in work required for this project.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Manufacture:

1. Unique Film 26; manufactured by Designed Film, SKU DF-UF26-60_50; https://designedfilm.com/collections/unique-films/products/unique-film-26?variant=17889109344327

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrate(s) for compliance. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Refer to the manufacturer's Technical Data Sheet to determine compatibility of finish to substrate.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

D. Responsibility for state of surfaces prior to installation to be pre-determined by installation specialist.

F. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 SURFACE PREPARATION

A. Comply with all manufacturer's instructions for surface preparation.

B. Thoroughly clean substrate of substances that could impair the overlay's bond, including mold, mildew, oil, grease.

C. Re-clean surfaces with appropriate surface prep solvent and remove any haze or surface contamination.

3.3 APPLICATION

A. Application must be performed by qualified installer.

B. Do not proceed with installation until all finishing work has been completed in and around the work area.

C. Verify pattern prior to material acquisition.

D. Comply with manufacturer's installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

E. Install substrates with no gaps or overlaps. Form smooth, wrinkle-free, bubble-free surface for finished installation.

F. Remove air bubbles, wrinkles, blisters and other defects. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.

G. Refer to the manufacturer's Installation Guide for additional details.

3.4 CLEANING AND PROTECTION

A. Use cleaning methods recommended by architectural surfacing manufacturer for applicable environment.

B. Protect completed glass finish during remainder of construction period.

END OF SECTION 08 8700

BALLISTIC RESISTANT WINDOW SYSTEM
SECTION 08 8856

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ballistic resistant window system and accessories

1.2 RELATED SECTIONS

A. Section 09 2900 “Gypsum Board”

B. Section 06 4023 “ Interior Architectural Woodwork”

C. Section 06 6500 “Solid Surfacing”

1.3 SUBMITTALS

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

B. Shop Drawings: Show dimensioned plans and elevations, large-scale details, attachments, and other components.
   1. Show locations and sizes of furring and blocking, including concealed blocking and reinforcement specified in other Sections.
   2. Show Owner’s salvaged components
   3. Show cuts and modifications to Owner’s salvaged components

C. Samples for Initial Selection:
   1. Glazing materials, 2 inch by 2 inch
   2. Frames, 6 inch long section

1.4 REFERENCES

A. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

B. ASTM B 209/B 209M Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

C. NIJ Standard 0108.01 (National Institute of Justice) Standard for Ballistic Resistant Protective Materials

D. Underwriters Laboratories: UL 752 Standard for Bullet Resisting Equipment

1.5 PERFORMANCE REQUIREMENTS

A. Design, fabricate and install all partition materials specified in this section to meet of exceed the requirements of UL 752.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience in providing ballistic resistant baffle window systems.

B. Installer Qualifications: All products listed in this section shall be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as those specified.

1.7 WARRANTY

A. At project closeout, provide an executed cop of the manufacturer's standard limited warranty against manufacturing defects in which manufacturer agrees to repair or replace components of ballistic resistant baffle window system that fail in materials or workmanship within specified warranty period. Submit ballistic resistant baffle window system installer's warranty, , signed by Installer, covering the Work of this Section, including all components of ballistic resistant baffle window system such as glazing, supports and attachments, for the following warranty period:

B. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Basis of Design: Total Security Solutions, 3705 Seaport Blvd, West Sacramento, CA 95691, www.tssbulletproof.com, (916) 507-2324

2. Products demonstrated to be equal will be accepted.

2.2 COMPONENTS

A. Glazing: Bullet Resistant Glazing
   1. Match the existing system. Confirm the following:
   2. Glazing Type: Laminated acrylic/polycarbonate composite.
   3. Rating: UL 752 Level 3.
   4. Glazing Thickness: 1-1/4 inch (32mm)
   5. Configuration as shown
   6. Transparent panels within a vertical baffle system. Provide a transparent backer that overlaps the cash tray by three inches, and sets back two inches, and extends to match the transparent panels.

B. Aluminum Sections: extruded aluminum alloy 6063 T5 manufactured in accordance with ASTM B209, with clear anodized finish.
   1. Glazing Channel: U-channel specifically designed for securing transparencies tightly in place. Provide angles and stops for attachments.

2.3 SYSTEM

A. Custom fabricated bullet resistant panels with secure air passage as required for voice transmission. Prefabricate panels to fit opening, with all necessary components, hardware and accessories for a complete installation.
   1. System Type: Vertical Baffle System
   2. Cash Tray: Owner's salvaged cash trays
   3. Natural Voice Transmission Speaker Port: Provide new speaker port to match the Owner's salvaged speaker port

2.4 OPAQUE ARMOR

A. Bullet resistant fiberglass armor tested and approved to meet U.L. 752 for level 3 protection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been installed.

B. Verify owner's salvaged components

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by the manufacturer.

3.3 FABRICATION

A. Cut and modify Owner's salvaged components

B. Provide new components as required to provide a complete installation as shown on the drawings.

3.4 INSTALLATION

A. Install in accordance with manufacturer's instructions

B. Install level and plumb.

3.5 PROTECTION

A. Protect installation until completion of Substantial Completion.

B. Touch-up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION 08 8856

CEMENT PLASTERING
SECTION 09 2400

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Lath and Plaster, as shown and specified per Contract documents.

1.2 QUALITY REQUIREMENTS

A. Reference Standards:

1. American Society of Testing Materials (ASTM): Materials and testing standards as identified throughout this Section.

2. Portland Cement Association (PCA): Plaster (Stucco) Manual.

3. Stucco Manufacturing Association (SMA): Color standards.

4. Western Lath, Plaster and Drywall Industries Association (WLDIA): Reference Specifications.

B. Requirements of Regulatory Agencies: Install stucco assembly to comply with all applicable codes and standards and with requirements of local agencies having jurisdiction.

C. Manufacturer: Manufacturer shall have marketed stucco products in the United States for at least ten years, and shall have completed projects of the same building size and type as this project.

D. Applicator Qualifications: Applicator shall have experience specializing in the installation of exterior stucco assembly, and shall have a minimum of five years experience in work similar to that required by this section.

E. Single Source Responsibility: All stucco basecoat and finish materials shall be from a single manufacturing source.

1.3 PRODUCT DELIVERY, SOTRAGE AND HANDLING

A. Deliver manufactured materials in original packages or containers, with manufacturer's label intact and legible.

B. Keep materials dry, above freezing, stored off ground, under cover and away from damp surfaces. At the time they are mixed, all materials shall be at a minimum temperature of 40 degrees F.

C. Remove wet, frozen, damaged or detrimental materials from the site immediately.

PART 2- PRODUCTS

2.1 MATERIALS

A. Backing Paper: Two layers of No. 15 (ASTM D 226-97a) WVP Grade D paper over all sheathing substrates

B. Lath:

1. General: Conform to CBC Table 25A-B for lath types, weights, attachments and support spacing, except where otherwise noted.

2. Wire Mesh Reinforcement: Woven wire mesh; 1-1/2 inches x 1-1/2 inches x 17 gage galvanized.

3. Lathing Accessories:

a. Fasteners:

1. Nails:

a) General: Common wire nails.

b) Furring: Galvanized 12 gage, diamond point, with 1 inch cap, 3/8" furring device, and sufficient length for minimum ¾ penetration into vertical wood framing and 1 inch penetration into horizontal wood framing.

2. Hook Staples: ½ inch wide x 1-1/2 inches long, No. 9 gage ring shank, hook staple.

3. Tie Wire: 18 gage galvanized annealed steel.

b. Screeds:

1. General: Weep screed; size for three coat cement plaster system; galvanized steel or zinc alloy for exterior use. Manufacturers: Keene, ClarkDietrich, AMICO, or approved equal

C. Cement Plaster:

1. General

a. Scratch and Brown Coats: LaHabra factory-blended scratch and brown basecoat assembly, or approved equal.

b. Finish Coat: LaHabra factory blended colored stucco finish coat, or approved equal. Color shall be selected by Agency Project Manager.

2. Cement: ASTM C150, Type I, Portland.

3. Lime: ASTM C207, Type S.

4. Aggregate: Sand per ASTM C897.

5. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

2.2 MIXES

A. General: Per CBC Tables 25A-F. Mix only as much plaster as can be used prior to initial set. Combine materials dry, to uniform color and consistency, before adding water. Protect mixtures from freezing, frost, contamination, and evaporation. Do not retemper mixes after initial set has occurred.

B. Cement Plaster:

1. General: Mix and proportion cement plaster per ASTM C926, Type C and per PCA Plaster (Stucco) Manual.

2. Scratch and Brown Coat: One (1) part cement, minimum 3-1/2 and maximum 4 parts aggregate, and minimum 15 percent and maximum 25 percent hydrate lime.

3. Finish Coat: One sack white Portland cement, 300 lbs. No. 30 white silica sand, 50 lbs. dry hydrated lime.

PART 3- EXECUTION

3.1 PREPARATION

A. Environmental Requirements: Maintain minimum temperature of materials, substrate and ambient air temperature above 50 degrees F during application and for at least 48 hours after each coat is applied. Do not apply when temperature exceeds 80 degree F, or during wet or windy weather conditions.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Measurements: Take field measurements; report variance between plan and field dimensions.

D. Protection: Protect adjacent surfaces from splattering or plaster.

E. Surface Preparation:

1. Clean surfaces to receive plaster; remove loose materials and deleterious substances which may impair work.
2. Sheathing substrates shall be sound, dry and free of dust, dirt, and other contaminants.
3. Substrate Dimensional Tolerances: Confirm that surfaces are flat with 1/4 inch (6.4 mm) within any 4-foot (1.219 m) radius to maintain a uniform thickness of basecoat material.
4. Confirm that maximum deflection of substrate assembly under positive or negative design loads shall not exceed L/360 of span.

3.2 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Rated Assemblies: Per UL and code requirements; one manufacturer for each assembly.

C. Application Method: By hand or machine; limit machine application to basecoats.

D. Plaster Thicknesses: Thickness to flush with existing adjacent surface.

E. Lath Application:

1. General: Apply taut, with long dimension perpendicular to supports. Lap ends minimum 1 inch; secure with tie wire where laps occur between supports. Lap sides minimum 1-1/2 inches.

2. Attachment: Attach metal lath to wood supports using nails at maximum 6 inches on center.

3. Grounds and Casing Beads: Apply in long lengths straight, plumb and true, where plaster adjoins other materials and at openings. Secure with wire ties at 9 inches on center.

4. Dissimilar Metals: Provide electrolytic protection with backing paper inserted and fastened between aluminum surfaces and metal lath.

5. Exterior Walls:

a. General: Apply two (2) layers of water vapor permeable (WVP) backing paper.

b. Grounds and Casing Beads: Apply continuously wherever plaster adjoins other materials, and around all openings, including electrical boxes, and all dissimilar materials.

c. Lath: At conditions where no plywood sheathing occurs, provide diamond mesh lath

F. Plaster Application:

1. Cement Plaster:

a. General: Finish surfaces smooth and even, to within tolerance of 1/8 inch in 10'-0". Three coat work, unless otherwise noted.

b. Scratch Coat: Apply to 3/8 inch thickness; fully cover and embed lath. Scratch horizontally to provide keys for brown coat. Moist-cure for 48 hours minimum, using frequent for spray. Machine application requires approval of Architect.

c. Brown Coat: Apply no sooner than 48 hours after scratch coat. Dampen scratch coat as required to provide proper suction. Apply plaster to 3/8 inch thickness; rod and float to even, true surface. Moist cure for 48 hours minimum, using frequent fog spray.

d. Finish Coat: Apply no sooner than 21 days after application of brown coat, to damp base coat surface; 1/8 inch minimum thickness. Machine application per manufacturer's directions to obtain finish matching existing adjacent surface.

3.3 FIELD QUALITY CONTROL

A. Plaster Sampling: Samples may be taken from work in place at any time. Areas represented by samples which show over-sanding or wrong aggregate proportion will be rejected.

B. Patching: Work containing cracks, blisters, pits, checks, and discoloration will not be accepted. Remove and replace with new work; defective work may be patched when permitted; patch to match existing work.

3.4 CLEANING

A. General: Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris. Remove plaster splatter promptly from other surfaces not to receive plaster.

END OF SECTION 09 2400

GYPSUM BOARD
SECTION 09 2900

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Gypsum Board, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS

B. Samples: If specifically requested.

C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

D. Closeout:

1. General: Refer to GENERAL CONDITIONS

2. Guarantee: Provide in required form for a period of two (2) years from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. American Society of Testing Materials (ASTM): Materials and testing standards as identified throughout this Section.

3. Gypsum Association (GA):

a. GA-216: Recommended Specifications for the Application and Finishing of Gypsum Board.

b. GA-600: Fire Resistance Design Manual.

4. Western Lath, Plaster and Drywall Industries Association (WLDIA): Reference Specifications.

5. Underwriters Laboratory (UL): Fire Resistance Directory and Building Material Directory.

C. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Approved Manufactures: United Stated Gypsum, CertainTeed Gypsum, Incl, Georgia Pacific, National Gypsum Company or approved equal.

C. Provide in maximum lengths and widths available that will minimum joints in each area and that correspond with support system indicated.

D. Gypsum Wallboard:

1. General: ASTM C36; taped edge where joint finish is required; 5/8 inch thickness, unless otherwise shown, long edges tapered. Provide additional thicknesses or layers to flush with existing conditions, if more or less than 5/8 inch.

2. At surfaces to be covered with wallcovering or other finish: Coated inorganic glass mat-faced back and front

3. At Public Restroom Ceilings: Mold- and Moisture-Resistant Gypsum Board: United States Gypsum "Sheetrock Mold Tough", CertainTeed Gypsum, Inc. "ProRoc Moisture and Mold Resistant with M2TECH", or approved equal non combustible, moisture- and mold-resistant gypsum core encased in moisture- and mold-resistant, 100-percent recycled face and back papers. Panels shall have a tapered long edge. Provide at restrooms.

   a. Mold Resistance: Panel score of 10 when tested in accordance with ASTM D3273

   b. Thickness: 5/8 inch thickness, unless otherwise shown.

   c. Ceiling Type: Mold- and Moisture-Resistant Gypsum Board, manufactured to have more sag resistance than regular-type gypsum board; long edges tapered, 5/8 inch thickness, unless otherwise shown.

4. At Public Restroom Wall Tile Installations: 5/8" thick DensShield Tile Backer manufactured by Georgia-Pacific, or approved equal

E. Corner Beads and Casing:

1. General: Galvanized steel, Dur-A-Bead No. 103 at exterior corners and No. 200B L-shaped casing without back flange. Use of corner trim with paper flanges shall not be allowed.

F. Joint System Materials:

1. General: ASTM C475.

2. Tape: Perf-A-Tape reinforcement.

3. Joint Compound: Brand Joint Compound – Taping.

4. Joint Finishing Compound: Brand Joint Compound – Topping.

5. Texture: Multi-purpose Texture Finish.

G. Interior Wall Sealant:

1. General: Acoustical Sealant as manufactured by Tremco, Inc.

2. Alternate Manufacturers: Comparable products manufactured by the Pecora Chemical Corp., or accepted equal.

H. Fasteners:

1. Fasteners to Wood Members:

a. General: Manufactured by the U.S. Steel Group Unit of USX Corp.

b. Alternate Manufacturers: Comparable products manufactured by the United States Gypsum Co., or accepted equal.

c. Screws: Type W drywall screws.

2.2 FINISH COAT

A. Level 5 Primer/Prep Coat: Interior high solid, vinyl acrylic latex-based coating, complying with GA-214, ASTM C-840 gypsum board finish specification, formulated to achieve a Level 5 finish over a properly prepared Level 4 joint treated gypsum panel surface, in lieu of a trowel applied skim coat.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS.

3.2 PREPARATION

A. Environmental Requirements: Do not install wallboard or joint compounds if building temperature is below 55 degrees F. Provide proper ventilation to eliminate excessive moisture from building.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Measurements: Take field measurements; report variance between plan and field dimensions.

D. Protection: Avoid exposure to weather; use protective covering. Protect from soiling and construction damage.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Rated Assemblies: Per UL and code requirements. Use only one manufacturer's products in the fabrication of each assembly, unless otherwise permitted by code.

C. Gypsum Wallboard:

1. Sheet Arrangement Layout: Install as shown; use long sheets to restrict joints to minimum.

2. Cutting and Scribing: Cut neatly to fit around outlets, switch boxes and other protrusions.

3. Joints: Butt sheets loosely together with tapered edges placed together; butt edges placed next to tapered edges are not acceptable. Sand or kerf cut edges and mill ends to provide smooth jointing on exposed face. Stagger end joints. Shim wallboard as required to provide even joints, without offsets.

4. Fasteners:

    1. General: Finish joints, fastener depressions, applied metal trim and surface blemishes per manufacturer's directions.

    2. Finished Wallboard: Send as necessary to provide flat, smooth surface ready for decoration.

    3. Concealed Wallboard: Wallboard covered by panels or wall-fastened casework, and wallboard above level of finished ceiling, does need to be sanded smooth.

5. Textured Surfaces:

    a. Provide a Level 5 finish throughout.

    b. Provide an in-place sample of finished installation, 8 feet by 8 feet, for approval prior to proceeding with finishing. Approved accepted sample may remain in place.

6. Tolerances:

    a. General: Refer to GENERAL CONDITIONS.

    b. Maximum Variation: 1/8 inch in 10'-0" in any direction.

3.4 CLEANING

A. General: Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris.

END OF SECTION 09 2900

TILE
SECTION 09 3000

PART 1 - GENERAL

1.1 GENERAL

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

1.2 DESCRIPTION

A. This Section describes the requirements for furnishing and installing the following:

1. Wall tile.

2. Backsplash tile.

2. Floor tile.

3. Tiling Accessories

1.3 SUBMITTALS

A. General: GENERAL CONDITIONS

B. Product Data: Furnish manufacturer's product data for each specified product.

C. Shop Drawings: Show tile patterns and locations

D. Samples for Verification: Furnish samples of the following items. Where products involve color and texture variations, furnish sets showing full range of variations expected.

1. Each type and composition of tile for each color and texture required, at least 12-inches square

2. Full-size units of each type of trim and accessory for each color required.

3. Metal transition strips in 6-inch lengths.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, and variety of tile from a single source with resources to provide products of consistent quality in appearance without delaying progress of the work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Installer's Qualifications: A minimum of 3-years experience installing ceramic tile of the types specified, and a minimum of 5 installations of a magnitude similar to or larger than the work of this Section.

D. Floor tile shall have a minimum dynamic coefficient of friction (DCOF) of 0.42 determined in accordance with ANSI 137.1-2012.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: GENERAL CONDITIONS

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with ANSI A137.1 for labeling sealed tile packages.

C. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Maintain temperatures at 50-deg. F. or more in tiled areas during installation and for 7-days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS

A. Furnish additional tile for replacement and maintenance, at the rate of approximately 3-percent, to the nearest full carton, for each size, color, pattern, and type installed. Identify each carton as to contents.

PART 2 - PRODUCTS

2.1 TILE MATERIALS

A. Manufacturer, color, and size: As indicated on the drawings Finish Schedule

2.2 SETTING MATERIALS

A Per ANSI standard specifications and CTI specifications.

2.3 GROUTING MATERIALS

A. Sanded grout at floors, unsanded grout at walls; UPCO "Hydroment," CUSTOM BUILDING PRODUCTS or approved equal.

2.4 MISCELLANEOUS MATERIALS

A. Metal Transition Strips: Schlueter profiles as indicated on drawings. Where profile is not indicated, provide a submittal for the proposed profile for approval.

a. Floor-to-wall: Schluter-Dilex-AHK

b. Inside wall corners: Schluter-Diles EHK

c. Threshold flooring material transition: Schluter-Schiene

d. Vertical field joint between tile TW-1 and TW-2: Schlueter -Dilex AKWS

B Sealer: As recommended by tile and grout manufacturers that does not change the color or appearance of the tile or grout

B. See Section 09 2900 for Tile Backer substrate

C. Provide other materials, not specifically described, but required for a complete and proper installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and areas where tile will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the range selected, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. General: Install tile materials in accordance with tile manufacturer's instructions and recommendations. Provide additional tile setting materials, including but not limited to crack isolation membrane, where specified andrecommended by tile manufacturer.

B. ANSI Tile Installation Standard: Comply with referenced parts of ANSI 108 series of tile installation standards.

C. TCNA Installation Guidelines: Comply with TCNA "Handbook for Ceramic Tile Installation" installation methods referenced.

D. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars or covers overlap tile.

F. Jointing Pattern at Floors: Unless otherwise indicated, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

C. Jointing Pattern: Layout tile in patterns shown. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall and floor area. No less than one half of one full tile shall be used on any wall or floor surface layout. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

H. Lay out tile wainscots to next full tile beyond dimensions indicated.

I. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.

2. Prepare joints and apply sealants as specified in Section 07 9200.

3.4 TILE INSTALLATION METHODS

A. Floors

1. Thin-set in accordance with ANSI A108.5 using TCNA Method F113A, with crack isolation membrane

B. Walls

1. At existing gypsum board walls (Staff Restrooms): Thin-set in accordance with TCNA Method W243

2. At new walls (Public Restrooms): Thin-set over glass-mat faced gypsum backing board: in accordance with TCNA Method W244C.

3.5 CLEANING

A, Upon completion of placement and grouting, clean tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.

2. Do not use acid or acid cleaners to clean tile.

B. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

3.6 CURING

A. Damp cure tile installations, including portland cement grouts, for a minimum of 72-hours.

1. Cover with clean non-staining kraft paper.

2. Do not use polyethylene sheets directly over tile on horizontal surfaces.

3.7 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures tile is without damage or deterioration at time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

2. Prohibit foot and wheel traffic from tiled floors for at least 7-days after grouting is completed.

B. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

C. Apply sealer to portland cement grout installations in accordance with sealer manufacturer's recommendations. Apply to small test area and obtain Architect's approval before proceeding with application over large areas.

END OF SECTION 09 3000

ACOUSTICAL CEILINGS
SECTION 09 5100

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Acoustical Ceilings, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Shop Drawings: Submit shop drawings showing suspension system details and reflected ceiling plans indicating location of light fixtures, mechanical air supply and return outlets and other items affecting ceiling construction. Identify locations of types of suspension systems and types of panels or tile including access panels, where required.

C. Samples:

1. Acoustical Board

2. Suspension System

D. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

E. Certificates: Manufacturer's certified test reports for each specified NRC and STC requirement.

F. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Extra Stock: Deliver one (1) percent or a minimum of one full container of each kind and type of acoustical material by Owner.

4. Guarantee: Provide in required form for a period of two (2) years from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions. Provide completely designed system complying with requirements of CBC.

2. American Society of Testing Materials (ASTM): Materials and testing standards as identified throughout this Section.

3. Ceilings and Interior Systems Construction Association (CISCA): Acoustical Ceilings, Use and Practice.

4. Underwriters Laboratory (UL): Fire Resistance Directory and Building Material Directory.
5. Uniform Building Code (UBC): Standard 8-1.
6. ASTM A641 for ceiling suspension materials.
7. ASTM E84 for acoustic panels.

C. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Manufacturer:

1. General: Specified products are manufactured by Armstrong World Industries, Inc.
2. Alternate Manufacturers: Comparable products manufactured by USG Interiors, Inc., or accepted equal.

C. Acoustical Tile: Optima Square Lay-in Square fine texture ceiling tile, 24” x 48” x 1”, NRC 0.95, Class A (ASTM E84); flame spread 25.

D. Suspension System: Prelude 15/16” white, including manufacturer’s heavy duty exposed runners, cross-runners and accessories, with exposed cross-runners coped to lay flush with main runners. Provide uniform factory applied finish on exposed surfaces of ceiling suspension system including moldings, trim and accessories, to match exposed runners.

E. Miscellaneous Materials:

1. Hanger wires: Galvanized carbon steel full length, ASTM A641.soft temper, pre-stretched, yield-stress load of at least three times design load, but not less than 12 gauge.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS

3.2 PREPARATION

A. Environmental Requirements: Maintain temperature approximating operational conditions, before, during and after installation; humidity not more than 70%.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Surface Preparation: Comply with ASTM C636 Article 3, Interference of Ceiling Related Components; coordinate requirements with other trades. Verify that required work has been installed above ceiling and that perimeter wall work, where ceiling abuts, is completed and dry.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Acoustical Tile:

1. Tile: Install smooth, level and plumb, as shown; with exposed tile joints true and straight, and junctures neat, tight and properly trimmed. Unevenness edge or corner offsets, cupping, scratches, broken tile or other imperfections, not acceptable.

2. Adhesive: Place 1-1/4 inch diameter, minimum, spots of adhesive at corners. Press and slide tile into place with face surface aligned and level.

3.4 CLEANING

A. General: Upon completion, thoroughly clean surfaces per manufacturer's instructions.

END OF SECTION 09 5100

RESILIENT FLOORING & BASE
SECTION 09 6500

PART 1 - GENERAL

1.1 SUMMARY

A. Description: Provide resilient flooring, an accessories, as shown and specified per contract documents.

1.2 SUBMITTALS

A. Product data for each type of product specified.

1. Certification by manufacturer that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).

B. Samples for selection purposes in form of manufacturer's actual samples showing full range of colors and patterns available for each type of resilient flooring product indicated.

C. Product certificates signed by manufacturer certifying that each product complies with requirements.

D. Maintenance data for resilient flooring, to include in Operating and Maintenance Manual specified in GENERAL CONDITIONS.

1.3 QUALITY ASSURANCE

A. General: Refer to GENERAL CONDITIONS

B. Single-Source Responsibility for Flooring: Obtain each type, color, and pattern of flooring from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

C. Fire Performance Characteristics: Provide resilient flooring with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.

2. Smoke Density: Less than 450 per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver flooring and installation accessories to Project site in original manufacturers unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained

between 50 deg F (10 deg C) and 90 deg F (32 deg C).

C. Store flooring on flat surfaces. Move flooring and installation accessories into spaces where theywill be installed at least 48 hours in advance of installation.

1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).

B Do not install flooring until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during flooring installation.

1.6 SEQUENCING AND SCHEDULING

A. Install flooring and accessories after other finishing operations, including painting, have been completed.

B. Do not install flooring over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by manufacturer's recommended bond and moisture test.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Furnish extra stock, of each class, wearing surface, color, pattern and size of resilient flooring installed.

PART 2 - PRODUCTS

2.1 RESILIENT FLOORING

A. Resilient Flooring: Shaw Contract; Inlet II 4372V; Color as specified on drawings, no know equal

2.2 RUBBER BASE

A. Rubber Base: Provide 6” high rubber base at locations indicated on the Drawings. Manufactures acceptable are Roppe, Burkemercer, FLEXCO Co. or accepted equal.

1. Color as indicated on the drawings

2. Provide manufacture's pre-molded outside and inside corner pieces. Bending the rubber base around corners will not be accepted.

2.3 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

C. Adhesives (Cements): Water-resistant type recommended by manufacturer to suit resilient flooring products and substrate conditions indicated.

D. Transition Moldings: Roppe, Burkemercer or approved equal; provide reducer transition molding at flooring-transitions in maximum available lengths to minimize running joints; provide maximum ½" high transition to comply with accessibility requirements of the California Building Code. Color to be selected by the Architect from the manufacture's standard color selection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring installation and comply with manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by manufacturer.

2. Finishes of subfloors shall comply with tolerances specified by manufacturer for moisture content prior to installing flooring. Provide documentation of moisture content of substrate.

3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring, including compliance with slab moisture content requirements.

B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Notice: Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone.

D. Broom or vacuum clean substrates to be covered by flooring immediately before installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 FLOORING INSTALLATION

A. General: Comply with flooring manufacturer's installation directions and other requirements indicated that are applicable to each type of flooring installation.

B. Lay out flooring from center marks established with principal walls, discounting minor offsets, to minimize seams. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a roll width. Install flooring square with room axis, unless otherwise indicated.

D. Scribe, cut, and fit flooring to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, and thresholds.

E. Extend flooring into toe spaces, door reveals, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

G. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.

H. Adhere flooring to substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed flooring installation.

I. Use full spread of adhesive applied to substrate in compliance with flooring manufacturer's directions including those for trowel notching, adhesive mixing, adhesive open and working times.

J. Hand roll flooring where required by manufacturer.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing flooring installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by flooring manufacturers.

2. Sweep or vacuum floor thoroughly.

3. Do not wash floor until after time period recommended by flooring manufacturer.

4. Damp-mop flooring to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.

1. Cover flooring with undyed, untreated building paper until inspection for Substantial Completion.

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

C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using method recommended by manufacturer.

END OF SECTION 09 6500

WALL COVERINGS
SECTION 09 72 00

PART 1-GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes non-woven wall coverings.

1.3 RELATED SUBMITTALS

A. Section 09 2900 “Gypsum Board”

1.4 SUBMITTALS

A. Product Data: Manufacturer’s specifications and data for each type of product.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.

C. Samples: Full width by 36-inch long section of wall covering from same print run or dye lot to be used for the Work, with specified treatments applied. Mark top and face of wall covering.

D. Maintenance Data: Manufacturer’s instructions.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

F. Maintenance 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. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Surface-Burning Characteristics: As follows, per ASTM E84:
1. Part 3-A. Flame Spread Index 25 or less
2. Part 4B. Smoke-developed Index: 50 or less.

PART 2- PRODUCTS

1.6 MANUFACTURERS AND MATERIALS:

A. Manufacturers, Colors and Patterns: As indicated on drawings in the Finish Schedule

PART 3- EXECUTION

3.1 INSTALLATION

A. Prepare substrates:
   1. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew and incompatible primers.
   2. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
   3. Before installation, verify that wall moisture content does not exceed 4% using a suitable moisture meter and that active moisture or water vapor infiltration is not present. If mold or mildew is present, or if walls show visible moisture damage or moisture content exceeds recommendations, do not proceed with installation until the condition has been fully corrected under the direction of a qualified expert. Moisture in and behind the wall must be eliminated.
   4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.

B. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

C. Wall covering must be stored in a dry, clean environment for 72 hours at 70°F, and installed at a similar temperature (but not to exceed 100°F).

D. The wall covering is untrimmed and must be double cut on the wall, trim at least 2"–3" in from each selvedge. If there is no design repeat (random texture), patterns should be reverse hung. Apply an even coat of adhesive to the back side of material using a stiff bristle brush or roller.

E. The wall covering should be applied to the wall within 12 minutes of paste application. When pasting several strips in advance, booking and rolling is recommended to insure proper wetting of the fibers and no drying of paste on the edges. Smooth surface, work out air bubbles and remove excess paste immediately with clear warm water, natural sponge, soft bristle brush, if necessary, and clean towels.

F. Avoid getting adhesive on the wall covering surface. Any excessive adhesive must be removed immediately with a natural sponge and clear warm water and then dried with a white towel or soft cloth.

G. Go at least 6" around outside corners. Do not stretch fabric. Do not overwork seams. Shading tends to be optical and should be checked carefully prior to hanging. Visually matching each panel will reduce and control this condition. If seams are prominent, they should be worked into the architectural treatment. D. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

H. Seamless install: 1/2" overlap feature provides seamless wallcovering application

I. Adhesive: Heavy-duty clear, pre-mixed, wallcovering adhesive. Do not dilute. Store and apply at room temperature (70 F)

J. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

K. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 7200

PAINTING
SECTION 09 9100

PART 1 - GENERAL

1.1 GENERAL

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

1.2 DESCRIPTION

A. This Section describes the requirements for painting and finishing of interior and exterior exposed items and surfaces.

1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatments specified in other Sections.

2. Work includes painting exposed pipes and ducts, hangers, exposed steel and iron, and primed metal surfaces of Mechanical and Electrical equipment, and general sheet metal work, except as otherwise indicated or specified.

3. Work includes painting hardware specified as primed (USP or 600).

4. Work includes sanding shop-primed surfaces and applying specified primer and finish coats.

5. "Paint" means coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

B. Surfaces Not to Be Painted:

1. Pre-finished items, including but not limited to acoustic materials, casework, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

2. Concealed surfaces such as walls or ceilings in concealed areas and inaccessible areas, furred areas, pipe spaces, and duct shafts.

3. Finished metal surfaces such as anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials, exterior aluminum entrances, storefronts, and windows.

5. Prefinished metal wall panels.

6. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts.

C. Following categories of work are included under other Sections:

1. Shop priming ferrous metal items including structural steel, metal fabrications, hollow metal work and similar items. The work of this Section includes sanding and applying specified primer on all shop-primed surfaces exposed to view in the completed work.

2. Shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories.

3. Piping identification is specified in Division 22.

D. Do not paint over code-required labels, equipment identification, performance rating, name, or nomenclature plates.

1.3 SUBMITTALS

A. Certification: Furnish certification by the paint manufacturer that products supplied comply with local regulations controlling the use of volatile organic compounds (VOCs).

B. Samples: Furnish samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.

1. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture is achieved.

2. Furnish samples on the following substrates for review of color and texture only:

a. Painted Wood: Two 12-inch square samples of each color and material on hardboard.

b. Stained or Natural Wood: Two 4-inch x 8-inch samples of natural and stained wood finish on actual wood samples.

C. Product Data: Specified paint systems are those of Benjamin Moore, Dunn Edwards, Frazee, Kelly Moore, Sherwin Williams and Vista. If other paint manufacturers are proposed and accepted by the Architect, furnish product comparison charts showing that proposed paint systems are equal to the specified materials in number of coats, type of paint, and sheen.

1.4 QUALITY ASSURANCE

A. Applicators Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent.

B. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use thinners approved by paint manufacturer, and use within recommended limits.

C. Coordination of Work: Review other Sections in which prime paints are to be provided to ensure compatibility of coatings system for various substrates. Upon request, furnish information or characteristics of finish materials to be used.

D. Requirements of Regulatory Agencies: Comply with applicable rules and regulations of governing agencies for air quality control.

1. Comply with current applicable regulations of the local air quality district, California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

2. Regulatory changes may affect the formulation, availability, or use of specified coatings. Confirm availability of coatings to be used prior to start of painting.

E. Field Samples: On interior wall surfaces provide full-coat finish samples on at least 100-sq. ft. of surface, as directed, until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work. Approved samples will be used as a standard for the Project.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name, batch number, color, and directions.

B. Store materials in tightly covered containers. Maintain containers in a clean condition, free of foreign materials and residue.

C. Keep storage area neat and orderly. Remove oily rags and waste daily. Ensure that workers and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.6 JOB CONDITIONS

A. Apply water-base paints when temperature of surfaces to be painted and surrounding air temperatures are between 50-deg. F. and 90-deg. F., unless otherwise permitted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45-deg. F. and 90-deg. F., unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in rain, fog or mist, when relative humidity exceeds 85-percent, or when temperature is less than 5-deg. F. above dew point, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

D. Provide adequate ventilation during interior painting using as close to 100-percent outside air as possible.

1.7 EXTRA MATERIALS

A. In addition to materials for completion of the work, furnish 5-gallons of additional materials for each type and color of opaque paint used.

B. Furnish extra materials from same production lots or color runs used in the work. Furnish in containers factory sealed and labeled. Identify each container with Project name and type of material.

C. Deliver materials and an inventory list just prior to Substantial Completion and store where directed by Owner.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Sherwin Williams, Benjamin Moore, Dunn Edwards, or approved equal.

2.2 MATERIALS

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application.

B. Material Quality: Provide best quality grade of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable. Each product within any one paint system shall be from the same manufacturer.

2.3 COLORS

A. Colors of paints, including shades of stain, shall match color samples approved by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting is to be applied. Surfaces receiving paint shall be thoroughly dry before paint is applied.

1. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect prior to applying barrier coats.

2. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning.

3. Start of painting will be construed as the applicator's acceptance of surfaces and conditions within a particular area.

3.2 PROTECTION

A. Protection: Protect work of other Sections against damage by painting and finishing work. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

1. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

2. Remove or protect hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting. Following completion of painting, reinstall removed items.

3. At completion of work of other Sections, touch-up and restore damaged or defaced painted surfaces.

3.3 SURFACE PREPARATION

A. General Preparation: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, living unit address numbers, identification signage, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

B. Cleaning: Before applying paint to other surface treatments, clean the substrates of substance that could impair the bond of the various coatings. Remove tape (or other masking material) oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Concrete and Masonry:

1. Prepare surfaces to be painted by removing surface contaminates.

a. Remove efflorescence with stiff bristle brush, wire brushing, wiping, sandblasting or acid washing and rinsing. Allow to dry.

b. Remove chalk, dust, dirt, asphalt, tar or excessive mortar by scraping or wire brushing.

c. Remove rust, grease or oil by solvent cleaning or sandblasting.

d. Treat concrete surfaces which are highly glazed or where traces of form release agents are present with a preparation of one-part concentrated muriatic acid, 4-parts water and one-part detergent or as recommended by parting compound manufacturer. Remove acid with water. Allow to dry.

e. Remove stains on concrete resulting from weathering or corroded metals, with a solution of 2-oz. sodium methasilicate in one-gallon water. Wet stained areas with water before application of solution. Allow to dry.

D. Plaster:

1. Clean surfaces free from grit, loose plaster and surface irregularities.

2. Determine alkalinity and moisture content by performing appropriate tests. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's literature or where pH exceeds 10.

E. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dry.

2. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

3. When transparent finish is required, back-prime with spar varnish.

4. Back-prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.

5. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

F. Ferrous Metal: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of The Society for Protective Coatings (SSPC).

1. Blast surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.

2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

3. Sand shop-applied prime coats to a smooth surface, ready to receive specified primer and finish coats.

G. Galvanized Metals: Clean with non-petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

H. Gypsum Board: Clean surfaces of dust, dirt, grease, oil and other foreign matter and dust clean.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and strain material before using.

D. Use thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Provide finish coats compatible with prime coats.

2. The number of coats required is the same regardless of the application method. Do not apply following coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where required to produce a smooth even surface.

3. Apply additional coats when undercoats, stains or other conditions show through final coat, until paint film is of uniform finish, color and appearance. Edges, corners, crevices, welds, and exposed fasteners shall receive a dry film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture.

5. Paint surfaces behind permanently-fixed equipment or furniture with prime coat before final installation of equipment.

6. Paint visible surfaces of ducts where visible through registers or grilles with a flat, non-specular black paint.

7. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

8. Finish doors on top, bottom and side edges same as faces. Where openings into rooms have different finishes, finish door edges as directed by the Architect.

9. Omit primer on metal surfaces that have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation.

1. Allow sufficient time between successive coatings to permit proper drying.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's instructions.

1. Brushes: Use brushes best suited for the material applied.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate.

E. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces. Finish to match adjoining wall or ceiling surfaces.

1. Mechanical items to be painted include, but are not limited to, piping, hangers, and supports; heat exchangers; tanks; ductwork; insulation; supports; motors and mechanical equipment; air grilles and diffusers; and accessory items.

2. Electrical items to be painted include, but are not limited to conduit and fittings, panels, and switchgear.

F. Block Filler: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores completely filled flush, free of pinholes. Provide multiple coats if required.

G. Prime Coats: Before applying finish coats, apply a prime coat. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas to assure a finish coat with no burn-through or other defects.

H. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness and other surface imperfections will not be acceptable.

I. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

J. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.6 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during painting.

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

2. The testing laboratory will perform appropriate tests for material analysis, abrasion resistance, reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, re-coating, skinning, color retention, alkali and mildew resistance, and application to specified mil thickness.

3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove non-complying paint, pay for testing, repaint surfaces coated with rejected material, and remove rejected material from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.7 CLEANING

A. Clean-Up: During progress of work, remove discarded paint materials, rubbish, cans and rags at end of each work day.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by washing and scraping; do not scratch or damage finished surfaces.

C. General: Upon completion, remove masking materials, reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing, and thoroughly clean all exposed surfaces per manufacturer's instructions. Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris.

D. Touch-up: After detailed inspection of paint work, touch up or refinish abraded, stained or otherwise disfigured work, as required by the Architect.

E. Cleaning: Remove containers, rags and debris from the site; observe special care in control or disposal of flammable materials.

3.8 EXTERIOR PAINT SCHEDULE

A. General: Provide manufacturer's paint system, as specified, for the substrates indicated.

B. Concrete Block:	1 coat primer (new surface patches only) 2 coats finish satin finish
C. Cement Plaster	1 coat primer (new surface patches only) 2 coats finish satin finish
F. Miscellaneous Metals	1 coat primer (new surfaces only) 2 coats finish satin finish
G. Wood Trims	1 coat primer (new surfaces only) 2 coats finish Satin finish
H. Gutter and Down-Spouts	1 coat primer 2 coats finish satin finish
I. Roof Flashings	1 coat primer (new surfaces only) 2 coats finish satin finish

3.9 INTERIOR PAINT SCHEDULE

A. General: Provide manufacturer's paint system, as specified, for the substrates indicated.

B. Gypsum Board	1 coat PVA primer sealer (new surfaces only) 2 coats finish at colors as noted in the drawings Finish Schedule, eggshell finish 3 coats finish at colors as noted in the drawings Finish Schedule, eggshell finish
B. Wood Doors	1 coat stain 1 coat sanding sealer 1 coat low luster polyurethane

END OF SECTION 09 9100

SIGNAGE
SECTION 10 1400

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Signage, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Shop drawings: Submit manufacturer's standard colors and letter styles for review.

C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

D. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. California Building Code (CBC): Sections 1115B5, 1117B.5.1.1. and 1117B.5.10.

3. Americans with Disabilities Act (ADA): Standards.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Plastic Signs:

1. General:

a. Sign: 1/8 inch thick, unless otherwise noted, engraved laminated plastic, color as selected by Architect; engraving 1/32 inch deep in contrasting background color.

b. Letters ¾ inch high, minimum; style as selected by Architect.

c. Symbols: International style.

d. Braille: Dots 1/10 inch on center in each cell with 2/10 inch space between cells, raised minimum of 1/40 inch above background; California Contract Grade 2 Braille.

2. Capacity Signs:

a. General: Per CBC; Typical 1/8 inch thick; number of occupants to be determined by the Architect for each room, where required.

b. Maximum Number – General: "The number of people permitted in this room shall not exceed ___ by order of the State Fire Marshal." Number of occupants as shown on the Drawings.

c. At Exit Doors: "This Door to Remain Unlocked During Business Hours."

3. Room Identification: "Fire Riser" sign, as directed by Fire Marshal

4. Toilet Room Door Signs:

a. General: Per CBC Section 1115B.5; ¼ inch thick with eased edges, with raised letters and Braille, as shown. Background color to contrast with door color. Colors as selected by Architect from manufacturer's standards.

b. Women: 12 inch diameter circle; international symbol for women with the word "WOMEN" below symbols.

c. Men: Equilateral triangle with sides 12 inches long, vertex up; international symbol for men with the word "MEN" below symbol.

d. Side Mounted Signs: Per CBC Section 1115B.5 and 1117B.5.7.

5. Entrance and Exit Signs:

a. General: Per CBC 1117B.5 9 inches high x 6 inches wide, ¼ inch thick, with eased edges.

b. Entrance: International symbol of accessibility with the word "ENTRANCE" below symbol.

c. Exit International symbol of accessibility with the word "EXIT" below symbol, and directional arrow pointing to required exit, where required.

6. Other Signage: as indicated on drawings

C. Metal Painted Signs:

1. General: Baked enamel on steel.

2. Handicapped Parking Signs: Metal reflectorized; 9 inches high and 8-1/2 inches wide; at handicapped parking stalls; international symbol of accessibility no text;

3. Parking Lot Entrance Signs: 17 inches high x 22 inches long, to read:

"Unauthorized vehicles parked in designated accessible spaces, not displaying distinguishing placards or license plates issued for persons with disabilities may be towed away at owner's expense. Towed vehicles may be reclaimed at _____or by telephoning _____."

4. Other Signage: as indicated on drawings

D. Posts:

1. General: Size as shown.
2. Steel Pipe: ASTM A-35, Grade B.
3. Galvanizing: Hot dip process per ASTM A153.

E. Fasteners: As recommended by manufacturer; tamper-proof screws; anchors where required.

F. Adhesives: As recommended by manufacturer.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS

3.2 PREPARATION

A. Environmental Requirements: Do not install plastic signs when temperature is below 70 degrees F.

B. Examination: Examine conditions of surface in place before beginning work; report defects.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Locations: As shown, or as directed by the Architect.

C. Surface Mounted:

1. Room Identification: As directed, per CBC 1117B.5.9.
2. Capacity Signs: As directed, per CBC.
3. Toilet Room Signs: As directed, per CBC Section 1115.B.5 and 1117B.5.9 and shown on drawing details
4. Entrance and Exit signs:
    a. General: Per CBC Section 117B.5.7.
    b. Entrance: Provide at each handicapped accessible entrance where shown.
    c. Exit: Provide at handicapped exits where shown.

D. Post Mounted:

1. General: Install post in concrete as shown. Attach sign to post with galvanized steel carriage bolt with hex nut and washer; touch up bolt head with paint to match sign background color.
2. Parking Space Signs: Center on post with bottom of sign 80 inches above paved surface; top of post shall not protrude above top of sign.

3.4 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instruction.

END OF SECTION 10 1400

TOILET COMPARTMENTS
SECTION 10 2113

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Toilet Compartments, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS

B. Shop drawings: Submit manufacturer's shop drawings for each product specified, including the following:

1. Plans, elevations, details of construction and attachment to adjacent construction.
2. Show anchorage locations and accessory items.
3. Verify dimensions with field measurements prior to final production of toilet compartments.

C. Samples:. Submit sample of selected color for confirmation

D. Product Data: Manufacturer’s product data

E. Closeout:

1. General: Refer to GENERAL CONDITIONS
2. Maintenance Data: Manufacturer’s instructions.
3. Guarantee: Provide 25 year guarantee against breakage, corrosion, delaminating and defects in workmanship for the date of purchase

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.
2. American National Standards Institute (ANSI): Hardware Standards for Handicapped Access.
3. Americans with Disabilities Act (ADA): Standards.
4. California Building Code Chapter 11B
5. ASTM E 84

PART 2- PRODUCTS

2.1 MATERIALS

A. Toilet Partitions: Toilet compartments manufactured by Bobrick Washroom Equipment, Inc., or approved equal

1. General: Basis of Design: Bobrick DuraLineSeries CGL 1180-G (Compact Grade Laminate)

2. Privacy: Extended Privacy

3. Overhead braced to within one inch of existing ceiling, extruded anodized aluminum

4. Doors and Stiles:

a. Gap-Free Doors and Stiles and gap-less wall posts

b. ¾" compact grade laminate (CGL) doors and stiles

c. Doors: 24 inches wide, unless otherwise shown; 36 inches wide, minimum, at handicapped stalls.

5. Latches: Occupancy Indicator Latches B-1002612 with emergency access feature., complaint with CBC Accessibility requirements

6. Coat hook: Provide coat hook at inside of each stall

7. Pulls: Out-swinging door pulls

8. Height: Extended

9. Brackets: Continuous U- and Z- channels for maximum security

10. Reinforce panels and prepare as required for accessories specified under Section 10 2800 – TOILET ROOM ACCESSORIES.

11. Shoe: 18-8, type 304, 22 gauge stainless steel with satin finish, 4" high, one-piece show

12. Color: Cello 0811-FH

F. Fastenings, Fittings and Hardware:

1. General: Complete system with corrosion resistant, chromate-treated, double zinc-plated steel angle leveling bars, rods, nuts, brackets washers, spacers, sleeves, anchors and shoe retainers, as required for a complete installation

2. Door keepers, coat hooks, and mounting brackets shall be 18-8, Type 304 heavy gauge stainless steel with satin finish

3. Hinges: self closing

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS

3.2 PREPARATION

A. Examination: Examine conditions of surface in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

C. Protection: Protect partitions until final acceptance. Repair scratches and defects in original finish; replace work damaged beyond repair.

3.3 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
   1. Verify blocking and supports in walls and ceilings have been installed properly at points of attachment.
   2. Verify location does not interfere with door swings or use of fixtures.
   3. Use fasteners and anchors suitable for substrate and project conditions
   4. Install units rigid, straight, plumb, and level.
   5. Conceal evidence of drilling, cutting, and fitting to room finish.
   6. Test for proper operation.

3.4 ADJUSTING, CLEANING AND PROTECTION

A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

B. Touch-up, repair or replace damaged products.

C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION 10 2113

DEMOUNTABLE PARTITIONS
SECTION 10 2219

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Demountable Partitions, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Samples: Submit manufacturer's standard colors.

C. Product Data: Submit manufacturer's specifications, data, cut sheet, elevation diagrams, materials selections, door operation, door hardware, product details and installation instructions for review.

D. Shop Drawings: Prepare shop drawings showing the plan and elevations layouts, dimensions, sections, and details of the fabrication and installation for review

E. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS.

B. Demountable Partitions:

1. General: Manufacturer: Teknion Architectural Interiors, available through The Collective, (916)930-0365, 1329 T Street, Sacramento, CA 95811, no know equal

2. Wall System: Focus demountable wall system

1. Configuration and size: As shown on drawings

2. Frame: Single Centered

3. Glazing: tempered, STC 45
4. Doors: Pair of solid hinged door leaves, complying with CBC Accessibility regulations
5. Door Hardware: CBC Accessibility Compliant Hardware
6. Color: Solar Black
7. Complete Installation: Provide all mullions, wall ends, transitions, frames, assemblies, glazing, doors, hardware and connectors for a complete installation.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to section GENERAL CONDITIONS.

3.2 PREPARATION

A. Examination: Examine conditions of surfaces in place before beginning work; report defects.

B. Measurements: Take field measurements prior to ordering to confirm fit.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, and as specified, level and true.

3.4 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.5 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instruction.

END OF SECTION 10 2219

TOILET ACCESSORIES
SECTION 10 2800

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Toilet and Shower Accessories, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS

B. Product Data: Manufacturer's product data and installation instruction for each product

C. Closeout:

1. General: Refer to GENERAL CONDITIONS

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. American National Standards Institute (ANSI): ANSI 117.1 – Safety Standards for the Handicapped.

3. Americans with Disabilities Act (ADA): Standards.

4. International Sanitary Supply Association (ISSA): Standards.

5. California Building Codes (CBC): Section 1115B.8.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Manufacture:

1. General: Products are manufactured by Bobrick Washroom Equipment, Inc., unless otherwise indicated; key lockable accessories alike.

2. Alternate Manufacturers: Comparable products manufactured by the Washroom Accessories Division of the Bradley Corp., or accepted equal.

3. Finishes:

   At Staff Restrooms: Matte Black

   At Public Restrooms: Type 304 stainless steel; No. 4 satin finish

4. Templates and Backplates: Furnish to applicable trades as required for each accessory together with location and mounting height.

C. Toilet Accessories:

1. Staff Restrooms

   a. Soap Dispenser: B-862 Matte Black

   b. LED Backlit Mirror: B-167 2436,MBLK, matt black frame

   c. Recessed Toilet Seat Cover Dispenser: B-3013.MBLK

   d. Recessed Sanitary Napkin Disposal: B-3513.MBLK

   e. Surface Mounted Sanitary Napkin Disposal: B-35139.MBLK

   f. Recessed Automatic Hand Dryer: B-3725.MBLK

   g. Grab Bar 36": B-9806x36.MBLK

   h. Grab Bar 42": B-9806x42.MBLK

   i. Recessed Toilet Paper Dispenser: B-35883.MBLK

   j. Surface Mounted Toilet Paper Dispenser: B-3588.MBLK

   k. Semi-Recessed Paper Towel Dispenser and Waste Receptacle: B-38032.MBLK

2. Public Restrooms

   a. Soap Dispenser: B-868 Polished Chrome

   b. LED Backlit Mirror: B167 2436, no frame, outer etched

   c. Recessed Toilet Seat Cover Dispenser: B-3013, stainless steel satin finish

   d. Recessed Sanitary Napkin Disposal: B-3513, stainless steel satin finish

   e. Recessed Automatic Hand Dryer: B-3725, stainless steel satin finish

   f. Grab Bar 36": B-9806x36, stainless steel satin finish

   g. Grab Bar 42": B-9806x42, stainless steel satin finish

   h. Recessed Toilet Paper Dispenser: B-35883, stainless steel satin finish

   i. Semi-Recessed Paper Towel Dispenser and Waste Receptacle: B-38032, stainless steel satin finish

D. Fasteners: As recommended by manufacturer; tamperproof type.

E. Blocking: Provide solid wood blocking in the walls for the mounting of all accessories, and provide block-outs for all recessed and semi-recessed accessories.

PART 3- EXECUTION

3.1 PREPARATION

A. Examination: Examine conditions of surface in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

3.2 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, mounting heights and locations as required to open and service units, and as specified.

B. Toilet Room Accessories: Install with concealed vandal-proof fasteners where mountings are made without back plates and where accessories are recessed or faster is exposed to view. Attach accessories securely to walls or toilet partitions as recommended by manufacturer for each item and each condition; adhesive installation not permitted.

3.3 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.4 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instruction.

END OF SECTION 10 2800

FIRE PROTECTION SPECIALTIES
SECTION 10 4400

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Fire Extinguishers and Cabinets, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: GENERAL CONDITIONS.

B. Product Data: None required for specified products; required for alternate products.

C. Certificates: Submit manufacturer's certificate stating that materials meet or exceed specified requirements

D. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. American National Standards Institute (ANSI):

a. ANSI/NFPA 10: Portable Fire Extinguishers.

b. ANSI/UL 711: Rating and Fire Testing of Fire Extinguishers.

3. National Fire Protection Association (NFPA): Fire Extinguisher Standards.

4. Underwriters Laboratories (UL): Listing for type, rating and classification of extinguisher.

C. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience; manufacturer and approved.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Manufacture:

1. General: Products manufactured by J.L. Industries

2. Alternate Manufacturers: Comparable products manufactured by Potter-Roemer Division of Smith Industries, Inc., or accepted equal.

C. Extinguishers:

1. General: Fire fighting devices must be approved by Underwriters' Laboratories, Inc., bear UL label, and be approved by Fire Marshal

2. Provide 2A10BC extinguishers.

D. Fire Extinguisher Cabinets:

1. Semi-Recessed Type: J.L. Industries Ambassador Architectural Series Steel Fire Extinguisher Cabinet, Model # C1017G10.

2. Fire extinguisher cabinet shall be a semi-recessed type with 20-gauge flanged epoxy coated factory finished steel box, rolled edges, sized to hold specified extinguisher. Verify extinguisher size compatibility and wall depth requirements. Box interior shall be white. Cabinet door to be white epoxy primed coated cold rolled steel door oversized to completely cover the flange, with a concealed hinge and safety lock. Doors to consist of a formed design with 7/8" nominal thickness. Door to contain 1/4" clear view glass

E. Fasteners: As recommended by manufacturer.

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS

3.2 PREPARATION

A. Environmental Requirements: Do not install when temperatures may cause freezing of extinguisher ingredients.

B. Examination: Examine conditions of surface in place before beginning work; report defects.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Extinguishers:

1. Cabinet: One (1) extinguisher for each cabinet.

3.4 FIELD QUALITY CONTROL

A. Service: Inspect, change and tag fire extinguishers not more than (10) days prior to occupancy of building by Owner.

3.5 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.6 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instruction.

END OF SECTION 10 4400

RESIDENTIAL APPLIANCES
SECTION 11 3100

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Kitchen Equipment, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Product Data: Manufacturer's product data

C. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards:

1. General: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

2. Americans with Disabilities Act (ADA): Access to Buildings requirements

3. Association of Home Appliance Manufacturers (AHAM): Standards.

4. Underwriter's Laboratories (UL): Standards of electrical equipment.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS

B. Kitchen Equipment:

1. General: Specified products are manufactured by the General Electric Co., unless otherwise indicated.

2. Alternate Manufacturers: Comparable products manufactured by the Maytag Co., Frigidaire, Whirlpool, or accepted equal.

C. Equipment:

1. Range: GE Profile Energy Staff 30” Smart slide-In Induction and Convection Range, model # PHS700AYFS, fingerprint resistant stainless finish

2. Hood: GE 30” Undercabinet Hood, Model # JVX5300EJES, with charcoal filter, lighting, grease filter and remote control

3. Refrigerator: GE Energy Star 24.8 CF bottom freezer drawer refrigerator, Model #GDE25EYKFS factory-installed ice-maker, fingerprint resistant stainless finish

4. Undercounter Refrigerator Wellness Room: GE Energy Star Double-Door Compact Refrigerator, Model # GDE03GLKLB, Clean Steel, freezer/refrigerator, ADA compliant, mount under accessible countertop

4. Undercounter Refrigerator Conference Room: GE Energy Star Compact Refrigerator, Model # GME04GLKLB, Clean Steel, freezer/refrigerator, ADA compliant, mount under accessible countertop

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to GENERAL CONDITIONS

3.2 PREPARATION

A. Examination: Examine conditions of surface in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer’s written directions, as shown, and as specified.

B. Kitchen Appliances: Install as shown; coordinate service connections with Divisions 22 Plumbing, Division 23 HVAC, and Division 26 Electrical.

3.4 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.5 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer’s instruction.

END OF SECTION 11 3100

WINDOW ROLLER SHADES
SECTION 12 2413

PART 1-GENERAL

1.1 SUMMARY

A. Description: Provide Window Roller Shades, as shown and specified per Contract documents.

1.2 SUBMITTALS

A. General: Refer to GENERAL CONDITIONS.

B. Samples: Submit manufacturer's standard colors.

C. Product Data: Submit manufacturer's specifications, data, and installation for review.

D. Closeout:

1. General: Refer to GENERAL CONDITIONS.

2. Maintenance Data: Manufacturer's instructions.

3. Guarantee: Provide in required form for a period of one (1) year from date of final acceptance by Owner.

1.3 QUALITY REQUIREMENTS

A. General: Refer to GENERAL CONDITIONS.

B. Reference Standards: Refer to GENERAL CONDITIONS for reference standards, applicable codes and definitions.

PART 2- PRODUCTS

2.1 MATERIALS

A. General: Refer to GENERAL CONDITIONS.

B. Roller Blinds:

1. General: Mecho /5 Shade System or approved equal.

a. Shade Cloth: EcoVeil, 3% open, 1550 series, color 1554 Black/Brown

b. Fascia: Square Fascia, color as selected by Architect

c. Components: Manufacturers standard.

d. Fasteners: As recommended by manufacturer.

e. Operation: manual

PART 3- EXECUTION

3.1 PERFORMANCE

A. General: Refer to section GENERAL CONDITIONS.

3.2 PREPARATION

A. Examination: Examine conditions of surface in place before beginning work; report defects.

B. Measurements: Take field measurements prior to fabrication

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, and as specified, at all windows.

B. Window Roller Shades:

1. General: Install window roller shades, anchorages, fastenings, and accessories as shown, level and in alignment with window openings.

3.4 ADJUSTMENT

A. General: Prior to acceptance, adjust moveable parts to assure smooth operation.

3.5 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instruction.

END OF SECTION 12 2413

SPECIAL FUNCTION DOORS
SECTION 08 3400

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:

1. Interior Aluminum-Framed Top-Hung Sliding Doors

B. Related Sections:

1. Section 08 1400 – Wood Doors

1.03 REFERENCES

A. ANSI – American National Standards Institute

1. ANSI 156.18 Materials and Finishes
2. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.

B. BHMA – Builders Hardware Manufacturers Association

C. DHI – Door and Hardware Institute

D. NFPA – National Fire Protection Association

1. NFPA 80 – Fire Doors and Windows
2. NFPA 101 – Life Safety code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Doors Assemblies

E. AWS – Architectural Woodwork Standards

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, including installation instructions.

B. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

C. Samples: Submit manufacturer's samples of the following sliding door components:

1. Door veneer sample.

2. Aluminum Frame finish sample.

D. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

E. Warranty Documentation: Submit manufacturer's standard warranty for complete system

F. Test Reports: Submit acoustical reports or UL1784 as applicable.

1.05 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.

B. Source: Obtain sliding aluminum framed doors and hardware from single source.

C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

1.06 PERFORMANCE

A. Aluminum perimeter frames with integral acoustic seals at all door/frame interfaces

1. Verify frame thickness suitable for required application

B. Soft-closing mechanism at both sides of door integrated with top track. Soft Closers tested to a minimum of 150,000 cycles.

C. Concealed door guide.

D. Manufacturer to 3rd party acoustical performance test data

E. Manufacturer to submit 3rd party test data on air infiltration and/or smoke ratings as applicable

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Notify manufacturer immediately of any shipping damage.

C. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
3. Store materials in clean, dry area indoors.
4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. AD SYSTEMS 2201 100th St. SW, Everett, WA 98204 | Website: http://specADsystems.com | Phone: 425-740-6011 | ADSystems.Estimating@allegion.com

2.02 INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS

1. ExamSlide™ High Performance Barn (Sliding) Door System by AD Systems.
2. No known equal

B. Frame Profiles: Extruded aluminum frame "wrap" frame with integral vertical jamb (stile pocket). Frames shall complete seal around door leaf. Provide gasketing required at all frame to door interfacings. Exposed gaskets at jamb shall be silicone.

C. Finish:

1. Standard: Painted Hardcoat (Kynar) Finish, flat black; meet AAMA 2604 Standard

D. Door Leafs. Doors shall be factory machined for hardware including pilot and function holes. Leading edge of door to be fully finished.

1. 1-3/4" Wood Door as shown on drawings Door Type in Door Schedule: Reference Spec Section 08200 Wood Doors, solid core, birch veneer, glazed

   a. Glazing: clear tempered glass
   b. Stiles: 6" with a 10" bottom rail.

E. Door Components

1. Single Top Track: Anodized finish aluminum track
2. Valances: Extruded aluminum with integral end caps

   a. Standard square valance.

3. Top Rollers: tandem nylon roller sized to match door weight
4. Concealed Floor Guide: Integral Jamb floor guide by AD Systems

5. Soft-Closers: Soft-closing dampeners at both sides of door leaf. Demonstrate soft closers as tested to 150k cycles

6. Handles:

a. Standard Straight Pull: 12” long x 1” diameter. Finish: US32D Satin Stainless Steel.

F. Door Locks

1. Electric Strike with control trim and single action egress

a. ELEC2—Lever Lock with electronic strike and cylinder override with back to back levers for egress

2. Magnetic Lock by AD Systems

G. Self-Closing Spring Mechanism

H. Automatic Door Bottom for improved acoustical performance

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine wall openings to receive sliding doors for plumb, level, and square.

B. Verify dimensions of wall openings.

C. Examine surfaces to receive top and bottom guide.

D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.

E. Do not begin installation until unacceptable conditions are corrected.

F. Verify that floor surfaces are smooth and flat with maximum variation of 3/16 inch in 10 feet, and are ready to receive Work.

G. Prepare substrate in accordance with ASTM F710 and flooring manufacturer’s recommendations.

H. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

1. Apply, trowel, and float filler to leave a smooth, flat, hard surface. Repair all floor irregularities.

2. 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.

3.02 INSTALLATION

A. Install sliding doors in accordance with manufacturer’s instructions at locations indicated on the Drawings.

B. Install sliding doors plumb, level, square, and in proper alignment.

C. Install sliding doors to close against walls without gaps

D. Install sliding doors to open and close smoothly.

E. Anchor sliding doors securely in place to supports. Required: Provide fire treated 2 x 6 blocking required full length of track.

3.03 ADJUSTING

A. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.

B. Adjust sliding doors to operate smoothly without binding.

C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

3.04 CLEANING

A. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.05 PROTECTION

A. Protect installed sliding doors from damage during construction.

END OF SECTION 08 3400

PLUMBING REQUIREMENTS
SECTION 22 00 00

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Work included in 22 00 00 applies to Division 22 work to provide materials, labor, tools, permits and incidentals to make plumbing systems ready for Owner's use for proposed project.
B. Related Work Specified Elsewhere:

1. Contents of Section applies to Division 22 specifications.
2. Requirements of Section are a minimum for Division 22 Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

1.2 DEFINITIONS

A. Following is a list of abbreviations generally used in Division 22:

1.	CBC	California Building Code
2.	CEC	California Electrical Code
3.	CGA	Canadian Gas Association
4.	CMC	California Mechanical Code
5.	CPC	California Plumbing Code
6.	CISPI	Cast Iron Soil Pipe Institute
7.	CSA	Canadian Standards Association
8.	MSS	Manufacturers Standardization Society
9.	NEC	National Electric Code
10.	NEMA	National Electrical Manufacturers Association
11.	NFPA	National Fire Protection Association
12.	NRCA	National Roofing Contractors Association
13.	NSF	National Sanitation Foundation.
14.	TEMA	Tubular Exchanger Manufacturers Association
15.	TIMA	Thermal Insulation Manufacturers Association
16.	UL	Underwriters Laboratories Inc.

B. Provide: To furnish and install, complete and ready for the intended use.
C. Furnish: Supply and deliver to the project site, ready for unpacking, assembly and installation.
D. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at the project site as required to complete items of work furnished by others.

1.3 ADDITIONAL REQUIREMENTS TO DIVISION 01

A. Operation and Maintenance Documentation: Copies of certificates of code authority acceptance, test data, parts lists, maintenance information for equipment, valves, balancing

reports, and other special guarantees, certificates of warranties, and the like, specified elsewhere herein or indicated on Drawings.

B. Shop Drawings: Provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and the like. Refer to individual Specification Sections for additional requirements for the shop drawings.

C. Closeout Documentation: Submit plumbing code authority certification of inspection.

D. Record Drawings:

1. Show changes and deviations from the Drawings. Include issued Addendum and change order items.
2. Make changes to the Drawings in a neat, clean, and legible manner.

E. Product Data:

1. Submit manufacturer's technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, supplied or provided. Refer to individual specification sections for specific items required in product data submittal. Submit at one time in 3-ring binder, tabbed and referenced to match the Contract Documents.
2. Maintain an updated product submittal package to be included in the final operation and maintenance documentation.

1.4 QUALITY ASSURANCE

A. Where Contract Documents are at variance with applicable codes governing work, code and local jurisdiction requirements take precedence, and include cost necessary for code compliance or local jurisdiction compliance in bid price. Machinery and equipment to comply with Occupational Safety and Health Act of 1970, as currently revised, as interpreted for equipment manufacturer requirements.

B. Plumbing Drawings: Drawings are intended to be diagrammatic and are based on one manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than basis of design, including but not limited to architectural, structural, electrical, HVAC, fire sprinkler, and plumbing.

C. Requirements: As a minimum requirement, work in accordance with following rules and regulations and applicable laws:

1. NFPA.
2. OSHA.
3. Codes as published by ICBO:

   a. IBC.
   b. IFC.
   c. IMC.
   d. IPC.

4. UPC.

5. Related supplements and standards.
6. California State Energy Code.
7. CBC California Building Code
8. CMC California Mechanical Code
9. CPC California Plumbing Code
10. State of California and local jurisdictional requirements.

D. Permits and Inspections:

1. Unless otherwise distinctly hereinafter specified, apply and pay for necessary permits, plans check, and inspections required by public AHJ.
2. Refer to General and Supplementary Conditions for payment of water and sewer service connection fees.
3. Obtain certificates of inspection from AHJs and deliver to Owner before final acceptance.
4. Each trade to consult local building department and utility companies prior to commencement of work to ascertain existence and location of existing underground utilities. Protect existing service against damage and interruption of use, and reroute as may be necessary to accomplish new work. Include costs for materials and installation for rerouting as specified for new work in bid price.

E. Regulatory Requirements:

1. UL and CSA Compliance: Provide units which are UL and CSA listed.
2. ASME Compliance: Provide units which are ASME listed when water heaters and boilers which exceed 200,000 BTUH, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
3. Provide safety controls required by National Boiler Code (CSD-1) for boilers and water heaters exceeding 400,000 BTUH.

1.5 SEQUENCING AND SCHEDULING

A. For proper execution of work cooperate with other trades as needed.
B. To avoid installation conflicts, thoroughly examine complete set of Contract Documents. Resolve conflicts with Architect prior to fabrication and installation.
C. Prior to installation of equipment requiring electrical connections, examine manufacturer's shop drawings, wiring diagrams, product data, and installation instructions. Verify that electrical characteristics indicated in Contract Documents are consistent with electrical characteristics of actual equipment being installed. When inconsistencies occur request clarification from Architect.

1.6 COORDINATION DOCUMENTS

A. Prepare and submit coordinated layout drawings, prior to construction, to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system, and progressively number. Prior to completion of Drawings, coordinate proposed installation with architectural and structural

requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and tile systems), and provide reasonable maintenance access requirements.

B. Prepare Drawings as follows:

1. Prepare Drawings to accurate scale of 1/4 inch = 1 foot or larger on Mylar sheets or AutoCAD. Drawings are to be same size as Contract Drawings and to indicate location, size and elevation above finished floor of plumbing equipment and piping. Drawings indicate proposed ceiling grid and lighting layout as shown on electrical drawings and reflected ceiling drawings.
2. Review and revise as necessary section cuts in Contract Drawings after verification of field conditions.
3. Indicate plumbing system piping including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.
4. Piping that must be graded to have right-of-way over more flexible items. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and reflected ceiling drawings and HVAC equipment, ductwork and piping.
5. Drawings are to incorporate Addenda items and change orders.
6. Distribute drawings to trades and provide additional coordination as needed.

C. Advise Architect, in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

D. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.

E. Final coordination drawings with appropriate information added to be submitted as Record Drawings at completion of project.

1.7 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, lights, and electrical services with architectural and structural requirements, and other trades (including plumbing, fire protection, electrical, ceiling suspension, and tile systems), and provide reasonable maintenance access requirements.

1.8 EXISTING SOILS CONDITIONS

A. Understand existing soils conditions before submitting bid on work. No additional allowance will be granted due to lack of information for existing conditions of subsurface soils.

B. Submission of a bid will be considered acknowledgment of review/understanding of project geotechnical soils report.

PART 2 - PRODUCTS

2.1 HAZARDOUS MATERIALS

A. Do not use products containing asbestos, lead, arsenic, or other material defined by EPA as hazardous to human or animal life.

2.2 MATERIALS

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, the latest products as listed in manufacturer's printed catalog data and are to be UL or CSA approved or acceptable by state, county, and city authorities. Equipment supplier is responsible for obtaining state, county, and city acceptance on equipment not UL approved or not listed for installation.
B. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.
C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

PART 3 - EXECUTION

3.1 ACCESSIBILITY AND INSTALLATION

A. Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors, drives, and the like) so that they may be serviced, reset, replaced or recalibrated and the like, by service people with normal service tools and equipment. Notify Architect in writing if equipment or components are shown in such a position that above cannot be accomplished.
B. Install equipment complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment, examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods and sequencing, in coordination with other trades and disciplines.
C. Earthwork:

    1. Refer to Division 31.
    2. Perform excavation and backfill for installation of plumbing work.

D. Firestopping:

    1. Coordinate with Drawings location of fire rated walls, ceilings, floors and the like. When these assemblies are penetrated, seal around piping, equipment, and the like, with approved firestopping material.
    2. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814.

3.2 NOISE AND VIBRATION

A. Install vibration isolators, flexible connectors, expansion joints, and measures required to prevent noise and vibration from being transmitted to occupied areas. Select equipment to operate within noise coefficient (NC) design level for particular type of installation in relation to its location.
B. After installation, make proper adjustments to reduce noise and vibration to acceptable levels as defined by Architect.

3.3 SEISMIC CONTROL

A. Provide the following:

1. General:

a. Earthquake resistant designs for plumbing equipment, i.e., water heaters, motors, and plumbing piping, to conform to regulations of CEC.
b. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment piping and the like, to withstand a force in direction equal to value defined in CEC.
c. Retain licensed structural engineer to provide shop drawings of seismic bracing and seismic movement assemblies for piping/equipment/water heaters, and the like. Engineer to design and provide stamped shop drawings for equipment, water heaters, piping seismic bracing, and the like. Submit shop drawings along with equipment submittals.
d. Retain licensed structural engineer to provide shop drawings of seismic flexible joints for piping and the like crossing building expansion or seismic joints. Engineer to design and provide stamped shop drawings for piping flexible seismic joints. Coordinate actual design deflection or travel with project structural engineer. Submit shop drawings along with seismic bracing details. Coordinate exact design requirements from project structural engineer.

2. Piping:

a. Use "Seismic Restraints Manual Guidelines for Plumbing Systems," published by SMACNA.
b. Sway bracing is not required for pipes that are installed on very short individual hangers (12 inch or less).
c. As approved by code authority, use a bracing system manufactured by Tolco, Superstrut, Mason, or Pipe Shields Inc. or approved.

3. Equipment:

a. Provide a means to prohibit excessive motion of plumbing equipment during earthquake.
b. Provide plumbing equipment, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to 0.5 of equipment operating weight.

3.4 REVIEW BY ENGINEER

A. Notify Architect/Engineer, in writing, at following stages of construction so that Architect/Engineer may, at their option, visit site for review and construction observation:

1. Underground piping installation prior to backfilling.
2. Prior to covering walls.
3. When ceiling installation is started.
4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

3.5 OPERATING DURING CHANGEOVER

A. During remodeling of existing structure, or addition of a structure to existing structure, while existing structure is occupied, present services to remain intact until new construction, facilities or equipment is installed.
B. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping, wiring, and the like, to point of connection.
C. Perform actual transfer to new service at off-peak time, as coordinated with Owner. Once changeover is started, pursue it to its completion, to keep interference to a minimum.

3.6 MUTILATION

A. Repair mutilation of building around pipes, fixtures, and the like.

3.7 DEMOLITION

A. Scope:

1. It is intent of these documents to provide necessary information and adjustments to plumbing system required to meet code, and accommodate installation of new work.
2. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access, access to different areas.
3. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

B. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of the demolition process are the Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
C. Unless specifically indicated on the Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.
D. Unless specifically indicated on the Drawings, remove unused equipment, fixtures, fittings, rough-ins, connectors, etc. Removal is to be to a point behind finished surfaces (floors, walls, ceilings, etc.).

3.8 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize plumbing equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.9 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.
B. Maintain design intent where equipment other than as shown in Contract Documents is provided. Where equipment requires piping arrangement, control diagrams, or sequencing different from that indicated in Contract Documents, provide electrical motors, wiring, controls, or other required electrical components at no additional cost to Owner.

3.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and equipment in a manner to prevent damage and deterioration. Store in original container which identifies manufacturer's name, brand and model number. Do not store indoor equipment outdoors unless provided with a waterproof protective cover.
B. Replacement: In event of damage, immediately make repairs and replacements necessary.

3.11 DEMONSTRATION

A. Upon completion of work and adjustment of equipment, test systems to demonstrate to Owner's Representative and Architect that equipment furnished and installed or connected under provisions of these Specifications functions mechanically in manner required.
B. Manufacturer's Field Services: Furnish services of a qualified person for a period of not less than 8 hours, at a time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in a satisfactory manner and complies with requirements of other trades or Contractors that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.12 CLEANING

A. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated by this work.

3.13 INSTALLATION

A. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level, firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

B. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of plumbing systems.
2. Furnish sufficient dry nitrogen for pressure testing under manufacturer's supervision.
3. Provide and install pump impellers to obtain design capacities. Coordinate exact requirements with balancing firm.

3.14 PAINTING

A. Ferrous Metal: After completion of plumbing work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, and the like, with one coat of black asphalt varnish or black enamel suitable for hot surfaces.

B. Machinery:

1. In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
2. See individual equipment Specifications for other painting.
3. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.

C. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.

3.15 CUTTING AND PATCHING

A. Refer to Section 01 73 29 "Cutting and Patching."

3.16 ACCEPTANCE

A. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

1. Testing and balancing reports.
2. Cleaning.
3. System balancing and balancing logs.
4. Operating and Maintenance Manuals.
5. Training of operating personnel.

6. Record Drawings.
7. Guaranty certificates.
8. Start-up and test document.
9. Letter of conformance.

3.17 LETTER OF CONFORMANCE

A. Provide letter and copies of extended warranties with a statement in letter that Plumbing items were installed in accordance with manufacturer's recommendations. Include letter of conformance and warranties in operating and maintenance manuals.
B. Warranties to begin at date of substantial completion.

END OF SECTION 220000

PLUMBING MATERIALS AND METHODS
SECTION 22 01 00

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Materials, installation and testing of pipe, tubing and fittings, and valves.
2. Refer to Specification Sections for each system medium (i.e., plumbing, hydronics, gas, and the like) for pipe application.
3. Motors and starters.
4. Rooftop equipment supports.
5. Plumbing identification materials.
6. Seismic/vibration isolation.

1.2 QUALITY ASSURANCE

A. Manufacturer's Inspection: Inspect flanges, fittings and field applied welds in accordance with manufacturer's standard written quality control procedure in accordance with the following techniques:

1. Visual Method: Comply with MSS SP-55 except as otherwise indicated.
2. Radiographic (X-Ray) Method: Employ wherever recommended or required for pressurized piping systems.

B. Welding Qualification: Qualify welding procedures, welders and operators in accordance with ANSI B31.9 for shop and project site welding of piping work.

1.3 SUBMITTALS

A. Piping Materials List: Provide a typewritten list which schedules the piping materials to be used for each system as a function of applicable nominal pipe size ranges. Arrange schedule in outline form for each specific piping system, e.g., "Domestic Water System," "Soil, Waste, and Vent Piping System," and the like. Include ASTM, ANSI or other numbers and other data as necessary to demonstrate compliance with requirements.

B. Test Procedure: Submit a typewritten checklist type of testing procedure indicating testing medium (i.e., water, air, nitrogen, and the like), pipe service, pipe and fitting type and classification, test pressure, pass/fail criteria and other pertinent data.

C. Maintenance Data: Submit maintenance data and parts list for each type valve. Include this data, product data, and certifications in maintenance manual.

PART 2 - PRODUCTS

2.1 PRODUCT STANDARDS

A. References to product Specifications for materials are listed according to accepted base standards. Materials to meet latest approved versions of these standards.
B. See Section 22 00 00, Plumbing Requirements and Section 22 05 00, General Plumbing Systems where piping materials are approved for use.

2.2 ACCESS PANELS

A. Provide flush mounting access panels as required for equipment service of cleanouts, valves, and the like, and other items requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum 24x24 (or required and approved size). Wall access panels to be minimum 12x12 (or required and approved size).
B. Manufacturers: Milcor, Karp, Elmdor, In-Ryko, Acudor, or approved. Provide two keys for each set of locks provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms, and other electrical or electronic equipment spaces and enclosures. Within equipment rooms, provide minimum 3-foot lateral clearance from sides of electric switchgear panels. Do not route piping above electric power or lighting panel, switchgear, or similar electric device. Coordinate with electrical and coordinate exact pipe routing to provide proper clearance with such items.
B. Pressure Piping Routing:

1. Route piping, except as otherwise indicated, vertically and horizontally (sloped to drain). Avoid diagonal runs wherever possible. Orient horizontal routes parallel with walls and beam lines.
2. Install piping as shown or described by diagrams, details and notations on Drawings or, if not indicated, install piping to provide the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.
3. Support piping adjacent to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 1/2 inch wherever furring is indicated for concealment of piping. Allow for insulation thickness. Locate insulated piping to provide minimum 1-inch clearance outside insulation.
4. Wherever possible in finished and occupied spaces, conceal piping from view by locating within column or beam enclosures, hollow wall construction, or above suspended ceilings. Do not encase horizontal routes in solid partitions, except where approved.

C. Preparation:

1. Cast Iron Soil Pipe: Conform with state plumbing code and standards, CISPI recommendations and applicable adopted code amendments.
2. Hubless Cast Iron Joints: Comply with CISPI HSN utilizing calibrated torque wrenches for tightening bands to manufacturer's recommended settings.
3. Unions:

    a. Insulating (Dielectric) Unions: Comply with manufacturer's instructions for installing unions wherever piping of dissimilar metals are adjoined. Install unions in manner which will prevent galvanic action and inhibit corrosion.
    b. Standard Unions: Install where indicated on Drawings and on each side of pieces of equipment to permit easy removal of equipment.

4. Copper Tubing:

    a. Remove burrs from and clean outer surface of tube ends and inner surface of fittings.
    b. Copper-Soldered: Make soldered joints for copper tubing and fittings with code approved solder alloys meeting ASTM and ANSI standards and listings. Solder-paste-flux combination fillers are not approved. Installations to conform to accepted published procedures; i.e., UPC IS 375, IS 21-80 standards and CDA Publications. Use of steel wool for cleaning tube and fittings is prohibited. Apply flux as recommended by manufacturer. Solder domestic hot and cold water and condensate pipe within building above grade with 95 percent tin and 5 percent antimony, Allstate Silver Bearing Solder 430 or other approved solder alloys which do not contain lead or cadmium.
    c. Copper-Brazed: Make brazed joints for copper tubing and fittings with code approved brazing filler alloys meeting ASTM and AWS standards and listings. Filler alloys of BCuP2 classification (e.g., "Phos-0" or "Fos-Copper") may not be used to make joints between copper tubing and cast brass or bronze fittings. Filler alloys containing cadmium are not approved for use in potable water piping. Installations to conform to accepted published procedures, i.e., UPC IS 3-75 standards and CDA Publications. Use of steel wool for cleaning tube and fittings is prohibited. Braze other copper pressure piping underground including water service. Remove bonnets and nonmetallic seats on valves and cool body with damp cloth while soldering or brazing. Remove excess flux from completed joints in accordance with manufacturer's instructions and code standards.
    d. Pressurized Service:

        1) Unless otherwise indicated, wrought copper/bronze solder joint fittings complying with ANSI B16.22-1995.
        2) Copper Tube Unions: Standard products as recommended by manufacturer for use in the service. Rated at 150 percent design operating pressure.
        3) Mechanically Formed Tee Connections:

            a) Form mechanically extracted collars in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not

less than three times the thickness of the tube wall. Fully adjustable collaring device to ensure proper tolerance and complete uniformity of the joint.

b) Notch the branch to conform with the inner curve of the run tube and dimpled to ensure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube.

c) Braze joints in accordance with the Copper Development Association Copper Tube Handbook using B-cup series filler metal. Note: Soft soldered joints will not be permitted.

3.2 PIPE AND PIPE FITTINGS

A. Pipe Sleeves:

1. Lay out work in advance of pouring concrete, furnish, and set sleeves necessary to complete work.
2. Floor Sleeves (Except DWV Piping at Slab on Grade): Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1 inch above finished floor. Caulk pipes passing through floor with nonshrinking grout or approved caulking compound. Provide "Link-Seal" sleeve sealing system for slab on grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with nonshrinking caulking compound. Caulk/seal piping passing through fire-rated building assemblies with UL approved fire-rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
4. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Indicate penetrations on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Plumbing Drawings are diagrammatic. Offset piping as required to meet these limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.

B. Conform with applicable codes and industry standards.

C. Install uninsulated piping so that unrestrained direct contact with the structure or other system installations is avoided. Where contact with or passage through building or structural features cannot be avoided; firmly anchor piping to, or isolated from, the structure to prevent noise transmission and occurrence of physical damage. Install piping to be insulated with adequate clearance around piping to allow for placement of full thickness insulating material.

D. Corrosion Control:

1. Underground Steel Piping Corrosion Protection: Factory wrap uninsulated underground steel piping systems with protective coating composed of a coal-tar saturated wrapping tape over a 20 mil thick coal-tar epoxy coating, equivalent to

"Republic X-Tru-Coat." Wrap joints spirally with a minimum overlap of 1/2 tape width. Extend wrap not less than 3 inches above grade. Provide tinker test to check for holidays. Provide cathodic protection to meet requirements of NACE Standard RP0169-2002.

2. Install hot water heating vessels with a stainless steel fitting at tank and a dielectric fitting on both supply and discharge sides of hot water tanks.

E. Installation/Coordination:

1. Expansion and Flexibility: Install work with due regard for expansion, contraction, and building settlement to prevent damage to the piping, ductwork, equipment and the building and its contents. Provide piping offsets, loops, expansion joints, anchors or other means to control pipe movement, to minimize pipe forces and effects of building settlement.
2. Install piping to prevent stresses and strains to piping and hangers and supports due to expansion or contraction and building settlement. Provide proper loops, guides, offsets, anchor points, or expansion joints. Verify with anticipated settlement or shrinkage of building. Verify construction phasing of project, type of building construction products and type for coordinating installation of piping systems. Include provisions for servicing and removal of equipment without dismantling piping.

3.3 ESCUTCHEONS

A. Install on exposed pipes passing through walls or floors, and on fixture stops and waste connections to wall, except not required in stockrooms.

3.4 PIPING AND EQUIPMENT REMOVAL

A. Piping and equipment removed as salvage by Owner to remain property of the Owner.
B. Remove as shown on drawings. Piping and equipment to be reused where shown. Dispose and remove excess piping and equipment (and not identified by Owner as salvage).

3.5 ACCESSIBILITY

A. Installation of valves, gauges and equipment conveniently and accessibly located with reference to finished building for repairs, removal and service.
B. Access Panels: Label access panels with engraved nameplates indicating function of panel. Seton, Bakelite or approved. Nameplates to have 1/4-inch high white letters on black background, unless noted otherwise.

3.6 PAINTING

A. Ferrous Metal: After completion of plumbing work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, and the like, with one coat of black asphalt varnish or black enamel suitable for hot surfaces.
B. Machinery:

1. In a mechanical room, on the roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
2. See individual equipment specifications for other painting.

C. Structural Steel: Repair damage to structural steel finishes or the finishes of other materials damaged by cutting, welding or patching to match original.

D. Piping: Clean, primer coat, and paint exposed piping on the roof or at other exterior locations with two coats of paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.

3.7 ACCESS PANELS

A. Install ceiling or wall access panels to provide access to concealed valves, motors, shock arrestors, and other plumbing items needing service. Provide access panels at locations required or as specified herein. Coordinate locations/sizes of access panels with Architect prior to work.

3.8 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

B. Manufacturers: Hilti, Proset, or approved.

3.9 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment and plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect. Remove cracked or dented units and replace with new units.

3.10 VALVE INSTALLATION

A. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

C. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

D. Mechanical Actuators: Install with chain operators where indicated. Extend chains to 5 feet above floor and hook to clips to clear aisle passage.

E. Stem Selection: Outside screw and yoke stems, except provide inside screw, nonrising stem where space prevents full opening of OS&Y valves.

F. Seats: Renewable seats, except where otherwise indicated.

3.11 VALVE ADJUSTING AND CLEANING

A. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.

3.12 VALVE IDENTIFICATION

A. General: Provide valve tag on every valve, cock and control device in each piping system. Exclude check valves, valves within factory fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, shutoff valves at plumbing fixtures, and similar rough-in connections of end-use fixtures. List each tagged valve in valve schedule for each piping system.
B. Install mounted valve schedule in each mechanical room.

3.13 PLUMBING EQUIPMENT IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each item of plumbing equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices: water heaters, pumps, and similar equipment.

3.14 PIPING SYSTEM IDENTIFICATION

A. Install pipe markers on each system and include arrows to show normal direction of flow.
B. Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels and plenums), and exterior nonconcealed locations, in locations as follows:

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, or enter nonaccessible enclosures.
4. At access doors, manholes and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50 feet along each piping run, except reduce spacing to 25 feet in congested areas of piping and equipment, i.e., mechanical rooms.

3.15 ADJUSTING AND CLEANING

A. Adjusting: Relocate plumbing identification device which has become visually blocked.
B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.16 CONNECTIONS TO EXISTING

A. Prior to connection of piping to existing as illustrated on Plumbing Drawings, field verify existing conditions and exact sizes and locations of existing piping. Provide additional

offsets, transitions, joints, cut-ins, and replace portions of existing as required to facilitate connections of new as shown on Documents.

3.17 CAULKING

A. Provide Geocel Corporation, (800) 348-7615, Construction 2000 Caulking Sealant. Standard color to match as close as possible to surrounding surface. Application standards, ASTM C920, Type S, Grade NS, Class 25, ICBO approved, Report No. 3680. Apply per manufacturer's recommendations.

END OF SECTION 220100

GENERAL PLUMBING SYSTEMS
SECTION 22 05 00

PART 1 - GENERAL

1.1 SUMMARY

A. Piping system work includes but not limited to:

1. Aboveground soil, waste and vent piping within buildings, including soil stacks, vent stacks, horizontal branches, traps, and connections to fixtures and drains.
2. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to sanitary sewers 5 feet outside foundation wall.
3. Domestic cold-water piping.
4. Domestic hot water piping.
5. Domestic circulating hot water piping.
6. Plumbing Fixtures: See Schedule on Drawings for types.
7. Specialty piping systems.
8. Condensate drain and water piping system for mechanical equipment.
9. Flashing and counterflashing of roof and wall penetrations required by installation of work of this Section.
10. Furnishing and installation of access doors required for work furnished by this Section.
11. Furnishing and installing of sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. Sleeve, wrap and seal piping in concrete.

B. Fixtures:

1. Plumbing fixtures and trim, including rims for sinks and lavatories in casework or counters, chair carriers (as required), drinking fountains, drains, cleanouts, floor sinks, and related fixtures shown on the Drawings.
2. Rough and final connection to equipment and fixtures, relocated or provided under other sections by Owner and under other divisions of the work.
3. Standards and supports for equipment requiring them.
4. Instructions and maintenance manuals for equipment furnished by this Section.

C. Water heaters.
D. Circulation pumps.

1.2 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of plumbing system products, of types, materials, and sizes required.
B. Regulatory Requirements:

1. Codes: Comply with CEC pertaining to plumbing materials, construction and installation of products. Comply with local and state regulations.
2. ANSI Compliance: Comply with applicable American National Institute standards pertaining to products and installation.
3. PDI Compliance: Comply with applicable Plumbing and Drainage Institute standards pertaining to products and installation.
4. Federal Standards: Comply with applicable Federal Specification WW-P-541 Series sections pertaining to plumbing fixtures.
5. NAHB Label: Provide fiberglass bathtub units and shower stalls which have been tested and labeled by NAHB Research Foundation.
6. ADA Compliance: Construct and install barrier-free plumbing fixtures in accordance with "The Americans with Disabilities" Act.
7. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by UL and which comply with NEMA standards.
8. CEC Compliance: Comply with CEC as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

C. Water Heaters:

1. Water heaters and storage tanks to meet current energy efficiency code requirements and be provided with anode rod corrosion protection, internal glass lining, insulated steel jacket with baked enamel finish, and pressure-temperature relief valve to match tank-working pressure. Rate water heaters at 150 PSIG working pressure; rate storage tanks at 125 PSI working pressure. Refer to schedule on Drawings for capacity and model.
2. ANSI Compliance: Comply with NFPA 58 "Liquefied Petroleum Gas Code," as applicable to installation of LP-fired appliances.
3. CSA and NSF Labels: Provide water heaters which have been listed and labeled by CSA and NSF.
4. ASME Code Symbol Stamps: For applicable equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME code symbol.
5. ASME Relief Valve Stamps: Provide water heaters and water tanks with safety relief valves bearing ASME valve markings.
6. Code Compliance: Comply with the UPC and ASHRAE 90.1-1999.
7. PDI Compliance: Comply with applicable Plumbing and Drainage Institute Standards pertaining to factory fabricated water heaters.

D. Pumps:

1. HI Compliance: Design, manufacture and install pumps in accordance with HI "Hydraulic Institute Standards."
2. UL Compliance: Design, manufacture and install in accordance with UL 778 "Motor-Operated Water Pumps."

1.3 SUBMITTALS

A. Product data in accordance with Division 01, Administrative Requirements. Manufacturer's specifications, installation and startup instructions, capacity and ratings, with selection indicated. Provide pump performance curves with selection points indicated. Provide specialties and accessories required for a complete and operable installation.

B. Shop Drawings: Provide assembly type shop drawings indicating dimensions, weights, required clearances, and methods of assembly of components and anchorages.
C. Wiring Diagrams: Ladder type wiring diagrams for components, indicating required field electrical connections.
D. Maintenance Data: Submit maintenance data and parts list for each item. Include "troubleshooting" maintenance guides. Include this data in operation and maintenance manual.

1.4 PLUMBING FIXTURES

A. General: Provide factory-fabricated fixtures of type, style and material indicated on the plumbing fixture connection schedule on the Drawings. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, and as required for complete installation. Where more than one type is indicated, selection is installer's option; but, fixtures of same type must be furnished by a single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

1. Fixtures: Complete with fittings, supports, fastening devices, faucets, valves, traps, stops and appurtenances required.
2. Exposed IPS Piping and Tubing: Brass, chrome plated.
3. Escutcheons: Brass, chrome plated.
4. Fixture Locations: As shown on Drawings.
5. Stops: Stops installed in each supply pipe at each fixture accessibly located with wall escutcheons.
6. Showers: Provide with flow control device to prevent flow over 2.5 GPM.
7. Public Lavatories: Provide with flow control device to prevent flow over 0.5 GPM.
8. Interior Faucets Except Public Lavatories: Provide with flow control device to prevent flow over 2.5 GPM.
9. Bathtubs: Provide waste and overflow assembly with soldered or solvent weld joints. Provide per fire rating of building assemblies.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 CHLORINATION

A. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.
B. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.
C. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.

3.2 OWNER-FURNISHED EQUIPMENT

A. Some equipment is to be furnished under another Contract and is indicated as such on Drawings. Rough-in for such equipment, receive, uncrate, install and connect plumbing equipment, faucets, and fixtures as furnished by others. Furnish and install stops, traps, strainers, backflow preventers, valves and other appurtenances not furnished by others in order to provide a complete operating system.
B. Comply with paragraph on Plumbing Fixtures Installation, this Section, for installation procedures.
C. Refer to plumbing fixture connection schedule on Drawings.

3.3 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.
B. Manufacturers: Hilti, Proset, or approved.

3.4 PROTECTION

A. Protect fixtures and equipment from damage. Replace damaged items with new.
B. Keep pipe openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of the work.
C. Protect bright finished shafts, bearing housings and similar items, until in service; no rust will be permitted.
D. Cover equipment and materials stored on the job site or otherwise suitably protect at the direction of, and to the satisfaction of Architect. If coverings become torn, replace until the equipment is connected and operating.

3.5 PIPING SYSTEMS INSTALLATION

A. Piping:

1. General: Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous materials as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops. Coordinate installation of piping below with structural components and other system installations.
2. Install piping pitched to drain at minimum slope of 1/4 inch per foot (2 percent). Where this slope is impractical, slope at 1/4 inch per foot for pipes below 4-inch size, and 1/8 inch per foot (1 percent) for piping 4 inches and larger, with the approval of the local code authority.
3. Condensate Drain Piping at HVAC Units: Trap condensate drain for HVAC units.

4. Seismic Restraint: Brace mechanical piping and plumbing equipment against lateral movement as detailed in document "Seismic Restraint Manual Guidelines for Mechanical Systems" as published by SMACNA.
5. Rough-in Piping: Provide temporary caps or plugs at piping shown on Drawings to be roughed-in for future connections by others.
6. Sanitary Waste and Storm Drain Piping: Slope at uniform grade of 1/4 inch per foot unless noted otherwise. Make changes in size with reducing and wye fittings. Run exposed piping parallel or perpendicular to building structure.
7. Sanitary Waste Piping from Back-to-Back Water Closets: Provide individual rough-in piping for each back-to-back water closet, no common sanitary cross, double fixture or double combination wye and 1/8 bend fittings allowed.
8. Vent Piping:

    a. General: Horizontal runs free of drops and sloped to drainage system.
    b. Vents-Through-Roof (VTRs): Provide flashing with counterflashing at vent penetrations through roof, as detailed. Wherever vents run up near or inside of exterior walls, offset pipe at underside of roof deck to obtain minimum 5-foot clearance between parapet and roof penetration. Provide code required clearances between vent-through-roof and HVAC equipment on roof. VTR counterflashings to have a manufactured rolled return bend with minimum 1-inch overlap; crimping by hand tools will not be allowed. On single ply vinyl or plastic type roofs, provide flashings as required by roof installer and manufacturer. On raised rib steel roofs, provide flashings as required by roof installer and manufacturer.

B. Cleanouts: Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135 degrees; at minimum intervals of 100 feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Coordinate locations and types of cleanouts with Architect prior to installation.

C. Equipment Connections:

1. Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by code.
2. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
3. Piping Runouts to Fixtures: Provide hot and cold piping runouts to fixtures of sizes indicated, but in no case smaller than required by code.
4. Equipment Connections: Connect hot and cold water piping system to equipment as indicated, and comply with equipment manufacturer's instructions. Provide shutoff valve and union for each connection; provide drain valve on drain connection.

D. Domestic Water Distribution Piping:

1. Water Service Piping: Provide sleeve in foundation wall for water service entry; make entry watertight. Provide shutoff valve at water service entry inside building; pressure gauge, test tee with valve.
2. Water Hammer Arrestors: Install in upright position, in locations and of sizes in accordance with PDI WH-201, and elsewhere as indicated.
3. Group piping installations and valves where possible to obtain maximum practical use of available space.

4. Arrange locations of valves, unions, drains and other components to provide for ease of cleaning, operation, repair or service. Size access panels and locate to provide both acceptable proximity and working space for such devices.
5. Provide valves and shock arrestors where required by code and where otherwise indicated in Specifications and on Drawings.
6. Provide protection plates for piping installed in wood stud walls and other building substructures as required by code.
7. Wherever piping is installed in exterior walls, route on warm side of insulation and as close to inside wall finish as possible, as detailed.
8. Provide low point drains and shutoff valves as required by local AHJ. Provide valve boxes, access panels, and the like, for complete installation.

E. Valves:

1. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.
2. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

F. Backflow Preventers:

1. Install where indicated, and where required by code. Where practical, locate in same room as equipment being protected.
2. Submit product cut sheets to local AHJ for approval prior to purchase.
3. Install as close to wall as possible with clearances for access and maintenance as required by AHJ.
4. Coordinate exact location of installation and type of backflow device serving a particular piece of equipment with AHJ and Architect prior to purchase and installation.
5. Provide wall/floor brackets that are of fully welded, hot dipped galvanized construction, fabricated to meet field conditions. Mount backflow preventer to brackets using cadmium plated "U" type bolts and nuts.
6. Contact: Contact local water district/backflow specialist and request backflow installation literature. Install backflow devices per CEC and local water district/backflow specialist requirements.
7. Route waste piping from air gap waste fitting concealed within walls to point of air gap termination at indirect waste interceptor.

G. Pressure Regulating Valves: Provide inlet and outlet ball valves, and globe valve bypass. Provide pressure gauge on valve outlet.

H. Excavation and Backfill:

1. General: Perform necessary excavation and backfill required for installation of mechanical work. Repair piping or other work damaged by Contractor's operations.
2. Water: Keep excavations free of standing water. Reexcavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
3. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of a testing laboratory.

4. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat, and the like), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material at no expense to Owner. Adequate width of trench for proper installation of piping or conduit.
5. Support Foundations:

   a. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to a depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other sections of Specifications or drawings.
   b. Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
   c. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form a base for replacement of required thickness of bedding material.

	Class A		Class B	
Material Passing:	Min.	Max.	Min.	Max.
3/4-inch Square Opening	27	47	0	1

   d. Bedding Material: Full bed site piping on sand, pea gravel or 3/4-inch minus crushed rock. Place a minimum 4-inch deep layer of sand or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide a firm foundation.

6. Backfilling:

   a. Following installation and successful completion of required tests, backfill piping in lifts.

      1) In "Pipe Zone," place backfill material and compact in lifts not to exceed 6 inches in depth to a height of 12 inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
      2) Place and compact backfill above "Pipe Zone" in layers not to exceed 12 inches in depth.

   b. Backfill Material:

      1) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.

2) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."

7. Compaction of Trench Backfill:

a. Where compaction of trench backfill material is required, use one of following methods or combination thereof:

1) Mechanical tamper,
2) Vibratory compacter, or
3) Other approved methods appropriate to conditions encountered.

b. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

I. Testing:

1. General:

a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.
b. Notify Architect and local Plumbing Inspector 2 days before tests.
c. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to a water pressure of a minimum of 5-PSI head. System to hold water without a water level drop greater than 1/2 pipe diameter of largest nominal pipe size within a 24-hour period. Test system in sections if minimum head cannot be maintained in each section. The 5-PSI head to be the minimum pressure at the highest joint.
d. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for a period of two hours with no loss in pressure.
e. Send test results to Architect for review and approval.

2. Testing of Pressurized Systems:

a. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
b. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

c. Test hot and cold domestic water piping systems upon completion of rough in and before connection to fixtures at a hydrostatic pressure of 125 PSIG.

3. Repair:

a. Repair piping system sections which fail the required piping test by disassembly and reinstallation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
b. Drain or purge test water, air, or nitrogen from piping system after testing and repair work have been completed.

J. Water Hammer Arrestors (Shock Absorbers): Locate shock absorbers in supply pipe in accordance with recommendations of Plumbing and Drainage Institute PDI-WH201. Install ahead of solenoid operated valves. Determine size of absorber by fixture unit value of fixture supplied, using PDI symbols to designate sizes. Provide access panel for each shock absorber.

3.6 FIXTURES INSTALLATION

A. General:

1. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes.
2. Verification of Conditions: Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures.
3. Set and connect to soil, waste, vent and water piping in neat, finished and uniform manner. Connections to be equal height, plumb and set at right angles to floor, wall or both unless otherwise required or specified.
4. Seal fixtures mounted on floors and walls at abutting joints with approved sealant compounds as directed by Architect.
5. For ADA accessible toilets, provide with handle at wide portion of stall.
6. Lavatories: Set mixing valves to limit outlet temperature to 110F.

B. Fixture Locations: As shown on Drawings. Center water closets and urinals between privacy partitions unless noted otherwise.
C. Stops: Stops installed in each supply pipe at each fixture accessibly located with stops of loose key type. Concealed stops to be screwdriver or loose key type with wall escutcheons.
D. Fixture Supports:

1. Support wall hung water closets, urinals and lavatories on heavy duty, full size, and concealed, commercial grade chair carriers mounted to floor structure. Refer to plumbing fixture connection schedule on drawings.
2. Support other fixtures mounted on stud partitions on heavy concealed wall brackets bolted to a 1/4-inch thick by 5-inch high steel plate anchored firmly to studs with

bolts (or welded to metal studs). Plate to extend one stud each way beyond fixture mounting point width.

E. Flush Valves: Provide "drop-ear" ells or couplings in wall at water supply outlets to flush valves; anchor firmly to structure. At ADA accessible fixtures, face handle to wide portion of stall.

F. After fixtures are set in place and secured to walls, caulk around between fixtures and wall with white silicone caulking compound. Dow Corning 780, General Electric Construction Sealant, or approved.

G. Set countertop lavatories and stainless steel sink rims in waterproof sealant made for application.

H. Adjust self-closing faucets to provide minimum of 10 seconds of waterflow, and maximum of 15 seconds.

I. After fixture installation is complete, cover and protect rims, fronts and exposed parts until completion of construction phase. Contractor to be responsible for damage to fixtures and assumes related fixture repair or replacement costs.

J. Adjusting and Cleaning: Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation. Adjust water pressure at drinking fountains, faucets, shower valves and flush valves to provide proper flow stream and specified GPM. Repair leaks at faucets and stops.

K. Extra Stock: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner.

L. Field Quality Control:

1. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
2. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect. Remove cracked or dented units and replace with new units.

M. Adjusting and Cleaning: Clean piping exterior surfaces. Comply with Section 22 07 00, Plumbing Insulation, as applicable. Flush out water filled or drainage piping systems with clean water.

N. Hose Bibb Piping: Provide each hose bibb with an individual accessible shutoff valve (ball type). Locate where shown on Drawings. Provide full access.

3.7 FLOOR DRAINS AND FLOOR SINKS

A. General: Install drains in accordance with manufacturer's written instructions and in locations indicated.

B. Coordinate with piping as necessary to interface drains with drainage piping systems.

C. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of floor drains flush with finished floor. Set floor sinks as required by local codes.

D. Install drain-flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

E. Position drains so that they are accessible and easy to maintain.

F. Coordinate drain flashing, flanges and strainer types and depths with floor substrate and topping configuration.

G. Primers:

1. Prime drains that experience intermittent use. Refer to Drawings and coordinate location with Architect. Coordinate with local AHJ for exact requirements.
2. Primer Locations:

a. Other Areas: PPP-type trap-priming valve. Do not install primer valves above ceiling. Coordinate trap primer locations with Architect/Engineer. If installed in wall, provide access panel and coordinate exact panel location with Architect.

3.8 HOSE BIBBS (INSIDE)

A. Install on exposed piping where indicated, with vacuum breaker.

3.9 SILL FAUCETS

A. Install on concealed piping where indicated, with vacuum breaker.

3.10 HOSE BIBBS AND HYDRANTS

A. Install where indicated, with vacuum breaker and in accordance with manufacturer's installation instructions.

3.11 CIRCULATING PUMPS

A. Install per manufacturer's instructions.
B. Adjust flow rate to design point.

END OF SECTION 220500

PLUMBING PIPE AND FITTINGS
SECTION 22 05 12

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Materials, installation and testing of pipe, tubing and fittings.
2. Refer to Specification Sections for each system medium (i.e., plumbing, hydronics, gas, and the like), for pipe application.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping products of types and sizes required.
2. Welding Qualification: Qualify welding procedures, welders and operators in accordance with ANSI B31.9 for shop and project site welding of piping work.

B. Manufacturer's Inspection: Inspect flanges, fittings and field applied welds in accordance with manufacturer's standard written quality control procedure in accordance with the following techniques:

1. Visual Method: Comply with MSS SP-55 except as otherwise indicated.
2. Radiographic (X-Ray) Method: Employ wherever recommended or required for pressurized piping systems.

1.3 SUBMITTALS

A. Piping Materials List: Provide a typewritten list which schedules the piping materials to be used for each system as a function of applicable nominal pipe size ranges. Arrange schedule in outline form for each specific piping system, e.g., "Domestic Water System," "Soil, Waste, and Vent Piping System," and the like. Include ASTM, ANSI or other numbers and other data as necessary to demonstrate compliance with requirements.

B. Test Procedure: Submit a typewritten checklist type of testing procedure indicating testing medium (i.e., water, air, nitrogen, and the like), pipe service, pipe and fitting type and classification, test pressure, pass/fail criteria and other pertinent data.

PART 2 - PRODUCTS

2.1 PIPING - GENERAL

A. Provide pipe, tube and fittings of the type, fitting requirements, grade, class, size and weight indicated or required for each service, as indicated in other Division 22 Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.

2.2 STEEL PIPE

A. ASTM A53, Welded or Seamless, Grade B: Schedule as specified.
B. ASTM A135, Electric Resistance Welded, Grade B: Black, unless otherwise indicated, schedule as specified.

2.3 COPPER TUBE

A. Temper: Annealed (hard drawn).
B. Water Service: ASTM B88, Type as indicated for each service.
C. Drain, Waste, and Vent (DWV): ASTM B306.

2.4 CAST IRON PIPE

A. ASTM A74, hub-and-spigot, service weight.
B. ASTM A888/CISPI 301 hubless, including coupling assembly.

2.5 FITTINGS FOR STEEL PIPE

A. General: Flanges, fittings, unions and other products, mark in accordance with MSS SP-25.
B. Welding Fittings: Wrought carbon steel fittings, ASTM A234, ANSI B16.9, B16.28. Butt-welding type unless otherwise indicated to be socket-welding type.
C. Branch Connections: From mains or headers 2-1/2 inches or larger, welded tees or forged welding outlets.
D. Welding Outlets: "Weldolets" or "Threadolets" equivalent to Bonney Forge. Use forged welding outlets wherever branch line is at least 1 nominal pipe size smaller than local main or header.
E. Threaded Fittings: ANSI B2.1, ASTM A47, 150 PSI rating, except where otherwise specified, prevailing codes or requirements or Specifications dictate use of 300 PSI rating. Fabricate from standard malleable iron with dimensions conforming to ANSI B16.3.

    1. Fitting requirements for galvanized steel piping systems to be the same as for black steel pipe except each to have galvanized coating.
    2. Fittings for waste, vent and drainage piping to be drainage pattern type.

F. Flanges: Carbon steel conforming to ASTM A105, ANSI B16.5, and factory forged in the USA. Flanges which have been machined, remade, painted, or are nondomestic origin are not acceptable. Provide raised or full face ends wherever indicated or required.
G. Unions: ANSI B16.39, ASTM A47, and be fabricated from malleable iron with bronze-to-iron ground joints rated at 150 percent design operating pressure. Threads: ANSI B2.1.

H. Fasteners: Semi-finished carbon steel bolts and hex nuts conforming to ASTM A307. Threads and Dimensions: ANSI B1.1 and B18.2.
I. Threaded Pipe Plugs: ANSI B16.14.
J. Thread Lubricant: RectorSeal No. 5 or Slic-tite Teflon Paste.

2.6 FITTINGS FOR COPPER TUBE

A. Wrought copper/bronze solder joint fittings complying with ANSI B16.22.
B. DWV Service:

1. Cast Copper Solder Joint Drainage Fittings: ANSI B16.23.
2. Wrought Copper Solder Joint Drainage Fittings: ANSI B16.29.

2.7 FITTINGS FOR CAST IRON PIPE

A. Hubless Cast Iron Drainage Pipe Fittings: CISPI 301 as manufactured by ABI, Charlotte or Tyler with stainless steel clamp assemblies.

1. Manufacturers for standard duty applications: Anaco, Mission, or Tyler.

2.8 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

A. Insulating (Dielectric) Unions: Standard units recommended by manufacturer for use in the service indicated, which isolate ferrous from nonferrous piping, and prevent galvanic corrosion action. Minimum rated "flashover" voltage: 600 volts. Watts 3000 Series. Provide insulated flanges for flanged piping system connection to dissimilar metals.
B. Welding Materials: Comply with Section 2-C of ASME Boiler Code, as applicable.
C. Tin-Antimony Soldering Materials: ASTM B13.
D. Gaskets for Flanged Joints: ANSI B16.12; full faced for cast iron flanges; raised face for steel flanges, unless otherwise indicated or recommended by manufacturer. Gaskets: Minimum 1/8-inch thick fabricated from nonasbestos bases.
E. Copper-Brazed: Make brazed joints for copper tubing and fittings with code approved brazing filler alloys meeting ASTM and AWS standards and listings. Filler alloys of BCuP2 classification (e.g., "Phos-O" or "Fos-Copper") may not be used to make joints between copper tubing and cast brass or bronze fittings. Filler alloys containing cadmium are not approved for use in potable water piping. Installations conform to accepted published procedures, i.e., UPC Installation Standard 3-75 and CDA Publications. Use of steel wool for cleaning tube and fittings is prohibited.

2.9 ACID-RESISTANT DRAIN PIPE

A. Schedule 40 flame resistant PVDF pipe and fittings with mechanical or thermal fusion type joints. Piping system meets the minimum ASTM E84 requirement of 25/50 flame propagation/smoke density rating. Connect mechanical joints with stainless steel couplings having one-piece, sintered, nonporous PTFE or PFA (Teflon) liners. Make fusion joints in accordance with manufacturer's instructions. Union nut/compression ring mechanical joints for polypropylene piping may be used in waste and vent piping installations above finished floor; subject to approval by jurisdictional authority. Enfield, Orion, Zurn, or approved.

B. Type 316L stainless steel (chromium nickel) with push fit (spigot and socket) joints and rubber EPDM/viton seals. Rate components for acid/corrosion waste and vent system. Blucher-Josam, or approved.
C. Borosilicate glass and pipe fittings with compression type stainless steel couplings, with a tetrafluoroethylene inner seal ring. Kimex, or approved.

2.10 UNIONS

A. Steel Pipe Union: 150 PSI malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe.
B. Copper Pipe Union: 200 PSI working pressure. Bronze body, solder or grooved ends. Pipes 2 inches and under use ground joint, pipes 2-1/2 inches and larger use flanged face or grooved ends.
C. Insulating Unions: 250 PSI working pressure. Pipe ends and material to match piping. Electric current below 1 percent of galvanic current. Gasket material as recommended by manufacturer. Epco or approved.

2.11 ESCUTCHEONS

A. Brass material, chrome plated finish. Size sufficient to cover pipe openings through wall, floor or ceiling. Set screw or spring to secure to pipe. Coordinate opening sizes.

2.12 ACCESS PANELS

A. Provide flush mounting access panels as required for service of cleanouts, valves, and the like, and other items requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum 24x24 (or required and approved size). Wall access panels to be minimum 12x12 (or required and approved size).
B. Manufacturers: Milcor, Karp, Elmdor, In-Ryko, Acudor, or approved. Provide two keys for each set of locks provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms, and other electrical or electronic equipment spaces and enclosures. Within equipment rooms, provide minimum 3 feet lateral clearance from sides of electric switchgear panels. Do not route piping above electric power or lighting panel, switchgear, or similar electric device. Coordinate with electrical and coordinate exact pipe routing to provide proper clearance with such items.
B. Installation/Coordination:

1. General: Comply with basic requirements of Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment. Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each route with a minimum of joints and couplings, but with adequate and accessible unions or flanges for disassembly, maintenance, and replacement of valves and equipment. Reduce sizes by use of reducing fittings.

Align piping accurately at connections, within 1/16-inch misalignment tolerance. Comply with ANSI B31.9 Code for Pressure Piping.

2. Installed piping not to interfere with maintenance of equipment, opening of doors or other moving parts nor be directly above or near the electrical equipment.
3. Support piping such that connected equipment and flanges do not bear weight of piping.
4. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near the riser or, preferably, by a base fitting set on a pedestal.
5. Piping not to be suspended or supported by pumps. Apply no force to pumps by connecting pipes. After final pipe adjustments and initial operational verification of the pumps, recheck alignment of pumps and realign as required.
6. Piping systems are to be installed to drain. Provide properly sized drain valves at low points.
7. Ream pipes after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods for opening and closure.
8. Remake or replace defective, leaking or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.
9. Install piping to prevent stresses and strains to piping and hangers and supports due to expansion or contraction and building settlement. Provide proper loops, guides, offsets, anchor points, or expansion joints. Verify with anticipated settlement or shrinkage of building. Verify construction phasing of project, type of building construction products and type for coordinating installation of piping systems. Include provisions for servicing and removal of equipment without dismantling piping.
10. Piping Systems Routing Within Unconditioned Spaces, Plenums, Chases, or Cavities:

    a. Unless absolutely unavoidable, route fluid filled and (or) pressurized piping systems on the "warm" side of local building wall, roof, or ceiling thermal insulation batts, boards, or blankets as near to heated space as practical.
    b. Whenever such routing as described above is entirely impractical or impossible, provide heat tracing systems to piping, wherever necessary. Inform Architect before proceeding.

11. Expansion and Flexibility: Install work with due regard for expansion, contraction, and building settlement to prevent damage to the piping, ductwork, equipment and the building and its contents. Provide piping offsets, loops, approved type expansion joints, anchors or other means to control pipe movement, to minimize pipe forces and effects of building settlement.
12. Corrosion Control:

    a. Underground Steel Piping Corrosion Protection: Factory wrap uninsulated underground steel piping systems with protective coating composed of a coal-tar saturated wrapping tape over a 20 mil thick coal-tar epoxy coating, equivalent to "Republic X-Tru-Coat." Wrap joints spirally with a minimum overlap of 1/2 tape width. Extend wrap not less than 3 inches above grade. . Provide tinker test to check for holidays. Provide cathodic protection to meet requirements of NACE Standard RP0169-2002.

b. Install hot water heating vessels with a stainless steel fitting at tank and a dielectric fitting on both supply and discharge sides of hot water tanks.

13. Pipe Sleeves:

a. Lay out work in advance of pouring concrete and furnish and set sleeves necessary to complete work.
b. Floor Sleeves (Except DWV Piping at Slab on Grade): Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1 inch above finished floor. Caulk pipes passing through floor with nonshrinking grout or approved caulking compound. Provide "Link-Seal" Type S sleeve sealing system for slab on grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements.
c. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with nonshrinking caulking compound. Caulk/seal piping passing through fire-rated building assemblies with UL approved fire-rated assemblies. Provide fire-rated assemblies per local AHJ requirements.

14. Conform to applicable codes and industry standards.
15. Install uninsulated piping so that unrestrained direct contact with the structure or other system installations is avoided. Where contact with or passage through building or structural features cannot be avoided; firmly anchor piping to, or isolated from, the structure to prevent noise transmission and occurrence of physical damage. Install piping to be insulated with adequate clearance around piping to allow for placement of full thickness insulating material.

C. Pressure Piping Routing:

1. Route piping, except as otherwise indicated, vertically and horizontally (sloped to drain). Avoid diagonal runs wherever possible. Orient horizontal routes parallel with walls and beam lines.
2. Install piping as shown or described by diagrams, details and notations on Drawings or, if not indicated, install piping to provide the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.
3. Support piping adjacent to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 1/2 inch wherever furring is indicated for concealment of piping. Allow for insulation thickness. Locate insulated piping to provide minimum 1-inch clearance outside insulation.
4. Wherever possible in finished and occupied spaces, conceal piping from view by locating within column or beam enclosures, hollow wall construction, or above suspended ceilings. Do not encase horizontal routes in solid partitions, except where approved.

D. Preparation:

1. Cast Iron Soil Pipe: Conform with state plumbing code and standards, CISPI recommendations and applicable adopted code amendments.
2. Hubless Cast Iron Joints: Comply with CISPI HSN utilizing calibrated torque wrenches for tightening bands to manufacturer's recommended settings.
3. Unions:

    a. Insulating (Dielectric) Unions: Comply with manufacturer's instructions for installing unions wherever piping of dissimilar metals are adjoined. Install unions in manner which will prevent galvanic action and inhibit corrosion.
    b. Standard Unions: Install where indicated on Drawings and on each side of pieces of equipment to permit easy removal of equipment.

4. Copper Tubing:

    a. Remove burrs from and clean outer surface of tube ends and inner surface of fittings.
    b. Copper-Soldered: Make soldered joints for copper tubing and fittings with code approved solder alloys meeting ASTM and ANSI standards and listings. Solder-paste-flux combination fillers are not approved. Installations to conform to accepted published procedures, i.e., UPC IS 375, IS 21-80 standards and CDA Publications. Use of steel wool for cleaning tube and fittings is prohibited. Apply flux as recommended by manufacturer. Allstate Silver Bearing Solder 430 or other approved solder alloys which do not contain lead or cadmium.
    c. Copper-Brazed: Make brazed joints for copper tubing and fittings with code approved brazing filler alloys meeting ASTM and AWS standards and listings. Filler alloys of BCuP2 classification (e.g., "Phos-0" or "Fos-Copper") may not be used to make joints between copper tubing and cast brass or bronze fittings. Filler alloys containing cadmium are not approved for use in potable water piping. Installations to conform to accepted published procedures, i.e., UPC IS 3-75 standards and CDA Publications. Use of steel wool for cleaning tube and fittings is prohibited. Remove bonnets and nonmetallic seats on valves and cool body with damp cloth while soldering or brazing. Remove excess flux from completed joints in accordance with manufacturer's instructions and code standards.
    d. Copper-Rolled Joints: Pipe ends clean and free from indentations, projections and roll marks in the area from pipe end to rolled area for proper sealing of gasket. Apply a thin uniform coat of nonpetroleum-based lubricant to the gasket, coupling or housing by brush or hand. Place the gasket over one pipe end, the pipe ends aligned and brought together, and the gasket positioned between rolled area and pipe ends. Assemble the coupling housing over the gasket with housing keys engaging both rolled areas. Insert the bolts and nuts started, uniformly tighten until the housing bolt pads are firmly together, metal to metal.
    e. Pressurized Service:

        1) Unless otherwise indicated, wrought copper/bronze solder joint fittings complying with ANSI B16.22.1995.

2) Copper Tube Unions: Standard products as recommended by manufacturer for use in the service. Rated at 150 percent design operating pressure.
3) Mechanically Formed Tee Connections:

a) Form mechanically extracted collars in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Fully adjustable collaring device to ensure roper tolerance and complete uniformity of the joint.
b) Notch the branch to conform with the inner curve of the run tube and dimpled to ensure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube.
c) Braze joints in accordance with the Copper Development Association Copper Tube Handbook using B-cup series filler metal. Note: Soft soldered joints will not be permitted.

3.2 FIELD QUALITY CONTROL

A. Inspection:

1. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
2. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect. Remove cracked or dented units and replace with new units.

3.3 ADJUSTING AND CLEANING

A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of painting, insulation, or coatings. Comply with the preparation requirements of Section 22 05 53, Identification for Plumbing Piping and Equipment, and Section 22 07 00, Plumbing Insulation, as applicable. Flush out water filled or drainage piping systems with clean water, and flush other piping systems with dry air or nitrogen after completing required tests. Inspect each segment of each system for completion of joints, supports, and accessory items.
B. Inspection: Inspect pressurized piping in accordance with the procedures of ANSI B31.9.

3.4 PROTECTION

A. Protect piping from damage. Replace damaged items with new.

3.5 ESCUTCHEONS

A. Install on exposed pipes passing through walls or floors, and on fixture stops and waste connections to wall.

3.6 ACCESS PANELS

A. Install wall and ceiling access panels to provide access to concealed valves, fans, motors, shock arrestors, coils and other mechanical items needing service. Provide access panels at locations required or specified herein. Coordinate locations/sizes of access panels with Architect prior to work.

END OF SECTION 220512

GENERAL-DUTY VALVES FOR PLUMBING PIPING
SECTION 22 05 23

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Materials, installation and testing of valves, including the following:

1. Gate valves.
2. Globe valves.
3. Drain valves.
4. Ball valves.
5. Balancing valves.
6. Swing check valves.

B. Refer to Specification sections for each system medium (i.e., plumbing, hydronics, gas, and the like), for valve application.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of valves of types and sizes required.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of valve.
B. Maintenance Data: Submit maintenance data and parts list for each type valve. Include this data, product data, and certifications in maintenance manual.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. General:

1. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
2. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6 inches and smaller, and 4 inches and smaller for plug valves. Provide gear operators for quarter-turn valves 8 inches and larger and plug valves 5 inches and larger. Provide chain-operated sheaves and chains for overhead valves.
3. End Connections: Mate with pipe, tube and equipment connections. Where more than one type is indicated, selection is installer's option.

B. Service:

1. Domestic Hot and Cold Water Shutoff and Isolation Valves:

a. Pipe Sizes 2-1/2 Inches and Smaller: Ball valve.
b. Pipe Sizes 3 Inches and Larger: Gate valve.

2. Drain Service; All Pipe Sizes: Drain valves.
3. Check Valves: Swing check valve.

C. Manufacturers: Crane, Fairbanks, Anvil, Jenkins, Kennedy, Walworth, Red/White (commercial grade), Mueller, Legend, Conbraco, Nibco, DeZurik, Hays, Powell, Stockham, Hammond, Watts, Milwaukee, or approved. Note: See individual sections for specialty valves (balancing valves, pressure regulators, relief valves, earthquake valves, gas valves).

2.2 GATE VALVES

A. 2 Inches and Smaller: Class 125, bronze, screw-in bonnet, solid wedge. Rising Stem: Nibco 111. Non-Rising Stem: Nibco 113.
B. 2-1/2 Inches and Larger: Flanged ends, Class 125, iron body, bolted bonnet, solid wedge, bronze mounted. OS&Y: Nibco 617-0. Nonrising Stem: Nibco F-619.

2.3 GLOBE VALVES

A. 2 Inches and Smaller: Class 125, bronze body, screw-in bonnet, integral seat, renewable disc, straight body, Nibco 211. Angle body, Nibco 311.
B. 2-1/2 Inches and Larger: Class 125, iron body, bolted bonnet, flanged ends, renewable seat and disc, bronze mounted. Straight Body: Nibco F-718-B. Angle Body: Nibco F-818-B.

2.4 DRAIN VALVES

A. Class 125, bronze body, screw-in bonnet, rising stem, composition disc, 3/4-inch hose outlet. Threaded: Nibco 73. Solder: Nibco 72.

2.5 BALANCING VALVES

A. Bronze with a machined orifice flow restriction, multi-turn globe type valve, internal O-rings, rated working pressure of at least 240 PSIG (175 PSI iron construction, 2-1/2 inches and larger), flow setting indicating pointer and calibrated nameplate, memory stops, and pressure readout port with integral check valve on each side of the orifice. Nibco, Wheatley, Tour & Anderson, or Illinois.
B. Combination check valve/balancing valve not allowed, 1/4 turn plug type allowed on 8 inches and larger pipe only.

2.6 BALL VALVES

A. 2-1/2 Inches and Smaller: 150 PSI, bronze body, full port, bronze trim, three-piece construction, TFE seats and seals. Threaded: Nibco T-595-Y. Soldered: Nibco S-595-Y.

2.7 SWING CHECK VALVES

A. 2 Inches and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc. Nibco 413.
B. 2-1/2 Inches and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends. Nibco F918.
C. Rubber Flapper Check Valve: Horizontal or vertical upward flow installation. Working pressure to 175 PSI. Ductile iron or cast iron body. Steel reinforced Buna-N rubber flapper epoxy coating on wetted parts. Apco Series 100l, Crispin RF Series.

2.8 PRESSURE AND TEMPERATURE RELIEF VALVES

A. Bronze body, ASME/CSA rated. Sized to meet BTUH and code requirements. Manual lever operator, ANSI listed. Stainless steel or thermal bond coated thermostat tube. Watts, Cash-Acme, or approved.

2.9 PRESSURE REGULATING VALVES

A. Water: Bronze body, diaphragm or piston type, spring actuated, with separate or integral strainer, pressure range to suit conditions, code approved for potable water use. Provide shutoff valves, pressure relief valves, unions, drain valve and bypass in accordance with code requirements. Manufacturers: Cash-Acme, Watts, Wilkins, Mueller approved.
B. Water: Bronze body construction, stainless steel strainer screen, thermal expansion bypass with renewable stainless steel seat and high temperature resisting diaphragm. Watts, Febco, Wilkins, or approved.

2.10 ACCESS PANELS

A. Provide flush mounting access panels as required for service of fire dampers, cleanouts, valves, and the like, and other items requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum 24x24 (or required and approved size). Wall access panels to be minimum 12x12 (or required and approved size).
B. Manufacturers: Milcor, Karp, Elmdor, In-Ryko, Acudor, or approved. Provide two keys for each set of locks provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose end adapter for each valve that must be installed with stem below horizontal plane.
C. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.
D. Mechanical Actuators: Install with chain operators where indicated. Extend chains to 5 feet above floor and hook to clips to clear aisle passage.

E. Stem Selection: Outside screw and yoke stems, except provide inside screw, nonrising stem where space prevents full opening of OS&Y valves.
F. Seats: Renewable seats, except where otherwise indicated.
G. Installation of Check Valves:

1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow.

H. Balancing Valves: Install with minimum 4 pipe diameters, straight inlet and outlet pipe or per manufacturer's recommendations.

3.2 VALVE ADJUSTING AND CLEANING

A. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.
B. Valve Identification. Tag valves per Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.3 ACCESS PANELS

A. Install wall and ceiling access panels to provide access to concealed valves, fans, motors, shock arrestors, fire dampers, terminal units, coils and other mechanical items needing service. Provide access panels at locations required or specified herein. Coordinate locations/sizes of access panels with Architect prior to work.
B. Where access panels are for service of fire, fire/smoke, or smoke dampers, stencil the words "Fire Damper," "Fire/Smoke Damper," or "Smoke Damper" in 1/2-inch-high capital letters on the outside of the panels.

END OF SECTION 220523

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

SECTION 22 05 29

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Material and installation of supports, anchors and sleeves including: horizontal piping hangers and supports; vertical piping clamps; hanger rod attachments; building attachments; saddles and shields; miscellaneous materials; equipment supports; anchors; equipment supports; wall and floor sleeves; and escutcheon plates.

1.2 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in the manufacture of supports and anchors, of types and sizes required.

B. Regulatory Requirements:

1. Provide pipe hangers and supports whose materials, design and manufacture comply with MSS SP-58, "Pipe Hangers and Supports - Materials, Design and Manufacture," latest edition.
2. Select and apply pipe hangers and supports complying with MSS SP-69, "Pipe Hangers and Supports - Selection and Application," latest edition.
3. Keep a copy of the above-referenced standards on the construction site at all times.

C. Seismic: Provide per Section 22 00 00, Plumbing Requirements.

D. Manufacturers: B-Line, Elcen Metal Products Co., F&S Control, Globe, Kindorf, Kinline, Michigan, Superstrut, Unistrut, Power-Strut. Note: See individual Sections for roof equipment support.

1.3 SUBMITTALS

A. Submit the following:

1. Manufacturer's technical product data, including installation instructions, for each type of support, anchor and sleeve. Include UL approval drawing from manufacturer for each different pre-engineered firestop assembly.
2. Assembly type shop drawings for each type of sleeve, indicating dimensions, weights, required clearances, and methods of assembly of components.
3. Shop drawings for each individual roof pipe curb assembly, indicating number and location of each pipe or conduit which is to pass through the curb. Indicate pipe insulation requirements.

PART 2 - PRODUCTS

2.1 PIPING HANGERS AND SUPPORTS

A. General:

1. Horizontal Piping Hangers and Supports-Horizontal and Vertical Piping, and Hanger Rod Attachments: Factory fabricated horizontal piping hangers and supports complying with MSS SP-58, to suit piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. 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 copper-plated hangers and supports for uninsulated copper piping systems.
2. Building Attachments: Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.
3. Saddles and Shields: Factory fabricated saddles or shields under piping hangers and supports for insulated piping. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12 inches in length (4-inch pipe and larger to be three times longer than pipe diameter).
4. Roller Hangers: Adjustable roller hanger. Black steel yoke, cast iron roller.
5. Concrete Inserts: Malleable iron body, black finish. Lateral adjustment.
6. Continuous Concrete Insert: Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.
7. Below Ground:

    a. Pipe Hangers Sizes: Adjustable Clevis type, UL listed, stainless steel Type 304. Michigan 406.
    b. Rod: 5/8-inch stainless steel Type 18-8.
    c. Eyebolt: Stainless steel Type 18-8.
    d. Nuts and Washers: Stainless steel Type 18-8.

B. Pipe Hangers Size 2 Inches and Smaller: Adjustable swivel ring hanger, UL listed. Michigan 100 or 101.

C. Pipe Hangers Size 2-1/2 Inches and Larger: Adjustable clevis type, UL listed. Michigan 400.

D. Riser Clamps: Steel, UL listed. Michigan 510 or 511. Copper coated; Michigan 368.

E. Plumbers Tape: Not permitted as pipe hangers or pipe straps.

F. Michigan numbers are indicated for type and quality. Comparable products manufactured by Globe, Elcen, B-Line, Kindorf, Kinline, Unistrut, Anvil, Super Strut, Tolco, PHD, Power-Strut, or approved.

2.2 FREESTANDING ROOF PIPE SUPPORTS

A. Support piping on roof with polyethylene high-density U.V. resistant quick "pipe" block with foam pad, manufactured by Erico Pipe Piers or Nelson-Olsen Inc., distributed by Bongard Corporation. Recommended installation is for quick "pipe" blocks to be freestanding. Piping 3 inch and larger mounted on roller hangers. Wood block supports are not acceptable.

2.3 WALL AND FLOOR SLEEVES

A. USE FOR SMALLER BASIC, BROADSCOPE TYPE PROJECTS] Minimum 20 gauge galvanized steel in concrete, 18 gauge in other construction. 1/2-inch clearance around pipe or insulation. Provide UL approved fire-rated assemblies/caulking as required. 3M or approved.

2.4 ANCHORS

A. General: Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project structural engineer.
B. Manufacturers: Anchor-It, Hilti Hit System, Epcon System, or Power Fast System.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine the Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.
B. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.

3.2 INSTALLATION

A. Building Attachments: Install within concrete or on structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert secure to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.
B. Hangers and Supports:

1. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers. Maximum spacings: MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not support piping from other piping.
2. Support fire protection piping independently of other piping.
3. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.
4. Allow controlled movement of piping systems to permit freedom of movement between pipe anchors and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
5. Piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

6. Insulated Piping: Provide protection saddles where insulation without vapor barrier is indicated. Provide protection shields on insulated piping where insulation with a vapor barrier is indicated.
7. Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms, and other electrical or electronic equipment spaces and enclosures. Within equipment rooms, provide minimum 3 feet lateral clearance from sides of electric switchgear panels. Do not route piping above electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact pipe routing to provide proper clearance with such items.
8. Hanger Spacing:

    a. Cast Iron Soil Pipe: Within 1 foot of each side of joints and at intervals not to exceed 8 feet.
    b. Steel Pipe 1 Inch and Smaller: 6 feet.
    c. Steel Pipe 1-1/4 Inches and Larger: 10 feet.
    d. Copper Tubing 1-1/2 Inches and Smaller: 6 feet.
    e. Copper Tubing 2 Inches and Larger: 10 feet.
    f. 90 Degree Offsets: Within 2 feet, both sides of offsets.

C. Anchors: Install at ends of principal pipe runs where indicated on Drawings. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
D. Equipment Curbs, and Pipe Curb Assemblies:

1. Provide prefabricated units for roof membrane and insulation penetrations related to plumbing equipment. Coordinate with roofing system. Set supports on the structural deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.
2. Pipe Curb Assemblies: Provide for piping and electrical conduit which penetrates the structural roof deck to service equipment above the roof level (i.e., piping, electrical power and control wiring).
3. Piping above roof to be supported with freestanding roof pipe supports unless detailed otherwise.

E. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor walls, and through equipment room walls and floors.
F. "Link-Seal" Pipe Sleeves: Install at exterior wall piping penetrations. For penetrations below grade provide Schedule 40 steel sleeve with 1-inch, continuously welded, "weep ring" centered on length of sleeve.
G. Fabricated Pipe Sleeves:

1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, will have free movement within the sleeve, including allowance for thermal expansion. Sleeves not to be more than 1 pipe size larger than piping or piping plus insulation size.
2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1/4 inch above floor finish and, where floor surface drains to a floor drain, extend floor sleeve 3/4 inch above floor finish.

3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.
4. Seal each end airtight with a resilient nonhardening sealer.

H. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

1. Install fabricated pipe sleeve.
2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve I.D. with specified material.

I. Piping penetrations through fire-rated (1 to 3 hour) assemblies: Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.

3.3 ADJUSTING AND PAINTING

A. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping and equipment to proper level and elevations.
B. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

3.4 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E84.
B. Manufacturers: Hilti, Proset, or approved.

END OF SECTION 220529

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
SECTION 22 05 53

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Materials and installation of plumbing systems identification.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
B. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.
B. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2- by 11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification. Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals.

PART 2 - PRODUCTS

2.1 PLUMBING IDENTIFICATION MATERIALS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22 sections. Where more than a single type is specified for application, provide single selection for each product category.
B. Manufacturers: Allen Systems, Inc., W. H. Brady Co., Signmark Division, Industrial Safety Supply Co., Inc., Seton Name Plate Corporation, or approved.

2.2 PLASTIC PIPE MARKERS

A. Provide one of the following:

1. Snap-on Type: Manufacturer's standard preprinted, semi-rigid snap-on, color-coded pipe markers.
2. Pressure-Sensitive Type: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure sensitive, vinyl pipe markers.

B. Small Pipes: For external diameters less than 6 inches (including insulation, provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:

1. Snap-on application of pretensioned semi-rigid plastic pipe marker.
2. Adhesive lap joint in pipe marker overlap.
3. Laminated or bonded application of pipe marker to pipe (or insulation).
4. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4 inch wide; full circle at both ends of pipe marker, tape lapped 1-1/2 inches.

C. Large Pipes: For external diameters of 6 inches and larger (including insulation), provide either full-band or strip-type pipe markers, but not narrower than three times letter height (and of required length), fastened by one of the following methods:

1. Laminated or bonded application of pipe marker to pipe (or insulation).
2. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2 inches wide; full circle at both ends of pipe marker, tape lapped 3 inches.
3. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.

D. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length.

E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.3 VALVE TAGS

A. Brass Valve Tags: Polished brass valve tags with stamp-engraved piping system abbreviation in 1/4-inch high letters and sequenced valve numbers 1/2 inch high, and with hole for fastener. 1-1/2-inch diameter tags, except as otherwise indicated. Valve designations to be coordinated with existing valve identifications to ensure no repetitive designations are utilized.

B. Valve Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.

C. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include center hole to allow attachment.

2.4 VALVE SCHEDULE FRAMES

A. General: For each page of a valve schedule, provide glazed display frame with removable mounting as appropriate for wall construction upon which frame is to be mounted. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.5 ENGRAVED PLASTIC-LAMINATE SIGNS

A. General: Engraving stock melamine plastic laminate, Federal Specification L-P-387, in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for plumbing fastening except where adhesive mounting is necessary because of substrate.

B. Thickness: 1/16 inch for units up to 20 sq.in. or 8 inches in length; 1/8 inch for larger units.

C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.6 PLASTIC EQUIPMENT MARKERS

A. General: Manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.

B. Nomenclature: Match terminology used on drawing schedules as closely as possible.
C. Size: Provide approximate 2-1/2- by 4-inch markers for control devices, dampers, and valves; and 4-1/2- by 6-inch markers for equipment.

2.7 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in plumbing identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of plumbing systems and equipment.
B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Boiler No. 3, Circulation Pump No. 42, Cold water riser No. 12, and the like).

2.8 CEILING TILE LABELS

A. Machine-generated, adhesive-backed tape labels with black letters on clear tape.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished plumbing spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 PIPING SYSTEM IDENTIFICATION

A. Install pipe markers on each system and include arrows to show normal direction of flow.
B. Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels and plenums), and exterior nonconcealed locations, in locations as follows:

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, or enter nonaccessible enclosures.

4. At access doors, manholes and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 20 feet along each piping run, except reduce spacing to 10 feet in congested areas of piping and equipment, i.e., mechanical rooms.

3.3 VALVE IDENTIFICATION

A. General: Provide valve tag on every valve, cock and control device in each piping system. Exclude check valves, valves within factory fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, shutoff valves at plumbing fixtures, and similar rough-in connections of end use fixtures. List each tagged valve in valve schedule for each piping system.
B. Install mounted valve schedule in each mechanical room.

3.4 PLUMBING EQUIPMENT IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each item of plumbing equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices: Pumps, compressors, and similar motor driven units, water heaters, tanks and pressure vessels, filters, water treatment systems and similar equipment.

3.5 ADJUSTING AND CLEANING

A. Adjusting: Relocate plumbing identification device which has become visually blocked.
B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 220553

PLUMBING SYSTEMS INSULATION
SECTION 22 07 00

PART 1 - GENERAL

1.1 SUMMARY

A. Piping and Equipment Insulation: Materials and installation of insulation, jackets and accessories for the following applications:

1. Hot and cold domestic water piping systems.
2. ADA accessible lavatory/sink P-trap and supplies/stops.

1.2 QUALITY ASSURANCE

A. Qualification of Workers: Use proficient journeyman insulators and supervisors in the execution of this portion of the work to ensure proper and adequate installation of insulation throughout. A firm with at least 5 years successful installation experience on projects with installations similar to that required for this project.

B. Compliance with Specifications:

1. Whenever required during progress of the work, furnish proof acceptable to the Owner that items installed are equal to or exceed requirements specified for this work.
2. In the event such proof is not available, or is not acceptable to the Owner, the Owner may require the Contractor to remove the item or items and replace with material meeting the specified requirements and to repair damage caused in the removal and replacement, at no additional cost to the Owner.
3. Install per manufacturer's written instructions.
4. As a minimum, comply with appropriate state energy code or other applicable codes.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of insulation, jacket, glue, paint, fitting cover, and accessory. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each piping, equipment and duct system requiring insulation.

1.4 PRODUCT HANDLING

A. Protection: Use means necessary to protect insulation materials before, during and after installation.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary.

1.5 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a flame spread of 25, fuel contributed of 50 and smoke developed of 50 as tested by ASTM E84 (NFPA 255) method.
B. Test pipe insulation in accordance with the requirements of UL "Pipe and Equipment Coverings R5583 400 8.15."
C. Test duct insulation in accordance with ASTM E84 and bear the UL label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Piping: Armacell LLC Armaflex, Certainteed, Imcoa, Johns Manville, Knauf, Nomaco, Owens-Corning, PPG, or approved.

2.2 TYPE 1, FIBERGLASS PIPE INSULATION

A. Glass Fiber: ASTM C547; rigid molded, noncombustible.

1. Thermal Conductivity Value: 0.27 at 75F.
2. Maximum Service Temperature: 850F.
3. Vapor Retarder Jacket: White Kraft paper reinforced with glass fiber and bonded to aluminum foil, secure with self sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as needed.

2.3 TYPE 2, FLEXIBLE ELASTOMERIC INSULATION

A. Elastomeric Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. Thermal Conductivity Value: 0.27 at 75F.
2. Maximum Service Temperature of 220F.
3. Maximum Flame Spread: 25.
4. Maximum Smoke Developed: 50 (3/4 inch thick and below).
5. Connection: Waterproof vapor retarder adhesive as needed.
6. UV Protection: UV outdoor protective coating as needed.

B. Glue Used in Cementing Rubber Insulation: Contact adhesive specifically manufactured for cementing flexible elastomeric foam. Armacell LLC Armaflex 520 adhesive, or Halstead.
C. Paint Used to Cover Rubber Insulation: Nonhardening high elasticity type, specifically manufactured as a protective covering of flexible elastomeric foam insulation for the prevention of degradation due to exposure to sunlight and weather. Armacell LLC Armaflex, or Halstead.

2.4 TYPE 5, PLASTIC PIPE INSULATION

A. Flexible unicellular polyolefin foam insulation complying to ASTM C534, ASTM E84 (25/50), UL 723 (25/50). Thermal conductivity of 0.24 (BTU/in)/(hr/sq.ft./deg. F) at 75F. Preslit longitudinal seam. Imcoa, or approved.

2.5 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT

A. P-traps, hot water and cold water insulating guards. Molded closed cell vinyl with nylon fasteners, paintable. Thermal conductivity; K = 1.17 (BTU/in)/ (hr/sq.ft./deg. F) at 75F mean temperature. Provide accessories as required for complete installation. Color white. Truebro Inc. Model 102. McGuire, ProWrap, Brocar Trap Wrap, or approved.

2.6 JACKETING

A. PVC Plastic Fitting Covers: Schuller Zeston 2000. One-piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks; pressure sensitive color matching vinyl tape.
B. Canvas Jacket: UL listed fabric, 6 oz/sq.yd., plain weave cotton treated with dilute fire retardant lagging adhesive.
C. Aluminum Jacket: 0.016-inch-thick sheet, (smooth/embossed) finish, with longitudinal slip joints and 2-inch laps, die-shaped fitting covers with factory attached protective liner.
D. Stainless Steel Jacket: Type 304 stainless steel, 0.010 inch, (smooth/corrugated) finish.

2.7 ACCESSORIES

A. Equipment Insulation Jacketing: Presized glass cloth, not less than 7.8 ounces/sq.yd., except as otherwise indicated. Coat with gypsum based cement.
B. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
C. General: Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have the same flame and smoke component ratings as the insulation materials with which they are used. Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety. Provide nonwater soluble treatments.

2.8 PIPE FITTING INSULATION COVERS

A. PVC preformed molded insulation covers. Zeston, or approved.

2.9 CANVAS JACKET

A. UL listed fabric, 6 ounce/sq.yd., plain weave cotton treated with dilute fire retardant lagging adhesive.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Do not apply insulation until pressure testing of the ducts has been completed. Do not apply insulation until the duct has been inspected.
B. Examine areas and conditions under which duct insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to be insulated.

3.3 INSTALLATION

A. Insulation: Continuous through walls, floors, partitions except where noted otherwise.
B. Piping and Equipment:

1. Install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Fill voids and holes. Seal raw edges. Install insulation in a manner such that the insulation may be split, removed, and reinstalled with vapor barrier tape on strainer caps and unions. Do not install insulation until the piping has been leak tested and has passed such tests. Do not insulate chiller manholes, equipment manufacturer's nameplates, handholes, and ASME stamps. Provide beveled edge at such insulation interruptions. Repair voids or tears.
2. Cover insulation on pipes above ground, outside of buildings, with aluminum jacketing. Position seam on bottom of pipe.

3.4 PROTECTION AND REPLACEMENT

A. Protect installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

3.5 FIBERGLASS INSULATION

A. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate the vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.
B. Apply insulation to pipe and seal with self-sealing lap. Use self-sealing butt strips to seal butt joints. Insulate fittings, valves and unions with single or multiple layers of insulation and cover to match pipe or use preformed PVC molded insulation covers.

3.6 LABELING AND MARKING

A. Provide labels, arrows and color coding on piping per Section 22 01 00, Plumbing Materials and Methods. Attach labels and arrows to the jacketing.

3.7 PIPING SURFACES TO BE INSULATED

Item to be Insulated:	System Insulation Type:	Pipe Size:	Insulation Thickness:
Domestic hot water and hot water circulation piping above grade.	1, 5	Runouts up to 2-inches Mains =<2 inches Mains >2 inches	1 inch 1 inch 1-1/2 inches
Domestic hot and cold water, piping and hot water circulation piping below grade.	2, 5	All	1-1/2 inches

Item to be Insulated:	System Insulation Type:	Pipe Size:	Insulation Thickness:
Domestic water piping exposed to weather and drainage pipe with heat tracing.	1, 2	All	1-1/2 inches
Domestic cold water except minor branch piping within walls serving fixtures.	1, 5	=<2 inches >2 inches	1/2 inches 1 inch
ADA accessible lavatory/sink.	7	All	as listed

3.8 ADA ACCESSIBLE LAVATORIES/SINKS

A. Install lavatory/sink insulation kit.

3.9 INSULATED PIPE EXPOSED TO WEATHER

A. Where piping is exposed on roof, cover insulation with aluminum jacket. Seal watertight jacket per manufacturer's recommendations. Provide heat tracing on piping subject to freezing.

3.10 PLASTIC PIPE INSULATION

A. Slip insulation on the pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to the weather and undergrade with two coats of finish as recommended by manufacturer.

3.11 FLEXIBLE ELASTOMERIC TUBING

A. Slip insulation over piping or if piping is already installed, it should be slit and snapped over the piping. Joints and butt ends must be adhered with 520 adhesive.

3.12 INSULATION SHIELDS

A. Provide full size diameter hangers and shields (18 gauge minimum) for cold piping. Hot water piping hangers may penetrate insulation to contact pipe directly. Provide 18-inch long, noncompressible insulation section at insulation shields for lines 2 inches and larger (steam and cold piping).

3.13 FOAMED PLASTIC EQUIPMENT INSULATION

A. Apply insulation and accessories to roof drain/overflow underbodies per manufacturer's recommendations.

END OF SECTION 220700

GENERAL PLUMBING PIPING SYSTEMS
SECTION 22 10 00

PART 1 - **GENERAL**

1.1 SUMMARY

A. Work includes but is not limited to:

1. Aboveground soil, waste and vent piping within buildings, including soil stacks, vent stacks, horizontal branches, traps, and connections to fixtures and drains.
2. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to sanitary sewers 5 feet outside foundation wall.
3. Domestic cold water piping.
4. Domestic hot water piping.
5. Domestic circulating hot water piping.
6. Plumbing fixtures: See schedule for types.
7. Specialty piping systems.
8. Condensate drain and water piping system for plumbing equipment.
9. Flashing and counterflashing of roof and wall penetrations, fixtures and the like and wall penetrations, fixtures and the like by installation of work of this Section.
10. Furnishing and installation of access doors required for work furnished by this Section.
11. Furnishing and installing of sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. Sleeve, wrap and seal piping in concrete.

1.2 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of plumbing system products, of types, materials, and sizes required.

B. Regulatory Requirements:

1. Codes: Comply with CPC pertaining to plumbing materials, construction and installation of products. Comply with local and state regulations.
2. ANSI Compliance: Comply with applicable American National Standards Institute Standards pertaining to products and installation.
3. PDI Compliance: Comply with applicable Plumbing and Drainage Institute standards pertaining to products and installation.

PART 2 - PRODUCTS

2.1 SOIL, WASTE, VENT AND DRAINAGE PIPING

A. Underground Piping to 5 Feet Outside Building Line:

1. 10 Inches and Smaller: "No-Hub" cast iron soil pipe and fittings with heavy-duty stainless steel couplings and neoprene gaskets.

B. Aboveground Piping:

1. 10 Inches and Smaller: "No-Hub" cast iron soil pipe and fittings with standard-duty stainless steel couplings and neoprene gaskets.

2.2 DOMESTIC WATER PIPING

A. Above Ground: Type "L" copper tubing. Wrought copper or cast bronze sweat fittings.

1. Piping 3 Inches and Above: Brazed.
2. Piping 2 1/2 Inches and Smaller: Soldered (95/5 solder) joints.
3. Approved Fillers:

a. Pressure Range 81 to 150 PSI and Temperatures 151 Degrees F to 200 Degrees F: 95/5 tin-antimony or silver-bearing solders, i.e., Allstate 430, Harris Stay Brite 5 or 8.
b. Use appropriate flux per manufacturer's recommendations. Use of corrosive fluxes is prohibited.

B. Below Ground:

1. Type "K" copper tubing with brazed joints. Approved Fillers: "Phos-0," "Silfos 5," "Aircosil 15," "Braze 450(DE)." Use appropriate flux per manufacturer's recommendations.

2.3 PRIMER PIPING

A. Above Ground: Type "L" hard-drawn copper tubing with wrought sweat fittings and soldered joints.
B. Below Ground: Type "L" soft annealed copper tubing with wrought sweat fittings and brazed joints.

2.4 CONDENSATE DRAIN PIPING

A. Type "M" copper tubing and wrought copper or cast bronze sweat fittings. 95/5 soldered joints. On sizes 1 1/4 inches and larger, provide "DWV" pattern drainage fittings.

2.5 PUMP PRESSURE PIPING

A. Above Grade: Type "L" copper with solder joints.
B. Below Grade: Type "L" copper with brazed joints.

2.6 CLEANOUTS

A. General: Locate cleanouts as shown on Drawings and as required by local code. Cleanouts same size as pipe except that greater than 4 inches will not be required. Plastic components not allowed, except unless specifically noted.
B. Types:

1. Tile Floor Cleanouts: J. R. Smith 4020-U with round heavy-duty nickel bronze top, taper thread, ABS plug and standard screws.
2. Carpeted Floor Cleanout: J. R. Smith with round heavy-duty nickel bronze top, taper thread, ABS plug, carpet clamping device and standard screws.
3. Concrete Floor Cleanout (General): J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread and ABS plug with standard screws.
4. Concrete Floor Cleanout (Heavy Load): Same as for "General" locations, Item 3 above, except J. R. Smith 4100.
5. Wall Cleanout: J. R. Smith 4472-U, countersunk bronze taper thread plug, stainless steel shallow cover and vandalproof screws.
6. Outside Area Walks and Drives: J. R. Smith 4023-U with round heavy-duty nickel bronze top, taper thread, ABS plug and top secured with vandalproof screws. Install in 18- by 18- by 6-inch deep concrete pad flush with grade.

C. Manufacturers: J. R. Smith, Zurn, Wade, Watts, or approved. J. R. Smith model numbers used as a basis of selection.

2.7 VALVES

A. General:

1. End Connections: Mate with pipe, tube and equipment connections. Where more than one type is indicated, selection is installer's option.
2. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe sizes.
3. Refer to Section 22 01 00, Plumbing Materials and Methods for detailed valve specifications.

B. Service:

1. Domestic Hot and Cold Water Shutoff and Isolation Valves:

a. Pipe Sizes 2 1/2 Inches and Smaller: Ball valve.
b. Pipe Sizes 3 Inches and Larger: Gate valve.

2. Drain Service; Pipe Sizes: Drain valves.
3. Check Valves Other than Pump Discharge: Swing check.

C. Relief Valve: ASME code approved pressure and temperature relief valve. Run full size pipe to floor drain, or as noted otherwise. Cash-Acme, Watts, or approved.

2.8 PRESSURE REGULATING VALVES

A. Water: Bronze body, diaphragm or piston type, spring actuated, with separate or integral strainer, pressure range to suit conditions, code approved for potable water use. Provide shutoff valves, pressure relief valves, unions, drain valve and bypass in accordance with code requirements. Cash-Acme, Watts, Wilkins, Mueller approved.
B. Water: Bronze body construction, stainless steel strainer screen, thermal expansion bypass with renewable stainless steel seat and high temperature resisting diaphragm. Watts, Febco, Wilkins, or approved.

2.9 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Bellows-type, stainless steel casing and bellows, pressure rated, tested and certified in accordance with PDI WH-201. Manufacturers: Amtrol, Inc., J. R. Smith, Wade, Zurn, or approved.
B. Piston-type, copper, brass or stainless steel with O-ring piston, pressure rated, tested and certified in accordance with PDI WH-201. Manufacturers: PPP, Sioux Chief, or approved

2.10 TRAP PRIMERS

A. Trap seal primer valve with integral automatic antisiphon protection. Code approval required. Wade, Zurn, J. R. Smith, PPP, or approved.

2.11 THERMOMETERS

A. 3-inch-diameter bi-metal dial thermometer with stainless steel case, white dial, black numbers with 4-inch stainless steel stem and brass separable socket. Provide back or bottom connections as required. Zero degree F to 200 degree F range. Manufacturers: Weiss Model 3BMS, Palmer, Ashcroft, Trerice, Marshaltown, Weksler, or approved.

2.12 PRESSURE GAUGES

A. Single-pointer gauge with zero to 100 PSI range, 10 PSI intervals and 1 PSI increments intermediate graduations. Aluminum dial with 1 percent accuracy and low bottom connections for wall mounting. Manufacturers: Weiss, Palmer, Marshaltown, Trerice, Ashcroft, Weksler, U.S. Gauge, or approved.

2.13 BACKFLOW PREVENTERS

A. General: Provide shutoff valve and unions upstream and downstream of backflow preventers. Provide bronze "Y" strainer upstream of backflow preventers. Note: For hot water applications of 140 degrees F or greater, provide backflow preventer rated for temperature of hot water system serving.
B. Atmospheric Vacuum Breaker: Watts Model 288A with Watts 777S "Y" strainer. Febco, Wilkins, or approved.
C. Pressure Vacuum Breaker: Watts Model 800MCQT with 777S "Y" strainer. Febco, Wilkins, Conbraco, or approved.
D. Double Check Backflow Preventer: Watts Model 007QT Series with strainer, Febco, Wilkins, Conbraco, or approved.
E. Reduced Pressure Backflow Preventer: Watts Model 909QT Series with strainer. Febco, Wilkins, Conbraco, or approved. Provide with air gap fitting and indirect drain piping to drain.

2.14 WATER VALVE BOXES

A. Rectangular concrete valve box with cast iron hinged locking access cover (traffic rated), labeled "water." Provide size adequate for depth, maintenance accessibility for valve assembly, and the like. Provide extensions as required. Manufacturers: Brooks Products Model 36-HFL, or approved.

2.15 PREMANUFACTURED COUNTERFLASHINGS

A. Factory-fabricated counterflashing constructed from Schedule 40 galvanized steel or galvanized malleable iron pipe coupling with tapered threads and 3-pound lead sheet lead formed and soldered to coupling to produce counterflashing minimum of 4-inch overlap over roof flashings. Provide for pipe sizes as required. Manufacturers: A&B Sheetmetal, 503-254-5581.

2.16 ACCESS PANELS

A. Provide flush-mounting access panels as required for service of fire dampers, cleanouts, valves, and the like, and other items requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum 24x24 (or required and approved size). Wall access panels to be minimum 12x12 (or required and approved size). Manufacturers: Milcor, Karp, Elmdor, In-Ryko, Acudor, or approved. Provide two keys for each set of locks provided.

PART 3 - EXECUTION

3.1 DRAIN PIPING

A. General: Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous materials as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops. Coordinate installation of piping below with structural components and other system installations.

B. Install piping pitched to drain at minimum slope of 1/4 inch per foot (2 percent). Where this slope is impractical, slope at 1/4 inch per foot for pipes below 4-inch size, and 1/8 inch per foot (1 percent) for piping 4 inches and larger, with the approval of the local code authority having jurisdiction.

C. Condensate Drain Piping at HVAC-Units: Trap condensate drain for HVAC units in accordance with detail on plumbing drawings.

3.2 CLEANOUTS

A. Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135 degrees; at minimum intervals of 100 feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Coordinate locations and types of cleanouts with Architect prior to installation.

3.3 EQUIPMENT CONNECTIONS

A. Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by code.
B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
C. Piping Runouts to Fixtures: Provide hot and cold piping runouts to fixtures of sizes indicated, but in no case smaller than required by code.
D. Mechanical Equipment Connections: Connect hot and cold water piping system to plumbing equipment as indicated, and comply with equipment manufacturer's instructions. Provide shutoff valve and union for each connection; provide drain valve on drain connection.

3.4 DOMESTIC WATER DISTRIBUTION PIPING

A. Water Service Piping: Provide sleeve in foundation wall for water service entry; make entry watertight. Provide shutoff valve at water service entry inside building; pressure gauge, test tee with valve.
B. Water Hammer Arrestors: Install in upright position, in locations and of sizes in accordance with PDI WH-201, and elsewhere as indicated.
C. Group piping installations and valves where possible to obtain maximum practical use of available space.
D. Arrange locations of valves, unions, drains and other components to provide for ease of cleaning, operation, repair or service. Size access panels and locate to provide both acceptable proximity and working space for such devices.
E. Provide valves and shock arrestors where required by code and where otherwise indicated in Specifications and on Drawings.
F. Provide protection plates for piping installed in wood stud walls and other building substructures as required by code.
G. Wherever piping is installed in exterior walls, route on warm side of insulation and as close to inside wall finish as possible, as detailed.
H. Provide low point drains and shutoff valves as required by local AHJ. Provide valve boxes, access panels, and the like, for complete installation.

3.5 VALVES

A. Backwater Valves: Provide rectangular concrete valve box with cast iron hinged locking access cover (traffic rated), labeled “Backwater Valve”. Provide size adequate for depth, maintenance accessibility for valve assembly, and the like. Provide extensions as required. Set flush with finish grade.

3.6 BACKFLOW PREVENTERS

A. Install where indicated and where required by code. Where practical, locate in same room as equipment being protected.
B. Submit product cut sheets to local AHJ for approval prior to purchase.
C. Install as close to wall as possible with clearances for access and maintenance as required by AHJ.
D. Coordinate exact location of installation and type of backflow device serving a particular piece of equipment with AHJ and Architect prior to purchase and installation.

E. Provide wall/floor brackets that are of fully welded, hot dipped galvanized construction, fabricated to meet field conditions. Mount backflow preventer to brackets using cadmium plated "U" type bolts and nuts.
F. Contact: Contact local water district/backflow specialist and request backflow installation literature. Install backflow devices per UPC and local water district/backflow specialist requirements.
G. Route waste piping from air gap waste fitting concealed within walls to point of air gap termination at indirect waste receptor.

3.7 PRESSURE REGULATING VALVES

A. Provide inlet and outlet ball valves, and globe valve bypass. Provide pressure gauge on valve outlet.
B. Provide factory startup on automatic control valves.

3.8 EXCAVATION AND BACKFILL

A. General: Perform necessary excavation and backfill required for installation of plumbing work. Repair piping or other work at no expense to Owner.
B. Water: Keep excavations free of standing water. Reexcavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.
C. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of a testing laboratory.
D. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat, and the like), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material. Adequate width of trench for proper installation of piping or conduit.
E. Support Foundations:

1. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to a depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other sections of Specifications or Drawings.
2. Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
3. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form a base for replacement of required thickness of bedding material.

	Class A		Class B	
Material Passing:	Min.	Max.	Min.	Max.
3/4-inch Square Opening	27	47	0	1

4. Bedding Material: Full bed piping on sand, pea gravel, or 3/4-inch minus crushed rock. Place a minimum 4-inch-deep layer of sand, pea gravel, or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire

length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide a firm foundation.

F. Backfilling:

1. Following installation and successful completion of required tests, backfill piping in lifts.

a. In "Pipe Zone" place backfill material and compact in lifts not to exceed 6 inches in depth to a height of 12 inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.
b. Place and compact backfill above "Pipe Zone" in layers not to exceed 12 inches in depth.

2. Backfill Material:

a. Backfill Material in "Pipe Zone": 3/4 inch minus crushed rock, sand or pea gravel.
b. Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."

G. Compaction of Trench Backfill:

1. Where compaction of trench backfill material is required, use one of following methods or combination thereof:

a. Mechanical tamper,
b. Vibratory compacter, or
c. Other approved methods appropriate to conditions encountered.

2. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

3.9 PIPE INSTALLATION

A. Seismic Restraint: Brace plumbing piping and plumbing equipment against lateral movement as detailed in document "Seismic Restraint Manual Guidelines for Mechanical Systems" as published by SMACNA.
B. Rough-in Piping: Provide temporary caps or plugs at piping shown on Drawings to be roughed-in for future connections by others.
C. Sanitary Waste and Storm Drain Piping: Slope at uniform grade of 1/4 inch per foot unless noted otherwise. Make changes in size with reducing and wye fittings. Run exposed piping parallel or perpendicular to building structure.
D. Underground Preinsulated Piping System:

1. Take care to ensure the installed system is completely watertight.

2. Install pipes and accessories in accordance with the manufacturer's recommendations.
3. After anchor blocks are poured and cured, a hydrostatic test of 150 PSIG or 1 1/2 times operating pressure, whichever is greater, required for a period of 4 hours.
4. Backfill: Follow manufacturer's recommendations.

E. Vent Piping:

1. General: Horizontal runs free of drops and sloped to drainage system.
2. Vents-Through-Roof (VTRs): Provide 3-pound flashing with counterflashing at vent penetrations through roof, as detailed. Wherever vents run up near or inside of exterior walls, offset pipe at underside of roof deck to obtain minimum 5-foot clearance between parapet and roof penetration. Provide code-required clearances between vent-through-roof and HVAC equipment on roof. VTR counterflashings to have a manufactured rolled return bend with minimum 1-inch overlap; crimping by hand tools will not be allowed. On single ply vinyl or plastic type roofs, provide flashings as required by roof installer and manufacturer. On raised rib steel roofs, provide flashings as required by roof installer and manufacturer.

3.10 TESTING

A. General:

1. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.
2. Notify Architect and local plumbing inspector 2 days before tests.
3. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to a water pressure of a minimum of 5 PSI head. System to hold water without a water level drop greater than 1/2 pipe diameter of largest nominal pipe size within a 24-hour period. Test system in sections if minimum head cannot be maintained in each section. The 5 PSI head to be the minimum pressure at the highest joint.
4. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1 1/2 times static pressure at connection to serving utility main for a period of 2 hours with no loss in pressure.
5. Send test results to Architect for review and approval.

B. Testing of Pressurized Systems:

1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

3.11 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Locate shock absorbers in supply pipe in accordance with recommendations of Plumbing and Drainage Institute PDI-WH201. Install ahead of solenoid operated valves. Determine size of absorber by fixture unit value of fixture supplied, using PDI symbols to designate sizes. Provide access panel for each shock absorber.

3.12 ADJUSTING AND CLEANING

A. Piping: Clean piping exterior surfaces. Comply with Section 22 07 00, Plumbing Insulation, as applicable. Flush out water-filled or drainage piping systems with clean water.

3.13 HOSE BIBB PIPING

A. Provide each hose bibb with an individual accessible shutoff valve (ball type). Locate where shown on Drawings.

3.14 CHLORINATION

A. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.
B. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.
C. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.

3.15 PROTECTION

A. Keep pipe openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of the work.

3.16 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.
B. Manufacturers: Hilti, Proset, or approved.

3.17 ACCESS PANELS

A. Install ceiling or wall access panels to provide access to concealed valves, motors, shock arrestors, and other plumbing items needing service. Provide access panels at locations required or as specified herein. Coordinate locations/sizes of access panels with Architect prior to work.

END OF SECTION 221000

DOMESTIC WATER PIPING
SECTION 22 11 16

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. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.

2. Encasement for piping.

3. Flexible connectors.

4. Escutcheons.

5. Sleeves and sleeve seals.

6. Wall penetration systems.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.

2. Transition fittings.

3. Dielectric fittings.

4. Flexible connectors.

5. Escutcheons.

6. Sleeves and sleeve seals.

B. Water Samples: Specified in "Cleaning" Article.

C. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Domestic water piping.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.

2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.3 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Form: Sheet

C. Material: LLDPE film of 0.008-inch minimum thickness.

D. Color: Black

2.4 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.

2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements:

a. Cascade Waterworks Manufacturing.

b. Dresser, Inc.; Dresser Piping Specialties.

c. Ford Meter Box Company, Inc. (The).

d. JCM Industries.

e. Romac Industries, Inc.

f. Smith-Blair, Inc; a Sensus company.

g. Viking Johnson; c/o Mueller Co.

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements:

a. Charlotte Pipe and Foundry Company.

b. Harvel Plastics, Inc.

c. Spears Manufacturing Company.

2. Description: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements:

a. Colonial Engineering, Inc.

b. NIBCO INC.

c. Spears Manufacturing Company.

2. Description: CPVC four-part union. Include brass threaded end, solvent-cement-joint plastic end, rubber O-ring, and union nut.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements:

a. Capitol Manufacturing Company.

b. Central Plastics Company.

c. EPCO Sales, Inc.

d. Hart Industries International, Inc.

e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

a. Pressure Rating: 150 psig at 180 deg F.

b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements:

a. Perfection Corporation; a subsidiary of American Meter Company.

b. Precision Plumbing Products, Inc.

c. Victaulic Company.

2. Description:

a. Electroplated steel nipple complying with ASTM F 1545.

b. Pressure Rating: 300 psig at 225 deg F.

c. End Connections: Male threaded or grooved.

d. Lining: Inert and noncorrosive, propylene.

2.7 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

2.8 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

PART 3 EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

H. Install domestic water piping level with 0.25 percent slope downward toward drain without pitch and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping.

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping adjacent to equipment and specialties to allow service and maintenance.

O. Install piping to permit valve servicing.

P. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

Q. Install piping free of sags and bends.

R. Install fittings for changes in direction and branch connections.

S. Install PEX piping with loop at each change of direction of more than 90 degrees.

T. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

U. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump.

V. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

W. Install thermometers on outlet piping from each water heater.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

G. Steel-Piping Grooved Joints: Cut or roll groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.

2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.

2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings, nipples.

C. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.

2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.

3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

4. NPS 2-1/2: 108 inches with 1/2-inch rod.

5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

6. NPS 6: 10 feet with 5/8-inch rod.

7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.

2. NPS 1-1/2: 108 inches with 3/8-inch rod.

3. NPS 2: 10 feet with 3/8-inch rod.

4. NPS 2-1/2: 11 feet with 1/2-inch rod.

5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.

6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

7. NPS 6: 12 feet with 3/4-inch rod.

8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.

G. Install supports for vertical steel piping every 15 feet.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.

3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.

2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.

3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.

3.10 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Molded PVC.

a. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

2. Sleeves for Piping Passing through Gypsum-Board Partitions:

a. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Firestopping" for firestop materials and installations.

3.11 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.12 WALL PENETRATION SYSTEM INSTALLATION

A. Install wall penetration systems in new, exterior concrete walls.

B. Assemble wall penetration system components with sleeve pipe. Install so that end of sleeve pipe and face of housing are flush with wall. Adjust locking devices to secure sleeve pipe in housing.

3.13 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.14 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.15 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.16 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.17 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building service piping, NPS 3 and smaller shall be the following:

1. Soft copper tube, ASTM B 88, Type K wrought-copper solder-joint fittings; and brazed joints.

E. Aboveground domestic water piping, NPS 2 and smaller shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L wrought- copper solder-joint fittings; and soldered joints.

F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 shall be the following:

1. Hard copper tube, ASTM B 88, Type L wrought- copper solder-joint fittings; and soldered joints.

3.18 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.

2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.

3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

DOMESTIC WATER PIPING SPECIALTIES
SECTION 22 11 19

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Hose bibbs.
2. Water hammer arresters.
3. Trap-seal primer valves.

B. Related Sections include the following:

1. Division 22 Section "Domestic Water Piping" for water meters.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

1.4 SUBMITTALS

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

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 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. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 PRODUCTS

2.1 OUTLET BOXES

A. Icemaker Outlet Boxes:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Acorn Engineering Company.
    b. IPS Corporation.
    c. LSP Products Group, Inc.
    d. Oatey.
    e. Plastic Oddities; a division of Diverse Corporate Technologies.
3. Mounting: Recessed.
4. Material and Finish: Enameled-steel or epoxy-painted-steel or plastic box and faceplate.
5. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
6. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.2 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.

11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

2.3 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. PPP Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    g. Tyler Pipe; Wade Div.
    h. Watts Drainage Products Inc.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Metal bellows.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.4 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. MIFAB, Inc.
    b. PPP Inc.

c. Sioux Chief Manufacturing Company, Inc.

d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

e. Watts Industries, Inc.; Water Products Div.

3. Standard: ASSE 1018.

4. Pressure Rating: 125 psig minimum.

5. Body: Bronze.

6. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.

7. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.

8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Valves:

1. 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:

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

a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

3. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.

4. Size: NPS 1-1/4 minimum.

5. Material: Chrome-plated, cast brass.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.

3. Do not install bypass piping around backflow preventers.

C. Install water hammer arresters in water piping according to PDI-WH 201.

D. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding."

END OF SECTION 221119

FACILITY SANITARY SEWERS-BUILDING
SECTION 22 13 13

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Cleanouts.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Expansion joints and deflection fittings.
2. Backwater valves.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

D. Profile Drawings: Show system piping in elevation. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet (1:500) and to vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

E. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

F. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 PRODUCTS

2.1 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI-Trademark, Shielded Couplings:

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

a. ANACO-Husky.

b. Fernco Inc.

c. Mission Rubber Company; a division of MCP Industries, Inc.

d. Stant; a Tompkins company.

e. Tyler Pipe.

2. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Shielded Couplings:

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

a. ANACO-Husky.

b. Clamp-All Corp.

c. Dallas Specialty & Mfg. Co.

d. Mission Rubber Company; a division of MCP Industries, Inc.

e. Stant; a Tompkins company.

f. Tyler Pipe.

2. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.2 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe.
   e. Watts Water Technologies, Inc.
   f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Heavy Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

PART 3 EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
2. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch (25 mm) above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section "Sanitary Waste and Vent Piping."

B. Connect force-main piping to building's sanitary force mains specified in Division 22 Section "Sanitary Waste and Vent Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.

b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.6 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.

3.7 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
   a. Fill sewer piping with water. Test with pressure of at least 10-foot (3-m) head of water, and maintain such pressure without leakage for at least 15 minutes.
   b. Close openings in system and fill with water.
   c. Purge air and refill with water.
   d. Disconnect water supply.
   e. Test and inspect joints for leaks.
5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

b. Option: Test concrete gravity sewer piping according to ASTM C 924 (ASTM C 924M).

6. Manholes: Perform hydraulic test according to ASTM C 969 (ASTM C 969M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION 221313

SANITARY WASTE PIPING SPECIALTIES
SECTION 22 13 19

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Through-penetration firestop assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.

B. Related Sections include the following:

1. Division 22 Section "Plumbing Fixtures" for hair interceptors.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Floor Drains.

2. Cleanouts.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. 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.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. 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:

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

3. Basis-of-Design Product: Subject to compliance with requirements, or a comparable product by one of the following:

a. Josam Company; Josam Div.

b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

c. Tyler Pipe; Wade Div.

d. Watts Drainage Products Inc.

e. Zurn Plumbing Products Group; Specification Drainage Operation.

f. Josam Company; Blucher-Josam Div.

4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

5. Size: Same as connected drainage piping

6. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.

7. Closure: Countersunk or raised-head plug.

8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

9. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. 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:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, or a comparable product by one of the following:
    a. Josam Company; Josam Div.
    b. Oatey.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Zurn Plumbing Products Group; Light Commercial Operation.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M for cleanout.
5. Size: Same as connected branch.
6. Type: Cast-iron soil pipe with cast-iron ferrule.
7. Body or Ferrule: Cast iron
8. Clamping Device: Not required
9. Outlet Connection: Threaded.
10. Closure: Brass plug with straight threads and gasket.
11. Adjustable Housing Material: Cast iron
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
13. Frame and Cover Shape: Round.
14. Top Loading Classification: Heavy Duty.
15. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
16. Standard: ASME A112.3.1.
17. Size: Same as connected branch.
18. Housing: Stainless steel.
19. Closure: Stainless steel with seal.
20. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, or a comparable product by one of the following:
    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M. Include wall access.
5. Size: Same as connected drainage piping.
6. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
7. Closure: Countersunk plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, or a comparable product by one of the following:
    a. Commercial Enameling Co.
    b. Josam Company; Josam Div.
    c. MIFAB, Inc.
    d. Prier Products, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.

g. Watts Drainage Products Inc.

h. Zurn Plumbing Products Group; Light Commercial Operation.

i. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.6.3.

5. Pattern: Floor drain.

6. Body Material: Gray iron

7. Seepage Flange: Not required.

8. Anchor Flange: Not required.

9. Clamping Device: Not required.

10. Outlet: Bottom

11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel

12. Sediment Bucket: Not required

13. Top or Strainer Material: Bronze

14. Top of Body and Strainer Finish: Nickel bronze.

15. Top Shape: Round.

16. Top Loading Classification Heavy Duty.

17. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.

18. Trap Material: Cast iron.

19. Trap Pattern: Standard P-trap.

20. Trap Features: Trap-seal primer valve drain connection.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. 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:

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

3. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:

a. Acorn Engineering Company; Elmdor/Stoneman Div.

b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Low-Silhouette Vent Cap: With vandal-proof vent cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. 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:

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

a. ProSet Systems Inc.

3. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.

4. Size: Same as connected soil, waste, or vent stack.

5. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

6. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.

7. Special Coating: Corrosion resistant on interior of fittings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.

4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

   a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.

   b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.

   c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.

2. Size: Same as floor drain inlet.

I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

J. Install vent caps on each vent pipe passing through roof.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

END OF SECTION 221319

PLUMBING EQUIPMENT
SECTION 22 30 00

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Water heaters.
2. Grease traps.
3. Circulation pumps.
4. Expansion tanks.

1.2 QUALITY ASSURANCE

A. Refer to Section 22 00 00, Plumbing Requirements.

B. Water Heaters:

1. Water heaters and storage tanks to meet current energy efficiency code requirements and be provided with anode rod corrosion protection, internal glass lining, insulated steel jacket with baked enamel finish, and pressure-temperature relief valve to match tank working pressure. Rate water heaters at 150 PSIG working pressure; rate storage tanks at 125 PSI working pressure. Refer to Schedule on Drawings for capacity and model.
2. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code," as applicable to installation of gas-fired water heaters.
3. CSA and NSF Labels: Provide water heaters which have been listed and labeled by CSA and NSF.
4. ASME Code Symbol Stamps: For applicable equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME code symbol.

C. Commercial Water Heaters:

1. ASME Relief Valve Stamps: Provide water heaters and water tanks with safety relief valves bearing ASME valve markings.
2. Code Compliance: Comply with the UPC and ASHRAE/IESNA 90.1.
3. PDI Compliance: Comply with applicable Plumbing and Drainage Institute Standards pertaining to factory-fabricated water heaters.

D. Pumps:

1. HI Compliance: Design, manufacture and install pumps in accordance with HI "Hydraulic Institute Standards."

2. UL Compliance: Design, manufacture and install in accordance with UL 778 "Motor-Operated Water Pumps."

1.3 SUBMITTALS

A. Product Data in Accordance with Division 01: Manufacturer's specifications, installation and startup instructions, capacity and ratings, with selection indicated. Provide pump performance curves with selection points indicated. Provide specialties and accessories required for a complete and operable installation.

B. Shop Drawings:

1. Assembly type shop drawings indicating dimensions, weights, required clearances, and methods of assembly of components and anchorages.

2. Submit For:

a. Water heaters.

b. Grease traps.

c. Circulation pumps.

d. Expansion tanks.

C. Wiring Diagrams: Ladder type wiring diagrams for components, indicating required field electrical connections.

D. Maintenance Data: Submit maintenance data and parts list for each item. Include "troubleshooting" maintenance guides. Include this data in operation and maintenance manual.

PART 2 - PRODUCTS

2.1 WATER HEATERS

A. Natural gas fired type. Complete with magnesium anode, automatic flue damper, intermittent electronic ignition, Hi-limit temperature control device, gas pressure regulator, 100 percent safety shut off, steel burner, draft diverter, glass lined storage tank and steel jacket with baked enamel finish. Tank insulation to have minimum R-factor value of 6. CSA approved unit, bear the UL label and be pressure tested and rated for 150 PSI working pressure. Provide pressure-temperature relief valve. Commercial type heater, minimum 5-year commercial warranty. See Schedule on Drawings for capacities.

B. Manufacturers: Rheem, Ruud, A. O. Smith, State, Bradford-White, or approved.

2.2 WATER HEATERS ELECTRIC

A. Factory assembled packaged electric water heater. Glass lined. 150 PSI working pressure. Magnesium anode. Steel jacket with baked enamel finish. Minimum 3-inch insulation. Sequence element operation through single immersion thermostat. Each heating element to have magnetic contactor and be protected by current limiting fuses. Fused control circuit. Pilot light to indicate when unit is operating. Prewire heaters ready for a single electrical connection and bear the UL label. Provide pressure/temperature relief valve.

B. Manufacturers: A. O. Smith, Ace-Buehler, Bradford-White, Lochinvar, Rheem, Ruud, State, or approved.

2.3 CIRCULATION PUMPS

A. General: Provide in-line factory tested pumps, cleaned, and painted with enamel prior to shipment. Provide pumps of same type by same manufacturer.

B. Type: Horizontal, oil-lubricated, designed for 125 PSI working pressure, 210F continuous water temperature.

C. Body: Bronze or stainless steel construction.

D. Shaft: Steel, ground and polished, integral thrust collar.

E. Bearings: Two horizontal sleeve bearings designed to circulate oil.

F. Seal: Mechanical, with carbon seal face rotating against ceramic seat.

G. Motor: Nonoverloading at any point on pump curve, open, dripproof, sleeve bearings, quiet operating, rubber mounted construction, built-in thermal overload protection.

H. Coupling: Self-aligning, flexible.

I. Manufacturers: Amtrol, Armstrong, Bell & Gossett, Grundfos, Paco, Taco, or approved.

2.4 GREASE TRAPS

A. Coated, cast iron, grease interceptor with coated steel extensions as required. Gasketed nonskid locking cover. Single-bolt, hold-down cover on interceptor. Cascade bottom. Internal air relief, visible double wall trap, removable baffles. Clamping ring and anchor flange. Grease draw-off piping, flexible hose and valve, flow control fitting. Smith, Wade, Zurn. Capacity as shown on Drawings. Note: Provide extension where required by structural features or depth of piping.

B. Interceptor to be installed flush with finish floor unless specifically directed otherwise by Architect or as detailed on Drawings.

2.5 EXPANSION TANKS

A. Manufacturers: Mueller, Amtrol, Armstrong, Taco, Bell & Gossett, Watts, or approved.

B. Welded steel, constructed, tested and stamped in accordance with IAPMO Standards for working pressure of 125 PSI. Support floor mounted tanks with steel legs or base. Provide single flexible diaphragm securely sealed into tank to separate air charge from system water, to maintain design expansion capacity. Provide pressure gauge and air-charging fitting, and drain fitting. Diaphragm: Removable and replaceable in line.

PART 3 - EXECUTION

3.1 WATER HEATERS

A. Gas-Fired Water Heaters:

1. General: Install in accordance with manufacturer's installation instructions.

2. Support: Set units on concrete pads, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.

3. Gas Supply: Connect to gas line with drip leg, tee, gas cock, and union; full size of unit inlet connection. Locate piping so as not to interfere with service of unit.

4. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve; check valve, and union. Pipe relief valve discharge full size to floor drain.

5. Flue: Connect flue to draft hood with gastight connection.

6. Startup: Start up, test, and adjust gas-fired water heaters in accordance with manufacturer's startup instructions, and utility company's requirements. Check and calibrate controls, adjust burner for maximum efficiency.

7. Seismic Restraint: Anchor tanks to structure.

B. Electric Water Heaters:

1. General: Install in accordance with manufacturer's installation instructions.

2. Support: Set units on insulated pads meeting energy code requirements, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.

3. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve; check valve, and union. Pipe relief valve discharge full size to floor drain.

4. Startup: Start up, test, and adjust electric water heaters in accordance with manufacturer's startup instructions, and utility company's requirements. Check and calibrate controls.

5. Seismic Restraint: Anchor tanks to structure utilizing methods outlined in Contract Documents as required by governing authorities.

3.2 INTERCEPTORS AND GREASE TRAPS

A. General: Install interceptors in accordance with manufacturer's installation instructions.

B. Support: Anchor interceptors securely to substrate, locate so adequate clearance is provided to remove covers and sediment baskets. Set recessed units so top of cover is flush with finished floor. Install per requirements of HD-20 truck wheel with 30 percent impact.

C. Piping: Connect inlet and outlet piping to interceptors.

3.3 CIRCULATING PUMPS

A. Install per manufacturer's instructions.

B. Adjust flow rate to design point.

3.4 EXPANSION TANKS

A. Install tank in accordance with manufacturer's instructions. Charge tank with air per manufacturer's instructions.

3.5 PROTECTION

A. Protect bright finished shafts, bearing housings and similar items, until in service; no rust will be permitted.

B. Cover equipment and materials stored on the job site or otherwise suitably protect at the direction of, and to the satisfaction of Architect. If coverings become torn, replace until the equipment is connected and operating.

END OF SECTION 223000

PLUMBING FIXTURES
SECTION 22 40 00

PART 1 - GENERAL

1.1 SUMMARY

A. Provide labor, materials, equipment and services necessary to furnish and install a complete plumbing system as shown on the Drawings and specified herein. The work includes, but is not necessarily limited to:

1. Plumbing fixtures and trim, including rims for sinks and lavatories in casework or counters, chair carriers (as required), drinking fountain, drains, cleanouts, floor sinks, and related fixtures shown on the Drawings.

2. Rough-in and final connection to equipment and fixtures, relocated or provided under other sections or under other divisions of the work.

3. Standards and supports for equipment requiring them.

4. Instructions and maintenance manuals for equipment furnished by this Section.

1.2 SUBMITTALS

A. Product Data in Accordance with Division 01: Manufacturer's specifications, installation and startup instructions, capacity and ratings, with selection indicated. Provide pump performance curves with selection points indicated. Provide specialties and accessories required for a complete and operable installation.

B. Shop Drawings:

1. Assembly type shop drawings indicating dimensions, weights, required clearances, and methods of assembly of components and anchorages.

2. Submit For:

a. Fixtures, see Plumbing Fixture Schedule.

b. Floor drains.

C. Wiring Diagrams: Ladder type wiring diagrams for components, indicating required field electrical connections.

D. Maintenance Data: Submit maintenance data and parts list for each item. Include "troubleshooting" maintenance guides. Include this data in maintenance manual.

1.3 PLUMBING FIXTURES

A. General: Provide factory fabricated fixtures of type, style and material indicated on the Plumbing Fixture Schedule on the Drawings. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, and as required for complete installation. Where more than one type is indicated, selection is installer's option; but, fixtures of same type must be furnished by a single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

1. Fixtures: Complete with fittings, supports, fastening devices, faucets, valves, traps, stops and appurtenances required.

2. Exposed IPS Piping and Tubing: Brass, chrome plated.

3. Escutcheons: Brass, chrome plated.

4. Fixture Locations: As shown on Drawings.

5. Stops: Stops installed in each supply pipe at each fixture accessibly located with wall escutcheons.

6. Showers: Provide with flow control device to prevent flow over 2.5 GPM.

7. Public Lavatories: Provide with flow control device to prevent flow over 0.5 GPM.

8. Interior Faucets except Public Lavatories: Provide with flow control device to prevent flow over 2.5 GPM.

9. Bathtubs: Provide waste and overflow assembly with soldered or solvent weld joints. Provide per fire rating of building assemblies.

1.4 DELIVERY, HANDLING AND STORAGE

A. Fixtures: Deliver plumbing fixtures individually wrapped in factory fabricated containers. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.1 CHINA FIXTURES

A. American Standard, Kohler, Eljer, Toto or approved.

2.2 STAINLESS STEEL FIXTURES

A. Elkay, Just, Haws, or approved.

2.3 MOLDED RESIN OR STONE FIXTURES

A. Fiat, Mustee, or approved.

2.4 ENAMELED STEEL FIXTURES

A. Eljer, Kohler, or approved.

2.5 ENAMELED CAST IRON

A. American Standard, Eljer, Kohler, or approved.

2.6 FIBERGLASS FIXTURES

A. Fiber-Fab, Aqua-Glass, Mustee, Hytec, or approved.

2.7 FLUSHOMETERS

A. Sloan, Zurn, Delaney, or approved.

2.8 FAUCET FITTINGS

A. Private: Chicago, Moen, Delta/Delta Commercial; Speakman, Symmons, T&S Brass, or approved.

B. Public: Symmons, Chicago, Delta Commercial, Moen Commercial, T&S Brass, American Standard, or approved.

2.9 WATER CLOSET SEATS

A. Solid white reinforced plastic, hinge with insert integrally in seat. Olsonite, Church, Beneke, Bemis, or approved.

2.10 FLOOR DRAINS

A. Cast iron body, double drainage flange with weep holes, nickel bronze or heavy C.P. strainer/grate/funnel finishes, flashing clamp device, adjustable or insert type strainer. Comply with ANSI A112.21.1. Smith, Wade, Watts, Zurn, or approved. See Schedule on Drawings.

2.11 FLOOR SINKS

A. Coated or enameled cast iron body, double drainage flange with weep holes, nickel bronze or heavy C.P. strainer/grate/funnel finishes, flashing clamp device, adjustable or insert type strainer. Comply with ANSI A112.21.1. Smith, Wade, Watts, Zurn, or approved. See Schedule on Drawings. (Plastic components not allowed.)

2.12 HOSE BIBBS

A. Cast brass heavy duty hydrant, brass operating parts, renewable seat, hose outlet, vacuum breaker and removable "T" handle. J. R. Smith, Woodford, Wade, Zurn, Mifab, Chicago, or approved. See Schedule on Drawings for types.

2.13 GARBAGE DISPOSERS

A. First grade quality suitable for commercial or residential kitchen use, complete with switches, controls, solenoid and flow control valves, vacuum breakers and appropriate sink or cone attachments. Motors, switches, solenoid valves and electrical controls compatible. In-Sink-Erator, or approved. See fixture schedule for description.

2.14 FIXTURE TRIM

A. Traps: Provide traps on fixtures except fixtures with integral traps. Exposed traps chromium plated cast brass or 17 gauge chromium plated brass tubing. American Standard, Kohler, Chicago, BrassCraft, Eastman, Speedway, McGuire, or approved.

B. Supplies and Stops: First quality, chrome plated with brass stems. Stops: Loose key type. American Standard, Kohler, Chicago, BrassCraft, Eastman, Legend, Speedway, McGuire, or approved.

2.15 FIXTURE SCHEDULE

A. Provide fixtures as scheduled on the Drawings.

2.16 KITCHEN EQUIPMENT

A. Furnish and install shutoff valves, pressure regulators, shock arrestors, vacuum breakers, strainers, indirect waste piping, backflow preventers, and other devices or piping which are not furnished with the Kitchen equipment. Approved, listed gas appliance connectors may be used for final connection to cooking equipment; subject to approval by local code authority.

2.17 SHOWER VALVES

A. Powers, Symmons, Acorn, Chicago, Moen, Delta.

2.18 THERMOSTATIC MIXING VALVES

A. Symmons, Powers, Bradley, or approved.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Fixtures: Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures.

3.2 FIXTURES INSTALLATION

A. General:

1. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes.

2. Set and connect to soil, waste, vent and water piping in neat, finished and uniform manner. Connections to be equal height, plumb and set at right angles to floor, wall or both unless otherwise required or specified.

3. Seal fixtures mounted on floors and walls at abutting joints with approved sealant compounds as directed by Architect.

4. For ADA accessible toilets, provide with actuator at wide portion of stall.

5. Lavatories: Set mixing valves to limit outlet temperature to 110F.

B. Fixture Locations: As shown on Drawings. Center water closets and urinals between privacy partitions unless noted otherwise.

C. Stops: Stops installed in each supply pipe at each fixture accessibly located with stops of loose key type. Concealed stops to be screwdriver or loose key type with wall escutcheons.

D. Fixture Supports:

1. Support wall hung water closets, urinals and lavatories on heavy duty, full size, concealed, commercial grade carriers mounted to floor structure. Refer to Plumbing Fixture Connection Schedule on Drawings.

2. Support other fixtures mounted on stud partitions on heavy concealed wall brackets bolted to a 1/4-inch thick by 5-inch high steel plate anchored firmly to studs with bolts (or welded to metal studs). Plate to extend one stud each way beyond fixture mounting point width.

E. Flush Valves: Provide "drop-ear" ells or couplings in wall at water supply outlets to flush valves; anchor firmly to structure.

F. After fixtures are set in place and secured to walls, caulk all around between fixtures and wall with white silicone caulking compound. Dow Corning 780, General Electric Construction Sealant, or approved.

G. Set countertop lavatories and stainless steel sink rims in waterproof sealant made for application.

H. Adjust self-closing faucets to provide minimum of 10 seconds of waterflow, and maximum of 15 seconds.

I. After fixture installation is complete, cover and protect rims, fronts and exposed parts until completion of construction phase. Contractor responsible for damage to fixtures and assumes related fixture repair or replacement costs.

J. At ADA accessible drinking fountains/water coolers, set at heights required for ADA compliance. See Architectural Drawings for bi-level fixtures. Provide right/left high/low orientation to match installation. Provide apron/skirt as required.

3.3 FLOOR DRAINS AND FLOOR SINKS

A. General: Install drains in accordance with manufacturer's written instructions and in locations indicated.

B. Coordinate with piping as necessary to interface drains with drainage piping systems.

C. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of floor drains flush with finished floor. Set floor sinks as required by local codes.

D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

E. Position drains so that they are accessible and easy to maintain.

F. Coordinate drain flashing, flanges and strainer types and depths with floor substrate and topping configuration.

G. Primers:

1. Prime drains which experience intermittent use. Refer to Drawings and coordinate location with Architect. Coordinate with local AHJ for exact requirements.

3.4 ROOF DRAINS/OVERFLOW DRAINS

A. General: Install drains in accordance with manufacturer's written instructions and in locations indicated.

B. Provide 4 lb. lead flashing and coordinate flashing work with work of roofing, waterproofing, and adjoining substrate work.

C. Coordinate with roofing as necessary to interface roof drains with roofing work.

D. Coordinate with storm water piping as necessary to interface drains with drainage piping systems.

E. Install drains at low points of surface areas to be drained.

F. Install drains flashing collar or flange so that no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

G. Position drains so that they are accessible and easy to maintain.

H. Set overflow drains at proper elevation relative to main roof drains.

I. Install flexible expansion joints on roof drains which do not have horizontal offsets at storm drainage piping.

3.5 HOSE BIBBS (INSIDE)

A. Install on exposed piping where indicated, with vacuum breaker.

3.6 SILL FAUCETS

A. Install on concealed piping where indicated, with vacuum breaker.

3.7 HOSE BIBBS AND HYDRANTS

A. Install where indicated, with vacuum breaker and in accordance with manufacturer's installation instructions.

3.8 ADJUSTING AND CLEANING

A. Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation. Adjust water pressure at drinking fountains, faucets, shower valves and flush valves to provide proper flow stream and specified GPM. Repair leaks at faucets and stops.

3.9 EXTRA STOCK

A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner.

3.10 FIELD QUALITY CONTROL

A. Inspection:

1. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

2. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect. Remove cracked or dented units and replace with new units.

3.11 OWNER-FURNISHED EQUIPMENT

A. Some equipment is to be furnished under another Contract and is indicated as such on Drawings. Rough-in for such equipment, receive, uncrate, install and connect plumbing equipment, faucets, and fixtures as furnished by others. Furnish and install stops, traps, strainers, backflow preventers, valves and other appurtenances not furnished by others in order to provide a complete operating system. Obtain list of such equipment from Contractor.

B. Comply with paragraph on Plumbing Fixtures Installation, this Section, for installation procedures.

C. Refer to Plumbing Fixture Connection Schedule on Drawings.

3.12 PROTECTION

A. Protect fixtures and equipment from damage. Replace damaged items with new.

END OF SECTION 224000

BASIC HVAC REQUIREMENTS
SECTION 23 00 00

PART 1 - **GENERAL**

1.1 SUMMARY

A. Work Included: Work included in 23 00 00 applies to Division 23 work to provide materials, labor, tools, permits and incidentals to provide and make ready for Owner's use heating, ventilation, and air conditioning systems for proposed project.

B. Related Work Specified Elsewhere:

1. Contents of Section applies to Division 23 specifications.
2. Requirements of Section are a minimum for Division 23 Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

1.2 DEFINITIONS

A. Following is a list of abbreviations generally used in Division 23:

1. ADA Americans with Disabilities Act.
2. AHJ Authority Having Jurisdiction.
3. ANSI American National Standards Institute.
4. ARI Air-Conditioning & Refrigeration Institute.
5. ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers.
6. ASME American Society of Mechanical Engineers.
7. ASTM American Society for Testing and Materials.
8. ASSE American Society of Sanitary Engineering.
9. AWWA American Water Works Association.
10. CBC California Building Code.
11. CEC California Electrical Code.
12. CGA Canadian Gas Association.
13. CMC California Mechanical Code.
14. CISPI Cast Iron Soil Pipe Institute.
15. ETL Electric Testing Laboratories.
16. FM FM Global.
17. HI Hydraulic Institute Standards.
18. HVAC Heating, Ventilating and Air Conditioning.
19. NEC National Electric Code.
20. NEMA National Electrical Manufacturers Association.
21. NFGC National Fuel Gas Code.
22. NFPA National Fire Protection Association.
23. NRCA National Roofing Contractors Association.
24. NSF National Sanitation Foundation.

25. SMACNA Sheet Metal and Air Conditioning Contractors' National Association, Inc.
26. TEMA Tubular Exchanger Manufacturers Association.
27. TIMA Thermal Insulation Manufacturers Association.
28. UL Underwriters Laboratories Inc.

1.3 ADDITIONAL REQUIREMENTS TO DIVISION 01

A. Operation and Maintenance Documentation: Copies of certificates of code authority acceptance, test data, parts lists, maintenance information for equipment, valves, balancing reports, equipment start-up documentation, and other special guarantees, certificates of warranties, and the like, specified elsewhere herein or indicated on Drawings.
B. Shop Drawings: Provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and the like. Refer to individual Specification Sections for additional requirements for the shop drawings.
C. Closeout Documentation: Submit mechanical code authority certification of inspection.
D. Record Drawings:

1. Show changes and deviations from the Drawings. Include issued Addendum and change order items.
2. Make changes to the Drawings in a neat, clean, and legible manner.

E. Product Data:

1. Submit manufacturer's technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, supplied or provided. Refer to individual specification sections for specific items required in product data submittal. Submit at one time in 3-ring binder, tabbed and referenced to match the Contract Documents.
2. Maintain an updated product submittal package to be included in the final operation and maintenance documentation.

1.4 QUALITY ASSURANCE

A. Where Contract Documents are at variance with applicable codes governing work, code and local jurisdiction requirements take precedence, and include cost necessary for code compliance or local jurisdiction compliance in bid price. Machinery and equipment to comply with Occupational Safety and Health Act of 1970, as currently revised, as interpreted for equipment manufacturer requirements.
B. Mechanical Drawings: Drawings are intended to be diagrammatic and are based on one manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., ducts and piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than basis of design, including but not limited to architectural, structural, electrical, fire sprinkler, and HVAC.
C. Requirements: As a minimum requirement, work in accordance with following rules and regulations and applicable laws:

1. NFPA.
2. OSHA.
3. UPC.
4. Related supplements and standards.
5. California State Energy Code.
6. California Building Code
7. California Mechanical Code
8. State of California and local jurisdictional requirements.

D. Permits and Inspections:

1. Unless otherwise distinctly hereinafter specified, apply and pay for necessary permits, plans check, and inspections required by public AHJ.
2. Refer to General and Supplementary Conditions for payment of water and sewer service connection fees.
3. Obtain certificates of inspection from AHJs and deliver to Owner before final acceptance.
4. Each trade to consult local building department and utility companies prior to commencement of work to ascertain existence and location of existing underground utilities. Protect existing service against damage and interruption of use, and reroute as may be necessary to accomplish new work. Include costs for materials and installation for rerouting as specified for new work in bid price.

E. Regulatory Requirements:

1. UL and CSA Compliance: Provide units which are UL and CSA listed.
2. ASME Compliance: Provide units which are ASME listed when boilers which exceed 200,000 BTUH, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
3. Provide safety controls required by National Boiler Code (CSD-1) for boilers exceeding 400,000 BTUH.

1.5 SEQUENCING AND SCHEDULING

A. For proper execution of work, cooperate with other trades as needed.
B. To avoid installation conflicts, thoroughly examine complete set of Contract Documents. Resolve conflicts with Architect prior to fabrication and installation.
C. Prior to installation of equipment requiring electrical connections, examine manufacturer's shop drawings, wiring diagrams, product data, and installation instructions. Verify that electrical characteristics indicated in Contract Documents are consistent with electrical characteristics of actual equipment being installed. When inconsistencies occur request clarification from Architect.

1.6 TEMPORARY HEATING

A. Temporary heating for facility during construction phase not to be supplied by permanent system installed under these Specifications.
B. Exception:

1. Extend product warranties to account for construction use. Furnish certified document stating such extended warranties.
2. Pressure clean coils and vacuum clean ductwork prior to occupancy.

1.7 COORDINATION DOCUMENTS

A. Prepare and submit coordinated layout drawings, prior to construction, to coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, fire sprinklers, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system, and progressively number. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including electrical, ceiling suspension, and tile systems), and provide reasonable maintenance access requirements.

B. Prepare Drawings as follows:

1. Prepare Drawings to accurate scale of 1/4 inch = 1 foot or larger on Mylar sheets or AutoCAD. Drawings are to be same size as Contract Drawings and to indicate location, size and elevation above finished floor of HVAC equipment, ductwork, and piping. Drawings to also indicate proposed ceiling grid and lighting layout as shown on electrical drawings and reflected ceiling drawings.
2. Review and revise as necessary section cuts in Contract Drawings after verification of field conditions.
3. Indicate system piping including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.
4. Piping that must be graded to have right-of-way over more flexible items.
5. Drawings are to incorporate Addenda items and change orders.
6. Distribute drawings to trades and provide additional coordination as needed.

C. Advise Architect, in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

D. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.

E. Final coordination drawings with appropriate information added to be submitted as Record Drawings at completion of project.

1.8 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, lights, and electrical services with architectural and structural requirements, and other trades (including electrical, ceiling suspension, and tile systems), and provide reasonable maintenance access requirements.

1.9 EXISTING SOILS CONDITIONS

A. Understand existing soils conditions before submitting bid on work. No additional allowance will be granted due to lack of information for existing conditions of subsurface soils.

B. Submission of a bid will be considered acknowledgment of review/understanding of project geotechnical soils report.

PART 2 - PRODUCTS

2.1 HAZARDOUS MATERIALS

A. Do not use products containing asbestos, lead, arsenic, or any other material defined by EPA as hazardous to human or animal life.

2.2 MATERIALS

A. Base contract upon furnishing materials as specified. Materials and equipment used for construction are to be new, the latest products as listed in manufacturer's printed catalog data and are to be UL or CSA approved or acceptable by state, county, and city authorities. Equipment supplier is responsible for obtaining state, county, and city acceptance on equipment not UL approved or not listed for installation.
B. Articles and equipment of a kind to be standard product of one manufacturer.
C. Trade names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

PART 3 - EXECUTION

3.1 ACCESSIBILITY AND INSTALLATION

A. Install equipment having components requiring access (i.e., drain pans, drains, fire dampers, control dampers, control operators, valves, motors, drives, and the like) so that they may be serviced, reset, replaced or recalibrated and the like, by service people with normal service tools and equipment. Notify Architect in writing if equipment or components are shown in such a position that above cannot be accomplished.
B. Install equipment complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment, examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect Engineer prior to proceeding with installation. This includes proper installation methods and sequencing, in coordination with other trades and disciplines.
C. Earthwork:

1. Refer to Division 31.
2. Perform excavation and backfill for installation of mechanical work.

D. Firestopping:

1. Coordinate with Drawings location of fire rated walls, ceilings, floors and the like. When these assemblies are penetrated, seal around piping, ductwork, equipment, and the like, with approved firestopping material.
2. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814.

3.2 NOISE AND VIBRATION

A. Install vibration isolators, flexible connectors, expansion joints, and measures required to prevent noise and vibration from being transmitted to occupied areas. Select equipment to operate within noise coefficient (NC) design level for particular type of installation in relation to its location.
B. After installation, make proper adjustments to reduce noise and vibration to acceptable levels as defined by Architect.

3.3 SEISMIC CONTROL

A. Provide the following:

1. General:

a. Earthquake resistant designs for mechanical equipment, i.e., air handling units, blowers, motors, ductwork, mechanical piping, to conform to regulations of IBC.
b. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment piping, ductwork, and the like, to withstand a force in direction equal to value defined in IBC.
c. Retain licensed structural engineer to provide shop drawings of seismic bracing and seismic movement assemblies for piping/ ductwork/ equipment, and the like. Engineer to design and provide stamped shop drawings for equipment, ductwork, piping seismic bracing, and the like. Submit shop drawings along with equipment submittals.
d. Retain licensed structural engineer to provide shop drawings of seismic flexible joints for piping/ductwork and the like crossing building expansion or seismic joints. Engineer to design and provide stamped shop drawings for piping/ductwork flexible seismic joints. Coordinate actual design deflection or travel with project structural engineer. Submit shop drawings along with seismic bracing details. Coordinate exact design requirements from project structural engineer.

2. Piping and Ductwork:

a. Use "Seismic Restraints Manual Guidelines for Mechanical Systems," published by SMACNA.
b. Sway bracing is not required for pipes that are installed on very short individual hangers (12 inch or less).
c. As approved by code authority, use a bracing system manufactured by Tolco, Superstrut, Mason, or Pipe Shields Inc. or approved.

3. Equipment:

a. Provide a means to prohibit excessive motion of mechanical equipment during earthquake.
b. Provide mechanical equipment, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to 0.5 of equipment operating weight.

3.4 REVIEW BY ENGINEER

A. Notify Architect/Engineer, in writing, at following stages of construction so that Architect/Engineer may, at their option, visit site for review and construction observation:

1. Underground piping installation prior to backfilling.
2. Prior to covering walls.
3. When ceiling installation is started.
4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
5. When ductwork installation starts.
6. When installation starts for each different major type of equipment.
7. When lines or ducts are to be permanently concealed by construction or insulation systems.
8. When balancing and testing is started.

3.5 OPERATING DURING CHANGEOVER

A. During remodeling of existing structure, or addition of a structure to existing structure, while existing structure is occupied, present services to remain intact until new construction, facilities or equipment is installed.
B. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping, wiring, and the like, to point of connection.
C. Perform actual transfer to new service at off-peak time, as coordinated with Owner. Once changeover is started, pursue it to its completion, to keep interference to a minimum.

3.6 MUTILATION

A. Repair mutilation of building around pipes, ducts, and the like.

3.7 DEMOLITION

A. Scope:

1. It is intent of these documents to provide necessary information and adjustments to mechanical system required to meet code, and accommodate installation of new work.
2. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access, access to different areas.
3. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with

new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

B. Equipment: Unless otherwise directed, equipment or fittings being removed as part of the demolition process are the Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.

C. Unless specifically indicated on the Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.

D. Unless specifically indicated on the Drawings, remove unused equipment, fittings, rough-ins, connectors, etc. Removal is to be to a point behind finished surfaces (floors, walls, ceilings, etc.).

3.8 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize mechanical equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.9 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

B. Maintain design intent where equipment other than as shown in Contract Documents is provided. Where equipment requires piping arrangement, control diagrams, or sequencing different from that indicated in Contract Documents, provide electrical motors, wiring, controls, or other required electrical components at no additional cost to Owner.

3.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and equipment in a manner to prevent damage and deterioration. Store in original container which identifies manufacturer's name, brand and model number. Do not store indoor equipment outdoors unless provided with a waterproof protective cover.

B. Replacement: In event of damage, immediately make repairs and replacements necessary.

3.11 DEMONSTRATION

A. Upon completion of work and adjustment of equipment, test systems to demonstrate to Owner's Representative and Architect that equipment furnished and installed or connected under provisions of these Specifications functions mechanically in manner required.

B. Manufacturer's Field Services: Furnish services of a qualified person for a period of not less than 16 hours, at a time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in a satisfactory manner and complies with requirements of other trades or Contractors that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.12 CLEANING

A. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated by this work.

3.13 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions, plumb and level, firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.
B. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of mechanical systems.
2. Furnish sufficient refrigerant and dry nitrogen for pressure testing under manufacturer's supervision.
3. Provide and install additional fan sheaves to obtain design capacities. Coordinate exact requirements with balancing firm.

3.14 PAINTING

A. Ferrous Metal: After completion of mechanical work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, and the like, with one coat of black asphalt varnish or black enamel suitable for hot surfaces.
B. Machinery:

1. In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
2. See individual equipment Specifications for other painting.
3. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.

C. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.

3.15 CUTTING AND PATCHING

A. Refer to Section 01 73 29 "Cutting and Patching."

3.16 ACCEPTANCE

A. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

1. Testing and balancing reports.
2. Cleaning.
3. System balancing and balancing logs.
4. Operating and Maintenance Manuals.
5. Training of operating personnel.
6. Record Drawings.
7. Guaranty certificates.
8. Start-up and test document.
9. Letter of conformance.

3.17 LETTER OF CONFORMANCE

A. Provide letter and copies of extended warranties with a statement in letter that mechanical items were installed in accordance with manufacturer's recommendations. Include letter of conformance and warranties in operating and maintenance manuals.

B. Warranties to begin at date of substantial completion.

END OF SECTION 230000

BASIC HVAC MATERIALS AND METHODS
SECTION 23 01 00

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Materials, installation and testing of pipe, tubing and fittings, and valves.

2. Refer to Specification Sections for each system medium (i.e., hydronics, gas, and the like) for pipe application.

3. Motors and starters.

4. Rooftop equipment supports.

5. Mechanical identification materials.

6. Seismic/vibration isolation.

1.2 QUALITY ASSURANCE

A. Manufacturer's Inspection: Inspect flanges, fittings and field applied welds in accordance with manufacturer's standard written quality control procedure in accordance with the following techniques:

1. Visual Method: Comply with MSS SP-55 except as otherwise indicated.

2. Radiographic (X-Ray) Method: Employ wherever recommended or required for pressurized piping systems.

B. Welding Qualification: Qualify welding procedures, welders and operators in accordance with ANSI B31.9 for shop and project site welding of piping work.

1.3 SUBMITTALS

A. Piping Materials List: Provide a typewritten list which schedules the piping materials to be used for each system as a function of applicable nominal pipe size ranges. Arrange schedule in outline form for each specific piping system, e.g., "Chilled Water System," "Heating Water System," and the like. Include ASTM, ANSI or other numbers and other data as necessary to demonstrate compliance with requirements.

B. Test Procedure: Submit a typewritten checklist type of testing procedure indicating testing medium (i.e., water, air, nitrogen, and the like), pipe service, pipe and fitting type and classification, test pressure, pass/fail criteria and other pertinent data.

C. Maintenance Data: Submit maintenance data and parts list for each type valve. Include this data, product data, and certifications in maintenance manual.

D. Access Panel Locations: Submit drawings for Architect to approve locations/sizes of access panels.

PART 2 - PRODUCTS

2.1 PRODUCT STANDARDS

A. References to product Specifications for materials are listed according to accepted base standards. Materials to meet latest approved versions of these standards.

2.2 ACCESS PANELS

A. Provide flush mounting access panels as required for service of fire dampers, cleanouts, valves, and the like, and other items requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum 24x24 (or required and approved size). Wall access panels to be minimum 12x12 (or required and approved size).

B. Manufacturers: Milcor, Karp, Elmdor, In-Ryko, Acudor, or approved. Provide two keys for each set of locks provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms, and other electrical or electronic equipment spaces and enclosures. Within equipment rooms, provide minimum 3-foot lateral clearance from sides of electric switchgear panels. Do not route piping above electric power or lighting panel, switchgear, or similar electric device. Coordinate with electrical and coordinate exact pipe routing to provide proper clearance with such items.

3.2 PAINTING

A. Ferrous Metal: After completion of mechanical work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, and the like, with one coat of black asphalt varnish or black enamel suitable for hot surfaces.

B. Machinery:

1. In a mechanical room, on the roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.

2. See individual equipment specifications for other painting.

C. Structural Steel: Repair damage to structural steel finishes or the finishes of other materials damaged by cutting, welding or patching to match original.

3.3 ACCESS PANELS

A. Install ceiling or wall access panels to provide access to concealed valves, fans, motors, fire dampers, terminal units, coils and other items needing service. Provide access panels at locations required or as specified herein. Coordinate locations/sizes of access panels with Architect prior to work.

B. Where access panels are for service of fire, fire/smoke, or smoke dampers, stencil the words "Fire Damper," "Fire/Smoke Damper," or "Smoke Damper" in 1/2-inch high capital letters on the outside of the panels.

3.4 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

B. Manufacturers: Hilti, Proset, or approved.

3.5 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment and after units are water pressurized, test coils to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove and replace with new unit. Feasibility and match to be judged by Architect. Remove cracked or dented units and replace with new units.

3.6 MECHANICAL EQUIPMENT IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices: terminal units, coils, fans, chillers, boilers, blowers, unitary HVAC equipment, and similar equipment.

3.7 ROOFTOP SEISMIC STRAPS

A. Provide 8-inch wide by 8-inch long, 16 gauge straps fastened from rooftop-mounted equipment to curb at minimum of one or more locations per side as determined by seismic design requirements.

3.8 DUCTWORK IDENTIFICATION

A. General: Identify air supply, return, exhaust, and intake ductwork with duct markers, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork identification color).

B. Location: In each space where ductwork is exposed, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and at 50-foot spacing along exposed runs.

C. Access Doors: Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions.

D. Dampers: Provide 12-inch plenum rated marker ribbon to end of balancing damper handles.

3.9 ADJUSTING AND CLEANING

A. Adjusting: Relocate or add mechanical identification device when another has become visually blocked.

B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.10 CONNECTIONS TO EXISTING

A. Prior to connection of piping and ductwork to existing as illustrated on Drawings, field verify existing conditions and exact sizes and locations of existing piping and ductwork. Provide additional offsets, transitions, joints, cut-ins, and replace portions of existing as required to facilitate connections of new as shown on Documents.

3.11 CAULKING

A. Provide Geocel Corporation, (800) 348-7615, Construction 2000 Caulking Sealant. Standard color to match as close as possible to surrounding surface. Application standards, ASTM C920, Type S, Grade NS, Class 25, ICBO approved, Report No. 3680. Apply per manufacturer's recommendations.

3.12 STARTERS

A. Install in sight of equipment controlled, easily accessible, protected from possible piping leaks and no more than 6 feet above the floor.

END OF SECTION 230100

HEATING, VENTILATING AND AIR CONDITIONING
SECTION 23 05 00

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following major items:

1. Air distribution, heating, cooling, ventilation and exhaust systems.
2. Equipment used for distribution of air, including fans, motors, controls, control wiring, filters, ductwork, air supply outlets, air return and exhaust inlets.
3. Sleeves, hangers, flashings, counterflashing and weatherproofing for mechanical equipment.
4. Combustion air and flues for gas-fired equipment including gas water heaters.
5. Fire dampers, sleeves, frames, fire/smoke dampers, and control devices.

B. Installation and startup instructions.

1.2 QUALITY ASSURANCE

A. Qualifications: Firms regularly engaged in the manufacture of HVAC equipment, of the types and capacities required.
B. Regulatory Requirements; UL and CSA Compliance: Provide units which are UL and CSA listed.
C. Unless otherwise noted, where the Specification refers to SMACNA in reference to sheet metal or flexible ductwork accessories, this refers to HVAC Duct Construction Standards, Metal and Flexible, latest edition, as published by SMACNA .
D. Unless otherwise noted, where the Specification refers to SMACNA in reference to fibrous glass ductwork accessories, this refers to Fibrous Glass Duct Construction Standard.
E. Regulatory Requirements - Packaged Air Conditioning Units:

1. ARI 210/240-2003: Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
2. ARI 270-95: Sound Rating of Outdoor Unitary Equipment.
3. NRCA: Provide roof curbs in accordance with NRCA.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed and operating), furnished specialties and accessories, and installation and start-up instructions.
B. Shop Drawings: Submit manufacturer's assembly type shop drawings indicating dimensions, weight loadings, required clearances, methods of assembly of components, location and size of each field connection, arrangement and construction including bussing, and number and type of contactors employed. Submit manufacturer's catalog data on sealer, flexible ducting, vent piping, factory fabricated devices, and factory fabricated duct and fittings.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply to HVAC equipment. Submit manufacturer's ladder type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

D. Maintenance Data: Submit maintenance data and parts list for equipment including control, accessory, and "troubleshooting" maintenance guide. Include this data and product data in maintenance manual.

E. Equipment Start-Up Procedures: Submit equipment start-up procedures for HVAC systems for each piece of equipment. Include completed Start-up Documentation as filled out by the field technician and include this data in the Operations & Maintenance manual.

F. For equipment that is roof mounted or hung from structure, equipment manufacturer to provide, as a shop drawing submittal, details, devices, and the like, required for appropriate equipment mounting. Details and drawings to be stamped by a registered structural engineer in the state of California.

G. Record Drawings: At project closeout, submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets.

1.4 AIR DISTRIBUTION DUCT SYSTEM

A. General: Provide ductwork, including collars, register boxes, fire dampers, exhaust fans, ventilation louvers, roof vents and screens, as well as dampers and other miscellaneous items not specifically mentioned but necessary for a complete installation. Apply the latest standards of SMACNA and ASHRAE with respect to sheet- metal gauge and general construction for round and rectangular ducts.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's rigging and installation instructions for unloading and installing HVAC equipment.

B. Protect accessories from damage during shipping, storage and handling.

1.6 GUARANTY

A. General: Provide written guaranty on HVAC work, agreeing to replace/repair inadequate and defective materials and quality of work, including leakage, breakage, improper assembly and failure to perform as required for a period of 1 year from date of Owner's acceptance. Include separate product warranties as indicated for specific parts or products in the work. Provide guaranty signed by both the installer and Contractor.

B. Include manufacturer's standard product warranty, covering HVAC equipment operation under normal conditions and use, where installed, operated and maintained in accordance with manufacturer's instructions. Provide product warranty period terminating 12 months after final acceptance, by Owner, of the project.

PART 2 - PRODUCTS

Section not used.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which HVAC equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 VERIFICATION OF CONDITIONS

A. Examine areas and conditions under which equipment and air terminals are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.3 VIBRATION AND ISOLATION APPLICATION

A. General:

1. Set floor-mounted equipment on 4-inch-high housekeeping type concrete pads. Extend pad 6 inches beyond footprint of equipment in each direction.
2. Install flexible duct connections at fan unit intakes, fan unit discharges, and wherever else shown on Drawings.
3. Install flexible pipe connections (FPC) at pipe connections to vibration isolated equipment. Included, but not be limited to, air handling units, pumps, chillers, and cooling towers.
4. Isolate miscellaneous pieces of mechanical equipment, i.e., storage tanks, and expansion tanks from the building structure by NP or HN isolators.
5. Provide mounts for equipment installed outdoors for wind loads of 30 lbs. psf applied to exposed surfaces of the isolated equipment.
6. Under no circumstances destroy isolation efficiency by bolting the isolators to the roof or floor or equipment. If bolting is necessary, provide rubber grommets and washers to isolate the bolt from the base plate.
7. Building Penetrations: Isolate water piping and ductwork penetrating wall, ceilings, floors or shafts from the structure by piping isolator or by 3/8-inch thick-foamed rubber insulation. Install units flush with finished structure face, using one for each side as required. Cut units to length if longer than structure thickness. Caulk around pipe or duct at equipment room wall.
8. Pipe and Duct Hangers in Equipment Rooms: Support water, gas piping and ducts connected to rotating equipment within the equipment rooms on spring and neoprene hangers. The first three hangers from a piece of vibrating equipment to have a minimum of 1/2 the static deflection of that of the equipment isolators. Other isolators should have a minimum of 1/4 the static deflection of that of the equipment.

3.4 VIBRATION ISOLATION EQUIPMENT INSTALLATION

A. General: Install vibration isolation equipment in accordance with the manufacturer's written instructions.

B. Isolation Mounts:

1. Squarely align vibration isolators above or below mounting points of the supported equipment.

2. If a housekeeping pad is provided, install isolators such that they bear on the housekeeping pad and the isolator base plate rests entirely on the pad.
3. Connect hanger rods for vibration-isolated support to structure. Provide intermediate members as necessary.
4. Position vibration isolation hanger elements as high as possible in the hanger rod assembly but not in contact with the building structure. Install hangers so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting object.
5. Where parallel running pipes are hung together on a trapeze which is isolated from the building, provide isolator deflections for the largest determined by provisions for pipe isolation. Do not mix isolated and nonisolated pipes in the same trapeze.
6. Install resiliently isolated pipes such that they do not contact rigid building structure or equipment.
7. Install FSNTL isolators such that the installed and operating heights of vibration-isolated equipment are identical. Install limit stops so that they are out of contact during normal operation.
8. Adjust leveling bolts and hanger rod bolts so the isolated equipment is level and in proper alignment with connecting ducts or pipes.

3.5 VIBRATION ISOLATION EQUIPMENT SCHEDULE

A. Provide vibration isolation component deflections as a minimum per the following:

Belt-Driven Equipment:		
Motor Size Horsepower:	Installation Above Grade:	Installation at Grade or Below:
5 - 10	3/4 inch	3/4 inch
15 - 30	1-1/2 inches	1 inch
40 - 75	2 inches	1-1/2 inches
100 - 150	2-1/2 inches	2 inches

Direct-Driven Equipment:		
Motor Size Horsepower:	Installation Above Grade:	Installation at Grade or Below
5 - 20	3/4 inch	3/4 inch
25 - 75	1 inch	3/4 inch

B. Schedule:

Equipment:	Type:
Chiller	NP
Base-Mounted Pumps	FSN, Snubbers, FPC
Boilers	NP
Air Handler Fans	FSNTL
Expansion Tanks	NP
Medical Air Compressor	FPC2, FPC2
Medical Vacuum Pump	FPC2, FPC2
Fans	FDC
Duct Connections to AHU	FDC
Air Handler Casings	NP
Piping, ducts, flues	HSN
Fuel Tanks	NP

3.6 DUCTWORK INSTALLATION

A. Install ductwork in strict conformance with SMACNA standards and comply with CMC requirements.

B. Erect ductwork true to dimensions indicated, straight and smooth on inside with neatly finished joints lapped in direction of air travel. Properly brace and reinforce ducts with steel angles or members.

C. Elbows: Standard centerline radius to equal 1-1/2 times width of duct.

D. Install single thickness turning vanes in square throat rectangular elbows and in tees. Provide 3/4-inch trailing edge on turning vanes, turned slightly past parallel to the duct.

E. Duct sizes shown on Drawings are net inside dimensions.

F. Locate access doors in ductwork as required for service of fire dampers, automatic dampers and other items requiring maintenance or inspection.

G. Duct Hangers and Supports:

1. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 sq.ft. with galvanized strips of No. 16 USS gauge steel 1 inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at 8 feet on center, as detailed.
2. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps to roof deck. Do not support ducts from other ducts or piping.
3. For round sheet-metal ducts, provide duct support in accordance with SMACNA Guidelines. Verify type of building construction.
4. Attach straphangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.

H. Joints:

1. Seal joints in sheet-metal ducts in concealed locations (i.e., enclosed ceiling spaces) with Hardcast joint sealant system applied in accordance with manufacturer's recommendations, or use Ductmate type joints.
2. To Connect Sheet-metal Ductwork to Fiberglass Ductboard: Hardcast only.
3. Standard gray duct tape not allowed.

I. Do not install duct stiffeners on interior (airside) of unlined ductwork; install on exterior only or on interior of ductwork with duct liner.

J. Flexible Duct Installation:

1. Provide round neck grilles/diffusers or square-to-round transitions. No flex duct connections directly to square neck allowed.
2. Flex duct allowed only for vertical drops to diffusers. Maximum offset angle from vertical: 30 degrees.
3. Approved for use on supply ducts only; not allowed for return or exhaust.
4. Minimum length 2 feet, maximum length 5 feet, unless noted otherwise.
5. Flex duct allowed in concealed spaces only.
6. Install with bend radius no less than three duct diameters.

K. Paint inside surface of bare ductwork which is visible through face of grilles with flat black paint for ceilings 12 feet and lower.

L. Standby Generator Connections: Provide complete discharge air ductwork system as shown on Drawings, including flexible duct boot. Connect full size to louvers in exterior wall. Verify exact generator connection size with equipment supplier.

M. Mounting for Sidewall Grilles and Registers:

1. Mounting heights indicated on Drawings from finish floor to lower edge of grille or register. Exception: If note on Drawings states for example "Down 6 inches," this indicates measurement from ceiling to top edge of grille or register.
2. Install sidewall return air grilles for "sight-tight" visibility at eye level (position blades to obscure visibility from floor level).

N. Transitions: Where transitions are required in metal or fiberglass ductwork, horizontal and vertical angles forming transition not to exceed 30 degrees. Provide supply and return air transitions at AC unit connections. Plenum connections not allowed at AC unit inlet and outlet.

O. Grille and Exposed Duct Cleaning:

1. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.
2. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, and the like, so that upon completion of installation, ducts are left in clean and unblemished manufactured condition.

P. Seismic Restraint: Brace ductwork and HVAC equipment against lateral movement as detailed in document "Seismic Restraint Manual Guidelines for Mechanical Systems" as published by SMACNA.

Q. Limitations: Do not run ductwork within confines of electrical rooms, elevator shafts or elevator equipment rooms except those ducts specifically serving only such rooms.

R. Duct Access Doors:

1. Install where shown and required by SMACNA. Provide on the reset side of fire dampers and adjacent to duct mounted automatic dampers. Install per manufacturer's recommendations.
2. Where access doors are for service of fire or smoke dampers, stencil the words "Fire Damper" or "Smoke Damper" in 1/2-inch-high capital letters on the outside of the door.

S. Volume Dampers: Provide in main duct branches where shown and in branch ducts serving air inlets and outlets.

T. Fire Dampers:

1. Install in accordance with SMACNA, the manufacturer's recommendations, UL 555, and NFPA 90A.
2. Install where indicated on the Drawings.

U. Fire/Smoke Dampers and Smoke Dampers:

1. Install dampers per manufacturer's instructions.
2. For each fan unit serving fire/smoke dampers and smoke dampers with associated duct-mounted smoke detectors, provide wiring and raceway as

needed for current sensing switch relay to cut 120V power to dampers when fan is not running. (see Specification Section 23 09 00).

3. If damper is installed within a duct, provide smoke detector within 5 feet of damper with no air inlets or outlets between the damper and detector. Detector to be listed for air velocity, temperature and humidity anticipated at point of installation.
4. If damper is installed within an unducted opening, provide smoke detector located within a 5-foot horizontal radius of the damper to control the damper.
5. Provide control wiring, transformers and power connections for an operable damper and detection system.
6. Coordinate multiple motor connectors with electrical.

V. Air Outlets and Inlets:

1. Install grilles, registers, and diffusers per manufacturer's instructions. Locate and size openings through finished surfaces to provide complete coverage of rough openings by integral device flanges or auxiliary frames.
2. Paint exterior of devices per color selected by Architect.
3. Coordinate duct connections with device final dimensions. Provide square to round adapters where required for connection to round ducts.
4. Adjust the throws of air outlets to eliminate drafts.

3.7 EQUIPMENT INSTALLATION

A. Heating and Cooling Units:

1. General: Install units in accordance with manufacturer's installation instructions, plumb and level, and firmly anchored in locations indicated. Maintain manufacturer's recommended clearances.
2. Inspection: Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
3. Secure fans to curb with lag bolts on each side. Seal with mastic. Mount level.

B. Terminal Units:

1. General: Install air terminals in accordance with manufacturer's installation instructions.
2. Location: Install each unit level and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.
3. Duct Connections: Connect ductwork to air terminals as indicated.

C. Equipment:

1. General: Install in accordance with manufacturer's installation instructions, plumb and level, firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.
2. Controls: Furnish field installed automatic temperature control requirements as indicated.
3. Manufacturer's Supervision: Equipment manufacturer supervises field assembly and installation of equipment work, with factory trained technical service

representative. Prepare manufacturer's written report of installation and testing, signed by representative.

a. Include leak testing, evacuation, dehydration, vacuum pumping, and charging in scope of supervision by manufacturer's representative.
b. Include lubrication, including filling of reservoirs, and confirm that lubricant is of quantity and type recommended by manufacturer in scope of supervision by manufacturer's representative.
c. Paint damaged or abraded factory finish with touch up paint matching factory finish.
d. Grounding: Provide positive electrical equipment ground for HVAC equipment and components where indicated.

4. Start up equipment in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

a. Do not place equipment in sustained operation prior to initial balancing of mechanical systems.
b. Furnish sufficient refrigerant and dry nitrogen for pressure testing under manufacturer's supervision.

D. Air-Cooled Condensing Units: Connect refrigerant piping to unit, run piping so as not to interfere with access to unit. Install furnished field mounted accessories. Verify manufacturer's requirements and provide accumulator when required due to length of refrigerant piping.

E. Refrigerant System:

1. Piping: Install refrigerant piping per unit manufacturer's latest published recommendations straight and free from kinks and restrictions, properly supported by Trisolator or Cush-A-Strip S-715 to minimize vibration. Furnish and install straps or hangers at 5-foot spacing for 1/2-inch lines, 6-foot spacing for 1-inch lines. Pass a slow stream of dry nitrogen through the tubing at times while soldering to eliminate the formation of copper oxide inside the tubing.
2. Slope lines to facilitate oil return to compressor. Provide suction line traps per manufacturer's recommendations.
3. Test piping to 150 PSI.
4. After dehydration, introduce the manufacturer's recommended type and quantity of refrigerant into system through a filter/dryer.

F. Air Handling Units:

1. Install units on curbs and secure as detailed. Provide neoprene gasket at curb perimeter.
2. Rig and set units in place. Ensure that spreader bars are used and the units are protected from the lifting cables.
3. Level entire air handling unit. Remove internal hold-down bolts and shipping fasteners, and install parts shipped loose. Level spring isolators.
4. Check and realign access doors and dampers to ensure smooth operation through the entire range of travel.

5. Upon start-up, check each fan motor for fan rotations and amp draw for each phase. Mark amp readings on the fan scroll.
6. Readjust belt drives for tension and alignment.
7. Provide a drain valve on each coil drain fitting, and a vent valve on each coil vent.
8. Thoroughly seal and caulk pipe and conduit penetrations to the casing to prevent air leakage.

3.8 TRAINING OF OWNER'S PERSONNEL

A. Provide services of manufacturer's technical representative for 8 hours to instruct Owner's personnel in operation and maintenance of equipment provided under this Section. Schedule training with Owner; provide at least a 7-day notice to Owner and Architect of training date.

3.9 CLEANING

A. Clean exposed factory finished surfaces.

3.10 FILTERS

A. Install complete sets of filters before operation of the supply fans. Do not operate fans without filters installed. Remove coils from units and clean if units are run without filters.
B. Provide two sets of filter cartridges for each supply fan. Clean filters to be installed prior to system balancing.

3.11 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.
B. Manufacturers: Hilti, Proset, or approved.

3.12 FACTORY TESTING

A. Test equipment at the factory prior to shipping.

3.13 FIELD QUALITY CONTROL

A. Terminal Units: Upon completion of installation and prior to initial operation, test and demonstrate that air terminals and duct connection to air terminals are leaktight. Repair or replace air terminals and duct connections as required to eliminate leaks, and retest to demonstrate compliance.

END OF SECTION 230500

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
SECTION 23 05 13

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Materials, installation and testing of motors and starters.
B. Refer to Specification sections for each system medium (i.e., hydronics, gas, and the like), for motor/starter application.

1.2 QUALITY ASSURANCE

A. Motor Manufacturers:

1. General Electric, Westinghouse, U.S. Motors, Wagner, Century/Gould, Louis-Allis, Reliance, Marathon, or approved.
2. Standards: ANSI/IEEE 112 and NEMA MG-1.

B. Starter Manufacturers:

1. Allen Bradley, Square D, General Electric, Siemens, Furnas, Eaton Electrical, Cerus, or approved.
2. Manufacturer is certified ISO 9002 facility 3, UL listed.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, motor efficiency, installation instructions, and dimensioned drawings for each type of motor or starter.
B. Maintenance Data: Submit maintenance data and parts list for each type. Include this data, product data, and certifications in maintenance manual.

PART 2 - PRODUCTS

2.1 ELECTRIC MOTORS

A. Motors: Energy efficient, suitable for nonoverloading operation, and capable of continuous operation at full nameplate rating. Motors 1 HP and larger must meet Energy Policy act of 1992. Motors to be high efficient type similar to Century/Gould E-plus.
B. Take NEMA standards as minimum requirements for motor design and performance. Motors suitable for load, duty, voltage, frequency, hazard and for service and location intended. Motors, unless specified otherwise, to be general-purpose open dripproof type, ball bearing equipped, 40C temperature rise; and rated for continuous duty under full load.

Motors to have nameplate giving manufacturer's name, shop number, HP, RPM and current characteristics.

C. Motors smaller than 1/2 horsepower, 1 phase; and motors 1/2 horsepower and larger, 3 phase and voltage as indicated on Drawings. Maximum motor speed of 1750 RPM, unless otherwise noted. One phase motors to have internal thermal overload protection with automatic reset.

D. Motors for belt drive to have adjustable bases with setscrew to maintain belt tension. Motor horsepowers indicated on the Equipment Schedule on Drawings are the minimum size acceptable.

E. Provide two-speed motors where indicated on schedule or in sequence.

F. Provide inverter rated motors per NEMA MG1-31 where variable frequency drives are applied or soft start starters.

2.2 STARTERS

A. Single Phase Motors:

1. Manual across-the-line starting switch having toggle-operated switch pilot running light and built-in thermal overload device with heating element rated not more than 115 percent motor full load current indicated on name plate of motor to be protected. Surface mount starters. Provide NEMA-1 enclosure.
2. Overload relays to be melting alloy type with a replaceable control circuit module. Thermal units to be interchangeable. Starter to be nonoperative if thermal unit is removed.
3. Single phase motors with automatic controls. Provide motor rated relay with coils rated for control voltage.

B. Starters up to size 8 to be suitable for the addition of a minimum of three external auxiliary contacts (normally open or normally closed). Contactor, coils, and relays to perform the control functions of the associated equipment and control sequence.

C. Three phase motors up to and including 15 HP:

1. Provide enclosed type magnetic across-the-line starter with thermal overload and under voltage protection.
2. Operator: "Start-Stop" pushbutton, except where automatic control is indicated on Drawings or specified. Then provide "Hand-Off-Auto" selector switch.
3. Starters for 3 phase motors to have overload protection in each of the three legs, with external manual reset.
4. Unless indicated on Drawings or in Specifications, furnish motor starters with a neon pilot light. Neon lights are required for exhaust fan switches.
5. Equip starters with integral transformer and coil for control circuit. Coordinate coil voltage with control voltage.

D. For 3 phase motors greater than 15 HP:

1. Provide combination starter and fused safety disconnect integral in the same enclosure. Utilize Type 'RK' or 'L' fuses. Provide fuse block with rejection type fuse holders. Size fuses per motor manufacturer's recommendations.
2. Provide a solid-state reduced voltage starter, consisting of power section, one-piece removable printed circuit logic board and field wiring interface terminals. Logic board uses quick disconnect plug-in connectors for current transformers

inputs, line-and-load voltage inputs, SCR gate firing output circuits and status panel. Three-phase current sensing via current transformers. Class 10 electronic overload protection.

3. Motor starters to include the following protections:

   a. Inverse time running overcurrent protection.
   b. 250 percent to 500 percent current limit adjustment
   c. Minimum and maximum voltage adjustments.
   d. Voltage stability adjustment.
   e. Single-phase protection with built-in short-time delay.
   f. Undervoltage protection with built-in short time delay.
   g. MOV surge suppression protection of SCRs rated 10 percent above the rated voltage.
   h. Phase sequence protection.

4. Display: Door-mounted status LCD alphanumeric or LED display indicating run, undervoltage, phase loss, phase current unbalance, overcurrent trip, overtemperature, current limit, end of ramp, and incorrect phase rotation.
5. Enclosure: NEMA 12. Operator: "Start-Stop" pushbutton, except where automatic control is required, then provide "Hand-Off-Auto" selector switch
6. Input/Output Relays: Provide relays as required to provide the control sequence.

2.3 DISCONNECTS

A. Provided by Division 26 unless otherwise specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install a soft start per the manufacturer's specifications with a minimum clearance of 4 inches on each side of the enclosure.
B. Include a standard wiring diagram for making the appropriate electrical connections.

3.2 START UP

A. For soft starters provide the services of a qualified technician to program, test, and start up soft starts furnished under this Specification.

3.3 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize mechanical equipment wiring diagrams to coordinate with the electrical systems so that proper wiring of the equipment involved is affected.

END OF SECTION 230513

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

SECTION 23 05 29

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Material and installation of supports, anchors and sleeves including: horizontal piping hangers and supports; vertical piping clamps; hanger rod attachments; building attachments; saddles and shields; miscellaneous metals, miscellaneous materials; roof equipment supports; anchors; equipment supports; wall and floor sleeves; and escutcheon plates.

1.2 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in the manufacture of supports and anchors, of types and sizes required.

B. Regulatory Requirements:

1. Provide pipe hangers and supports whose materials, design and manufacture comply with MSS SP-58, "Pipe Hangers and Supports - Materials, Design and Manufacture," latest edition.
2. Select and apply pipe hangers and supports complying with MSS SP-69, "Pipe Hangers and Supports - Selection and Application," latest edition.
3. A copy of the above referenced standards on the construction site at all times.

C. Seismic: Provide per Section 23 00 00, Basic HVAC Requirements.

D. Manufacturers: B-Line, Elcen Metal Products Co., F&S Control, Globe, Kindorf, Kinline, Michigan, Superstrut, Unistrut, Power-Strut. Note: See individual Sections for roof equipment support.

1.3 SUBMITTALS

A. Submit the following:

1. Manufacturer's technical product data, including installation instructions, for each type of support, anchor and sleeve. Include UL approval drawing from manufacturer for each different pre-engineered firestop assembly.
2. Assembly type shop drawings for each type of sleeve, indicating dimensions, weights, required clearances, and methods of assembly of components.
3. Shop drawings for each individual roof pipe curb assembly, indicating number and location of each pipe or conduit which is to pass through the curb. Indicate pipe insulation requirements.

PART 2 - PRODUCTS

2.1 PIPING HANGERS AND SUPPORTS

A. General:

1. Horizontal Piping Hangers and Supports-Horizontal and Vertical Piping, and Hanger Rod Attachments: Factory fabricated horizontal piping hangers and supports complying with MSS SP-58, to suit piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. 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 copper-plated hangers and supports for uninsulated copper piping systems.
2. Building Attachments: Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.
3. Saddles and Shields: Factory fabricated saddles or shields under piping hangers and supports for insulated piping. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12 inches in length (4-inch pipe and larger to be three times longer than pipe diameter).
4. Roller Hangers: Adjustable roller hanger. Black steel yoke, cast iron roller.
5. Concrete Inserts: Malleable iron body, black finish. Lateral adjustment.
6. Continuous Concrete Insert: Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.

B. Hangers For Pipes 2 Inches and Smaller: Adjustable swivel ring hanger, UL listed. Michigan 100 or 101.

C. Hangers For Pipes 2-1/2 Inches and Larger: Adjustable clevis type, UL listed. Michigan 400.

D. Riser Clamps: Steel, UL listed. Michigan 510 or 511. Copper coated; Michigan 368.

E. Plumbers Tape: Not permitted as pipe hangers or pipe straps.

F. Michigan numbers are indicated for type and quality. Comparable products manufactured by Globe, Elcen, B-Line, Kindorf, Kinline, Unistrut, Anvil, Super Strut, Tolco, PHD, Power-Strut, or approved.

2.2 ROOF EQUIPMENT SUPPORTS

A. General:

1. Coordinate location and type of each roof equipment support with roofing system supplier. Coordinate systems to maintain roof warranty.
2. Minimum 18 gauge galvanized steel with fully mitered and welded corners, internal bulkhead reinforcing, integral base plates, pressure-treated wood nailer, and 18 gauge galvanized steel counterflashing. Provide insulated curbs where surrounding roof is insulated.
3. Compensate for slope in roof so top of support is level.
4. Furnish engineered shop drawings for curbs on equipment over 400 pounds and where required by local Code.

B. Manufacturers:

1. Equipment Supports: By equipment manufacturer or Pate ES, Custom Curb, Vibrex, Thycurb, or Micrometl.
2. Equipment Curbs: By equipment manufacturer or Pate PC, Custom Curb, Vibrex, Thycurb, or Micrometl.
3. Pipe Curb Assemblies: Pate PCC, Custom Curb, Vibrex, or Thycurb.
4. Freestanding Pipe Supports: Pipe-Pier, or approved.

2.3 FREESTANDING ROOF PIPE SUPPORTS

A. Support piping on roof with polyethylene high-density U.V. resistant quick "pipe" block with foam pad, manufactured by Erico Pipe Piers or Nelson-Olsen Inc., distributed by Bongard Corporation. Recommended installation is for quick "pipe" blocks to be freestanding. Piping 3 inch and larger mounted on roller hangers. Wood block supports are not acceptable.

2.4 ANCHORS

A. General: Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project structural engineer.
B. Manufacturers: Anchor-It, Hilti Hit System, Epcon System, or Power Fast System.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine the Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.
B. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.

3.2 INSTALLATION

A. Building Attachments: Install within concrete or on structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert secure to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.
B. Hangers and Supports:

1. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers. Maximum spacings: MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or

install intermediate supports for smaller diameter pipe. Do not support piping from other piping.

2. Support fire protection piping independently of other piping.
3. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.
4. Allow controlled movement of piping systems to permit freedom of movement between pipe anchors and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
5. Piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
6. Insulated Piping: Provide protection saddles where insulation without vapor barrier is indicated. Provide protection shields on insulated piping where insulation with a vapor barrier is indicated.
7. Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms, and other electrical or electronic equipment spaces and enclosures. Within equipment rooms, provide minimum 3 feet lateral clearance from sides of electric switchgear panels. Do not route piping above electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact pipe routing to provide proper clearance with such items.
8. Hanger Spacing:

    a. Steel Pipe 1 Inch and Smaller: 6 feet.
    b. Steel Pipe 1-1/4 Inches and Larger: 10 feet.
    c. Copper Tubing 1-1/2 Inches and Smaller: 6 feet.
    d. Copper Tubing 2 Inches and Larger: 10 feet.
    e. 90 Degree Offsets: Within 2 feet, both sides of offset.

C. Anchors: Install at ends of principal pipe runs where indicated on Drawings. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

D. Roof Equipment Supports, Equipment Curbs, and Pipe Curb Assemblies:

1. Provide prefabricated units for roof membrane and insulation penetrations related to mechanical equipment. Coordinate with roofing system. Set supports on the structural deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.
2. Equipment Supports: Provide for roof-mounted equipment which does not require a structural roof deck penetration (i.e., condensing units).
3. Equipment Curbs: Provide for equipment which requires a structural roof deck penetration other than piping or conduit (i.e., fans, ducts).
4. Pipe Curb Assemblies: Provide for piping and electrical conduit which penetrates the structural roof deck to service equipment above the roof level (i.e., refrigerant piping, electrical power and control wiring).
5. Piping above roof to be supported with freestanding roof pipe supports unless detailed otherwise.

E. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor walls, and through equipment room walls and floors.

F. "Link-Seal" Pipe Sleeves: Install at exterior wall piping penetrations. For penetrations below grade provide Schedule 40 steel sleeve with 1-inch, continuously welded, "weep ring" centered on length of sleeve.

G. Fabricated Pipe Sleeves:

1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, will have free movement within the sleeve, including allowance for thermal expansion. Sleeves not to be more than 1 pipe size larger than piping or piping plus insulation size.
2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1/4 inch above floor finish and, where floor surface drains to a floor drain, extend floor sleeve 3/4 inch above floor finish.
3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.
4. Seal each end airtight with a resilient nonhardening sealer.

H. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

1. Install fabricated pipe sleeve.
2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve I.D. with specified material.

I. Piping penetrations through fire-rated (1 to 3 hour) assemblies: Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.

3.3 ADJUSTING AND PAINTING

A. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping and equipment to proper level and elevations.

B. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

3.4 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

B. Manufacturers: Hilti, Proset, or approved.

END OF SECTION 230529

COMMON WORK RESULTS FOR ELECTRICAL
SECTION 26 0500

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Electrical general requirements.
2. Electrical equipment coordination and installation.
3. Division of Work between trades
4. Sleeves for raceways and cables.
5. Sleeve seals.
6. Grout.
7. Common electrical installation requirements.

1.03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

C. Provide: The contractor shall provide and install the equipment including all associated wiring, raceways, controls and fittings and shall leave the equipment in a fully functioning state.

D. Furnish: Equipment shall be furnished but not installed.

1.04 ELECTRICAL GENRAL REQUIREMENTS

A. Throughout the progress of the work, the electrical contractor shall keep at the job site, a competent superintendent or supervisory staff satisfactory to the designer. The superintendent shall not be changed without the written consent of the designer unless said superintendent ceases to be employed by the contractor or ceases to be competent.

B. Contractor shall obtain and pay for all permits, bonds, licenses and inspection certificates and shall pay inspection fees and taxes.

C. Owner will provide temporary utilities including water, electric, gas and sewer. Electrical contractor shall coordinate switch-over from temporary to permanent power with Owner.

1.05 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To provide for ease of disconnecting the equipment with minimum interference to other installations.

2. To allow right of way for piping and conduit installed at required slope.

3. So, connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping".

E. Coordinate meter location(s) and conduit(s) from transformer(s) to meter(s) with local utility company. Provide conduit(s) per utility company requirements.

F. Electrical drawings are diagrammatic and indicate general arrangement of systems and work included. Consult architectural and structural drawings for building construction details.

G. Where variances occur between drawings and specifications or within either document itself, include in the contract price the item or arrangement of better quality, greater quantity, or higher cost.

1.06 DIVISION OF WORK

A. This section delineates the division of work between Division 23 and Division 26.

1. All electrical work necessary for the proper operation of equipment requiring electrical power and/or controls for this project shall be as described herein.

2. All Variable Frequency Drives (VFD) for equipment requiring electrical power shall be

furnished by the contractor providing the equipment unless indicated as a part of a motor control center. Installation and final connection by Division 26.

3. All power wiring up to a termination point consisting of a junction box, trough, starter, VFD or disconnect switch, herein referred to as line side terminations, shall be provided by Division 26.

4. Duct smoke detectors, where provided on the project per NFPA 90A requirements, shall be furnished and wired by Division 28, installed by Division 23.

5. Fire alarm Air Handling Unit (AHU) shut down circuits shall be wired from the fire alarm control panel to a termination point, adjacent to the AHU control, under Division

28. AHU control wiring from the termination point to the equipment shall be under Division 23 and shall be controlled as indicated on the Division 23 control diagrams.

6. Equipment operating at less than 110 volts AC, including but not limited to: all relays; actuators; timers; alternators; pressure sensors; vacuum sensors; float sensors; flow switches; pneumatic-electric switches; electric-pneumatic switches; aquastats; freezestats; line and low voltage thermostats; thermals; remote selector switches; remote push-button stations; interlocking devices; indicating lights; and disconnect switches beyond the line side termination point, and other appurtenances associated with equipment that is being provided shall be furnished, installed and wired by the contractor providing said equipment.

7. All wiring required for HVAC controls and instrumentation not indicated on the drawings shall be furnished and installed by Division 23.

8. Roof exhaust fans with built-in disconnects provided under Division 23, or doors provided with built-in outlets shall be wired under Division 26 to the line side of the disconnect switch, or the outlet.

9. A disconnect switch shall be provided under Division 26 if the fan is not provided with a built-in disconnect switch. In this case wiring from the switch to the fan shall be under Division 23.

10. The sequence of control for all HVAC equipment shall be as indicated on the Division 23 control diagrams and specified in Section 23, HVAC Control System.

11. All sprinkler flow and tamper switches shall be furnished and installed under Division 21 and wired under Division 28.

12. Where electrical wiring is required by trades, other than what is specifically indicated in this specification, shall refer to same Division 26 specifications and shall provide required starters, VFD, disconnect switches and controls as has been described herein for contractors providing equipment.

13. The contractor providing the equipment requiring starters, VFD, disconnect switches, conduits and conductors shall reference, in its entirety, the specifications of Division 26 and shall install all provided equipment in full compliance with all requirements of Division 26.

PART 2 - RODUCTS

2.01 SUBSTITUTIONS

A. In specifying materials where three brand names have not been given the following applies:

1. When the material or equipment is specified with the phrase "...or approved equal..." after a brand name and other identifying information, it is intended that the brand name is used for the purpose of establishing a minimum acceptable standard of quality and performance and Contractor may base his bid proposal on any item which is in all respects equal to that specified and presents essentially the same appearance. It shall be the Con- tractor's responsibility to ensure proper fit and clearances of all substituted equipment. The final determination of a substitute product submitted by the contractor of being equal to the product specified shall be made by the Engineer.

B. All the following shall be distinctly understood:

The Architect/Engineer will use his/her own judgment in determining whether or not any materials, equipment or methods offered in substitution are equal to those specified. The decision of the Architect/Engineer on all such questions of equality is final. Substitutions are made at the contractor's risk and if the proposed substitution is deemed not equal by the Architect/Engineer, then the contractor is responsible for providing the specified product(s) at no additional cost.

C. Upon receipt of written approval from (Architect/Engineer), Contractor may proceed with substitution providing Contractor assumes full responsibility for, and makes, at his own expense, any changes or adjustments in construction or connection with other work that may be required by the substitution of such materials, equipment or methods. In the event of any adverse decisions by the Architect/Engineer no claim of any sort shall be made or allowed against the Owner.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. It is the contractor's responsibility to schedule the required inspections including the final inspection.

B. Comply with NECA 1.

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

1. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

2. Horizontal raceway runs installed exposed in mechanical, chiller, boiler, generator and electrical rooms shall be installed at the structural ceiling height and attached to the bottom of beams and/or trusses.

a. Exception: Conduits installed between two adjacent pieces of electrical equipment or conduit runs that have a total horizontal length of 10-ft. or less may be installed at lower heights with permission from the Engineer.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

END OF SECTION

BASIC ELECTRICAL MATERIALS AND METHODS
SECTION 26 05 10

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 26 05 00 General Electrical Requirements

PART 2 – PRODUCTS

2.1 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: Formed of cold rolled strip steel, electrical resistance welded, hot dip galvanized, conforming to ANSI C80.3.

B. Acceptable manufacturers:
   1. Allied
   2. National
   3. Triangle
   4. or approved equal

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; concrete tight, compression type.

D. Connectors: Zinc plated, steel body with malleable iron nut and insulated throat:
   1. OZ/Gedney 4050ST Series
   2. Thomas & Betts 5031 Series
   3. or approved equal

E. Couplings: Zinc plated steel,
   1. OZ/Gedney 5050SW Series
   2. Thomas & Betts 5030 Series
   3. or approved equal

F. Conduit Bodies: Die cast, copper-free aluminum with compression hubs.
   1. OZ/Gedney LB-5OA-TW Series
   2. Appleton LB-50T-A Series
   3. or approved equal

2.2 FLEXIBLE METAL CONDUIT AND FITTINGS

G. Conduit: Fabricated in continuous length from galvanized steel strip, spirally wound and formed to provide an interlocking design. Manufacturers:
   1. AFC
   2. Alflex
   3. National
   4. or approved equal

H. Fittings: ANSI/NEMA FB 1, steel or malleable iron with insulated throat.
   1. Thomas & Betts Tite-Bite 3110 series

2. OZ Gedney KC-SOT series
3. or approved equal

2.3 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal conduit with grey PVC jacket, integral ground conductor. Manufacturers:
   1. Electri-flex, type LA
   2. Alflex
   3. AFC
   4. or approved equal

B. Fittings: ANSI/NEMA FB 1, steel or malleable iron with nylon insulated throat:
   1. Thomas & Betts 5330 series
   2. OZ 1 Gedney 4Q-50T series
   3. or approved equal.

2.4 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire. Conductor: Copper, solid or stranded for size 14 AWG and smaller, and stranded for size 12 AWG and larger.
B. Insulation Voltage Rating: 600 volts
C. Insulation: ANSI/NFPA 70, copper type THHN/THWN.
D. Color Coding: All power conductors identified as to phase and voltage by means of color impregnated insulation, as follows:

Voltage	ØA	ØB	ØC	Neutral	Ground
120/208V	Black	Red	Blue	White	Green
277/480V	Brown	Orange	Yellow	White	Green

E. For wire sizes No. 8 AWG and larger, color banding tape, minimum 2 inch wide, may be used at all accessible locations in lieu of colored insulation.

2.5 WIRING CONNECTORS

A. Solderless Pressure Connectors:
   1. Connectors shall be UL certified ALICU for aluminum and copper conductors.
   2. Burndy, Universal Terminal KA-U Series.
   3. Thomas & Betts 1PC Series
   4. or approved equal

B. Spring Wire Connectors:
   1. 3M Ranger
   2. deal Wingnut
   3. or approved equal

2.6 INSULATION

A. Insulating Tape:
   1. 3M Scotch #33
   2. Manville Bulldog #I66
   3. or approved equal

B. Heat-Shrink Tubing:
   1. Raychem
   2. or approved equal

2.7 ACCESSORIES

A. Vertical Cable Supports:
   1. O-Z/Gedney, Type Mat
   2. Adalet, SVM Series
   3. or approved equal

B. Conductor Ties:
   1. Panduit, Pan-ty
   2. Thomas & Betts, Ty-rap
   3. or approved equal

C. Conductor Sealant:
   1. Dow-Corning, #795 silicone
   2. General Electric, #SCS1000 silicone
   3. or approved equal

2.8 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel. Surface-Mounted Cast Metal Box: NEMA 250, Type 6: flat-flanged, surface-mounted junction box.

B. Material: Galvanized cast iron. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

2.9 CONDUIT STRAPS

A. Hot-dip galvanized, cast malleable iron, 1 hole type strap with cast clamp-backs and spacers as required.
   1. OZ/Gedney 14-G Series strap and 141G Series spacer
   2. Efcor 231 Series strap and 131 Series spacer
   3. Thomas & Betts 1276 Series strap and 1350 Series spacer
   4. or approved equal

2.10 CONSTRUCTION CHANNEL

A. 1-1/2 inch by 1-1/2 inch, 12 gage galvanized steel channel with 9/16 inch diameter bolt holes, 1-7/8 inch on center, in the base of the channel.

B. Superstrut A-1200-P, Unistrut P-1000-HS, KInline 4112-PO. or approved equal.

2.11 THREADED ROD

A. Galvanized rod, sized for the load unless otherwise shown or specified.

2.12 CABLE TIES AND CLAMPS

A. One (1) piece, nylon, reusable tape lashing ties.
   1. Thomas and Betts Co. Ty-Raps
   2. Panduit Pan-ty
   3. or approved equal

PART 3 - EXECUTION

3.1 RACEWAY SIZING, ARRANGEMENT, AND SUPPORT

A. Size of raceway and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.

B. Size conduits per the NEC Appendix C, Table C1, but in no case smaller than permitted to achieve a 50% fill capacity. Minimum raceway size shall be ¾-inch trade size.

C. Route exposed conduit parallel and perpendicular to walls and adjacent piping.

D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit on racks.

G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

3.2 RACEWAY APPLICATION AND INSTALLATION

A. Cut conduit square using a saw or pipe cutter; de-burr cut ends. Bring conduit to the shoulder of fittings and couplings, fully seat and fasten securely. Use conduit hubs for fastening threaded conduit to sheet metal boxes, and for fastening conduit to enclosures in damp or wet locations.

B. Install no more than the equivalent of 2 - 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

C. In normally dry unburied indoor locations, provide EMT conduit with compression type fittings. Minimum conduit size shall be 3/4-inch.

D. Raceways imbedded in concrete or in wet locations shall be rigid galvanized steel IMC with cast type galvanized fittings.

E. In unburied outdoor locations, provide weather tight galvanized steel IMC with cast type galvanized fittings.

F. Provide flexible metallic conduit (18 inches minimum, 3 feet maximum) for connections to all vibrating equipment; use liquid-tight flexible metallic conduit in wet or outdoor locations.

G. Underground, provide rigid non-metallic conduit (RNC), NEMA TC 2, Schedule 40 PVC with matching NEMA TC 3 fittings. Provide UL approved components and locate for accessibility, to NEC requirements. Burial depth shall be a minimum of 24 inches to top of conduit. PVC conduit 1-1/2 inch size and smaller shall be installed on 2 inch sand base and covered by 2 inch sand backfill. Multiple runs shall maintain 3-inch minimum separation between runs. Provide plastic spacers at maximum 5 feet-0 inch centers to maintain 3 inch spacing between conduits.

H. Electrical boxes shall be NEMA 250, Type 1, except in exterior or otherwise damp or wet locations, which shall be NEMA 250, Type 4. RNC boxes shall be liquid-tight PVC to match conduit.

I. Include one #12 tracer wire/pull string in each raceway 2.5 cm (1 in.) or larger and in underground conduits. Tag or label both ends of underground tracer wire/pull string.

J. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.

K. Raceways shall be concealed except in mechanical, electrical, and service rooms.

L. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

M. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).

N. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

O. Use flexible steel conduits with steel Tite-Bite type connectors where raceway crosses building expansion joints and install a code sized ground wire 3-foot maximum length on flexible conduit.

P. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.

Q. Conceal raceways and wiring, except in mechanical rooms and areas where other conduit and piping are exposed.

R. Fire-stop all conduit penetrations of Boiler Room and Corridor Walls and through all fire rated enclosures. Cables extending through walls above ceilings shall be through length of steel conduit extending six inches on both sides of wall; fire-stop these penetrations. Fire-stop shall be UL listed for application. Include fire-stop materials in submittals.

S. Clamping of Flex within 12 inches of box and at intervals not exceeding 4.5 feet (NEC 350-18), Clamping of EMT within 3 feet of box and at intervals not exceeding 10 feet (NEC 348-12)

T. Make bends and offset so that ID is not reduced. Locate pull box every 4 bends of conduit.

U. Use insulated bushings to protect wire from abrasions.

V. Circuits over 50V must have their metal enclosures and raceways grounded. Install conduit to assure continuity of ground per raceway manufacturer's instructions. Code size ground wire installed in all raceways, secure using approved methods to each pull box, junction box and equipment housing.

W. Galvanized steel raceways only shall be imbedded in concrete and shall be located in the middle third of slab thickness with a minimum of 2 inches of cover.

3.3 BUILDING WIRE AND CABLE INSTALLATION

A. Provide products in accordance with manufacturer's instructions. Use conductor not smaller than 12 AWG for power and lighting circuits. Pull all conductors into raceway at same time. Use suitable wire pulling lubricant for building wire 4 AWG and larger. Provide all conductors used for power and fire alarm in conduit or approved raceway systems.

B. Install all exposed conductors and conductors concealed in walls in conduit or approved raceway systems.

C. In dry interior locations, use type THHN/THWN or THW. In wet or damp interior locations, use type THWN, THW or XHHW. In exterior locations, including underground installations, use type THWN or XHHW.

D. Make wire connections on conductors #10 AWG and smaller with spring wire connectors. Make wire connections and splices on conductors #8 AWG and larger with solderless pressure connectors, compression connectors or split-bolt connectors.

E. Tape all connections made with non-insulated type connectors with insulating tape to 150 percent of the insulating value of the conductor insulation.

F. Seal around conductors with silicone sealant where conduit passes through exterior walls.

G. Tag all conductors in junction boxes; pull boxes and wire-ways, indicating panel board and circuit number.

3.4 PULL AND JUNCTION BOXES INSTALLATION

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements. Install electrical boxes to maintain headroom and to present neat mechanical appearance. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

B. Inaccessible Ceiling Areas: Provide outlet and junction boxes no more than 6 inch from ceiling access panel or from removable recessed luminaire. Install boxes to preserve fire resistance rating of partitions and other elements. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

C. Use flush mounting outlet boxes in finished areas. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation. Provide minimum 24 inch separation in acoustic rated and fire rated walls. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Use stamped steel bridges to fasten flush mounting outlet box between studs. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

D. Use adjustable steel channel fasteners for hung ceiling outlet box. Do not fasten boxes to ceiling support wires. Support boxes independently of conduit.

E. Use multi-gang box where more than 1 device is mounted together. Do not use sectional box. Use 4 inch square box with plaster ring for single device outlets. Use cast floor boxes for branch circuits in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.

F. Large Pull Boxes: Boxes larger than 100 cubic inch in volume, or 12 inch in any dimension. Interior Dry Locations: Use hinged enclosure under provisions of Section 16160.

G. Other Above Grade Locations: Use surface-mounted cast metal box.

H. Install knockout closure in unused box openings

3.5 CONDUIT SUPPORT INSTALLATION

A. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast inserts, expansion anchors, preset inserts or beam clamps (single point beam clamps are not allowed). Use self-drilling anchors or expansion anchors on concrete surfaces. Powder activated anchors may only be used if first accepted in writing by the University's Representative. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

B. Use sheet metal screws in sheet metal studs and wood screws in wood construction. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

C. Do not drill structural steel members unless first accepted in writing by the University's Representative.

D. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

E. Install surface-mounted cabinets and panel boards with a minimum of 4 anchors. Provide additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.

F. Bridge studs top and bottom with channels to support flush-mounted cabinets and panel boards in stud walls. Anchor free-standing equipment on concrete pads where indicated.

3.6 WIRING AND RACEWAYS:

A. General: Provide copper wiring, plenum cable, and raceways as specified. All components shall be UL approved and locate for accessibility, to NEC requirements.

B. All insulated wire to be copper conductors, UL labeled for 90°C minimum service.

C. Class 2 circuits (not over 30V and 100 VA) include most wiring for controllers, intelligent microprocessor devices (meters, etc.), communication gateways/interfaces and network cabling. Class 2 power sources must be durably marked and circuits must be wired with TP, CM, CMP, CL2P, CL2 or CL3 cable or THHN-THWN.

D. Class 3 power sources must be durably marked (not exceeding 150V and not over 100 VA) and circuits must be wired with CL3 or CM cable or THHN-THWN.

E. Class 1 remote control, signaling and power circuits shall not exceed 600 volts and require over-current protection.

F. Power Limited Class 1 Circuits include either ac or dc and must be supplied power from a power source that limits the output to 30V and 1,000 VA. Cables shall be 600V rated. Conductor sizes no smaller than #18 to 6 amps and not smaller than #16 to 8 amps.

3.7 WIRING:

A. All control and interlock wiring shall comply with national and local electrical codes and this specification.

B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway according to NEC.

C. All low-voltage wiring shall meet NEC Section 725 Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current limit.)

D. All controls power wiring and NEC Class 1 wiring shall be routed in raceways.

E. All control wiring shall be routed in raceways except NEC Class 2 cables routed above accessible ceilings (and NEC Class 2 cables arranged in straight drops concealed in walls to devices located on surface of same wall). (NEC Class 2 cables routed in walls, and similar concealed locations, shall be routed in conduit and terminate to accessible electrical box.)

F. UL Listed plenum-rated cable (CMP, CL3P, CL2P) is required where low-voltage and current-limited cables (not installed in metal raceway) are installed in ducts, plenums and dropped ceilings spaces used to move environmental air.

G. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems. Cables shall not be laid on ceilings.

H. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.

I. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.

J. Class 1 control circuits and power conductors associated with the same equipment can occupy the same raceway, but Class 1 circuits cannot occupy the same cable, enclosure or raceway with other low-voltage or limited-energy circuits. Class 2 or Class 3 circuits shall not be routed with power or Class 1 conductors so that the higher voltage power conductors do not accidentally energize them.

K. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers). Two inches of separation is required between low-voltage or limited energy conductors and power conductors not located in raceways.

L. All wire insulation shall be rated for the greatest voltage conductor in raceway or panel. Class 2 control circuits located in panels containing voltages in excess of 300 volts shall be THHN-THWN.

M. Provide separation of Class 2 conductors from power conductors in accordance with the NEC. In Temperature Control Panels (TCP), separate power from control conductors by minimum 2 inches or use metal raceway or suitable metal encasement.

N. Maximum allowable voltage for control wiring shall be 120 volts. If only higher voltages are available, the contractor shall provide step-down transformers.

O. Low-voltage cables and conductors must be spliced using listed connectors. All wire-to device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections (except for sensor attachment to cables) shall be at a terminal block. Terminal-strips at all analog inputs shall include Scaling Block.

P. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.

Q. Shielded Class 2 or 3 twisted pair conductors that extend beyond the building structure and are exposed to lighting must be earth grounded.

R. Do not install wiring in raceway containing tubing.

S. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

T. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.

U. Use coded conductors throughout with conductors of different colors or numbers. Number-code or color-code conductors appropriately for servicing of metering system and identification of future conductors. Maintain updated conductor-coding on as-built drawings.

V. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

3.8 COMMUNICATION WIRING:

A. The contractor shall adhere to the items listed in the Wiring article in this specification section.

B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

E. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.

G. All runs of communication wiring shall be un-spliced length when that length is commercially available.

H. All communication wiring shall be labeled to indicate origination and destination data.

I. Where utilizing owner's network, install in strict accordance with owner's IT department and per the following specific IT underground requirements and Metal Conduit requirements:

Underground

- Sch-40 PVC Conduit Installation
- Install at no less than 30-inches deep.
- Always install with ORANGE colored warning tape at no more than 12-inch below finish grade. Warning tape to follow telecommunication pathway.
- After conduit install, re-fill cavity with native surrounding soil, classified for the removal of debris that is larger than ½-inch.
- Compact back-fill to 95% compaction with machine tamper.
- Restore site after final grade to original condition. This includes painting if so required.
- Conduct a mandrel conduit test to certify conduit is clean and has not crushed after install. Test is required on ALL conduits along the pathway.
- Install pull rope inside all conduit and tie off each end from being pulled back into conduit before its use. Install 1/4-inch diameter polypropylene pull rope rated at no less than 500-lbs pulling tension.
- Install non-categorized, non-rated 2-pair telephone wire as a trace wire. Tie off each end from being pulled back into the conduit.
- Rigidly secure any exposed Sch-40 PVC conduit from movement.

Metal Conduit

- Per typical telecommunication requirements, no more than 180-deg of bends before a junction point is required.
- Ending points of all metal conduits must include a plastic bushing.
- NO metal flex conduit is allowed for telecom pathways.
- NO LB conduit outlet bodies are allowed for telecomm pathways.
- Rigidly secure all conduits into place from movement.

3.9 CONTROL/METER CABINETS:

A. Finished cutouts and holes shall be free of burrs and sharp edges. Cabinets shall be securely fastened together and aligned, and each cabinet shall be securely anchored to wall or floor as required.

B. Provide wiring and piping diagram of panel showing all components, located on the inside of the door. Diagram shall be either laminated plastic or protected by clear plastic protection sheet bonded to entire door.

3.10 WARNING LABELS:

Provide updated labels per the following:

A. Permanent warning labels shall be affixed to all control panels that are connected to multiple power sources utilizing separate disconnects.

B. Labels shall use white lettering (12-point type or larger) on a red background.

C. Warning labels shall read as follows: —C A U T I O N - This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing

3.11 IDENTIFICATION OF HARDWARE AND WIRING:

A. All wiring and cabling, including that within factory fabricated panels, shall be labeled at each end within 2 inches of termination.

B. Permanently label or code each point of field terminal strips.

C. Identify control panels with minimum 1 cm (½ inch) letters on laminated plastic nameplates.

D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label. Label all non-panel devices as well as instruments mounted in face of panels to indicate system function.

E. Verify all manufacturers' nameplates and UL or CSA labels are visible and legible.

F. Identifiers shall match record documents.

END OF SECTION

ELECTRICAL COMMISSIONING
SECTION 260800

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: Labor, materials and equipment necessary to complete the start-up and commissioning of the electrical systems, including but not limited to:

1. Grounding and bonding system.
2. Building wire and cables.
3. Packaged engine generator system.
4. Transient voltage surge suppressors.
5. Transfer switches.
6. Motor controls.
7. Switchboards.
8. Panelboards.
9. Dry type transformers.
10. Overcurrent protection devices.
11. Lighting control systems.
12. Fire alarm system
13. Security systems.
14. Telecommunication cabling system.
15. Television distribution system.
16. Public address system.

B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. Division 01: Commissioning.
2. Division 22: Plumbing Commissioning.
3. Division 23: HVAC Commissioning.
4. Division 25: Energy Management Control System Commissioning.

C. Perform commissioning of electrical systems as directed by the Owner's Commissioning Authority in accordance with the Contract Documents. The Contractor shall coordinate all commissioning activities with the Commissioning Authority.

D. Work required in this Section will add to the requirements of work specified in other Division 26 Sections.

E. Electrical commissioning requires the participation of all parties related to the Division 26 contract to ensure that systems are operating in a manner consistent with the Contract Documents. The parties shall consist of, but not be limited to the following:

1. Contractor.
2. Special systems Subcontractors or Distributors.
3. Independent Testing Agency.
4. Factory-authorized service representatives.

F. Additionally, there is participation required from parties outside of Division 26 contract to ensure that their systems are operating or monitoring in accordance with a sequence of operation consistent with the Contract Documents. The parties shall consist of, but not be limited to the following:

1. Division 21: Fire Sprinkler System – For monitoring and alarm annunciation of sprinkler system components via the fire alarm system.
2. Division 14: Elevators – For control interface requirement with ATS during emergency power operation.
3. Division 14: Elevators - For control interface via fire alarm system to include elevator recall and alternate floor.
4. Division 23 & 25: HVAC and Controls – To ensure that under emergency power system operations all systems function per the sequence of operation.
5. Division 23: HVAC – For control of fire/smoke damper system via the fire alarm system per the sequence of operation.

G. The commissioning responsibilities applicable to each of the parties indicated above are as follows:

1. One representative from each of the above parties shall attend a commissioning scope meeting and all other meetings necessary to facilitate the commissioning process.
2. Contractor shall provide the Commissioning Authority with normal cut sheets and Shop Drawing submittals of all commissioned equipment.
3. Provide additional requested documentation, prior to normal O&M manual submittals, to the Commissioning Authority for development of startup and functional testing procedures.
    a. Typically this will include detailed Manufacturer installation and startup, operating, troubleshooting and maintenance procedures, full factory testing reports (if any) and full warranty information with the responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, startup and checkout materials that are shipped with the equipment, including field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority.
    b. The Commissioning Authority may request further documentation necessary for the commissioning process.
4. Contractor shall assist in clarifying the operation and control of commissioned equipment in areas where the Specifications, Drawings or equipment documentation is not sufficient for writing detailed testing procedures.
5. Develop a full startup and initial checkout plan using Manufacturer's startup procedures and the equipment verification and checklists for all commissioned equipment. Submit to Commissioning Authority for review and approval prior to startup.

6. During the startup and initial checkout process, execute the electrical related portions of the prefunctional checklist for all commissioned equipment.
7. Perform and clearly document all completed startup system operational checkout procedures, providing a copy to the Commissioning Authority.
8. Address current architectural/engineering punch list items before functional testing.
9. Ensure that the appropriate technicians are available and present to execute the startup and functional testing of commissioned equipment for the duration required to complete the necessary tests, adjustments and problem solving.
10. Perform functional testing under the direction of the Commissioning Authority for specified equipment. Assist the Commissioning Authority in interpreting the monitored data, as necessary.
11. Provide assistance to the Commissioning Authority in preparing the building integration test procedures.
12. Correct deficiencies as interpreted by the Commissioning Authority and retest the equipment.
13. Prepare O&M manuals according to the Contract Documents, including clarifying and updating to correspond with as-built conditions.
14. Provide training of the Owner's operating personnel as specified.

H. The commissioning process does not take away from or reduce the responsibility of the installing Contractor to provide a finished and fully functioning installation.

1.02 REFERENCES

A. The system shall be tested in strict accordance with the latest edition of the following applicable Specifications and standards and any other applicable standards, except as otherwise indicated or specified:

1. National Fire Protection Association (NFPA).
2. National Electrical Code (NEC).
3. InterNational Electrical Testing Association, Inc. (NETA).
4. American National Standards Institute, Inc. (ANSI).
5. National Electrical Manufacturer Association (NEMA).
6. Institute of Electrical and Electronic Engineers (IEEE).
7. Insulated Cable Engineers Association (ICEA).
8. Occupational Safety and Health Administration (OSHA).
9. Factory Mutual (FM) Standards.

1.03 DEFINITIONS

A. Commissioning Authority: The Owner's independent representative hired to provide technical verification that the project meets the intended design/ criteria per the contract documents. The Commissioning Authority generally provides the services of a Project Manager, Engineers and Inspectors to perform their required scope.

B. Commissioning Schedule: Is a checklist itemizing all equipment to be commissioned, which specifically tracks and verifies the construction progress including submittals, factory tests,

equipment arrival, equipment installation, test procedures, checklists, field testing, training and O&M manuals.

C. Prefunctional Testing:

1. Verification and Checklist: Is a summary verification checklist indicating equipment conformance with that specified and reviewed in submittal process, equipment nameplate, site preparation, installation, terminations, etc. prior to equipment startup.

2. Pre-startup: The required initial power-on checks and procedures prior to operating of the equipment. This is the initial startup test performed in conjunction with the manufacturer's recommended start-up procedures. Startup used to establish basic performance parameters and to verify performance data.

D. Functional Testing: Testing to verify equipment or system operation, parameters, electrical characteristics, visual and mechanical inspection, continuity, calibration, etc. as defined in the individual Sections of these Specifications.

1. Start-up:

2. Electrical Testing:

E. Building Integration Test: Testing to verify equipment or system integration with other building systems for overall sequence of operation, performance parameters, etc. to insure different systems operate together per the design intent.

1.04 SYSTEM DESCRIPTION

A. Commissioning is a systemic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, submittals, control system calibration, equipment checklist, startup, functional testing, building integration tests, O&M manuals and training.

B. Commissioning on this Project is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the Manufacturer's recommendations, to industry accepted standards and in compliance with the Specifications, and that they receive adequate operational checkout by installing Contractors.

2. Verify and document proper performance of equipment and systems.

3. Verify that O&M documentation left on Project site is complete.

4. Verify that the Owner's operating personnel are adequately trained.

C. Commissioning process:

1. The Owner shall provide the services of a Commissioning Authority to develop the commissioning plan and to direct, review and approve the commissioning Work.

2. The following is an overview of the anticipated commissioning tasks during construction:

a. Commissioning during construction shall begin with a scope meeting conducted by the Commissioning Authority where the commissioning process is reviewed with all commissioning team members.

b. Additional meetings shall be required throughout construction, scheduled by the Commissioning Authority with necessary parties attending, to plan, scope, coordinate, schedule activities and resolve problems.

c. Equipment documentation shall be submitted to the Commissioning Authority during normal submittal process, including detailed startup procedures.

d. The Contractor shall assist the Commissioning Authority in the preparations of the Equipment Commissioning Schedule with list of equipment to be commissioned, location, and target dates for submittals, factory tests, arrival, installation, verification/pre-startup, functional test, training, and O&M manuals.

e. The Commissioning Authority shall work with the Contractors in developing startup plans and startup documentation formats.

f. The checkout and performance verification shall proceed from simple to complex; from component level to equipment to systems and inter-system levels with verification/checklists being completed before functional testing.

g. The Contractors, under their own direction, shall execute and document the equipment verification and pre-startup checklists. The Commissioning Authority shall document that the equipment verification and pre-startup checklists were completed according to the approved plans. This may include the Commissioning Authority witnessing the checklist process.

h. The Contractors, along with the Commissioning Authority as a witness, shall execute and document the startup and functional testing. The Commissioning Authority shall document that the startup and functional testing were completed according to the approved plans.

i. The Commissioning Authority develops building integration test procedures for review by the Contractors.

j. The building integration test procedures are executed by the Contractors, under the direction of and documented by the Commissioning Authority.

k. Items of non-compliance in material, installation, startup, testing, etc shall be corrected at the Contractor's expense and the system retested.

l. The Commissioning Authority reviews the O&M documentation submitted by the Contractor for completeness.

m. The Commissioning Authority reviews, pre-approves and coordinates the training process provided by the Contractor and verifies that it was completed.

1.05 SUBMITTALS

A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:

1. Provide a complete list of equipment to be commissioned per the requirements of the Division 26 Specifications.

2. Manufacturer's written instruction manuals applicable to commissioned equipment to include special inspection, detailed startup procedures and testing requirements.

3. Upon completion of equipment verification and pre-startup checklist, have all parties sign-off on checklist form and submit to Commissioning Authority.

4. Provide Commissioning Authority with startup plan for all equipment to be commissioned.

5. Upon completion of startup and functional testing for commissioned equipment or systems, have form signed-off by all parties and provide test form to the Commissioning Authority.

6. Submit schedule for training of all commissioned equipment for coordination and approval by Owner's operating personnel.

B. Provide qualifications for independent Testing Agency.

1.06 QUALITY ASSURANCE

A. Provide testing equipment and accessories that are free of defects and are certified for intended use.

B. Provide testing equipment with current calibration labels.

C. Independent Testing Agency:

1. Testing firm shall be a financially stable organization and able to function as an unbiased testing authority, professionally independent of Manufacturers, Suppliers and installers of equipment or systems evaluated by the Testing Agency.

2. Test firm shall also be a member of the International Electrical Testing Association (NETA), specializing in the testing of equipment or apparatus specified in this Division with a minimum of 5 years experience.

3. Testing firm shall be regularly engaged in testing of electrical equipment, devices, installations and systems.

4. Testing firm shall meet Federal Occupational Safety and Health Administration (OSHA) requirements for accreditation of independent testing laboratories.

5. Testing firm shall use technicians who are regularly employed by the firm for testing services.

PART 2 - PRODUCTS

2.01TEST EQUIPMENT

A. The Contractor shall provide all standard testing equipment required to perform startup, initial checkout, required functional testing and commissioning. Also, the Contractor shall provide two-way radios to facilitate communications during commissioning.

B. Special equipment, tools and instruments (only available from vendors, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the specified tolerances. All equipment should be calibrated according to the Manufacturer's recommended intervals.

PART 3 - EXECUTION

3.01MEETINGS

A. Within 90 days of commencement of construction, the Commissioning Authority will schedule, plan and conduct a commissioning scope meeting with the entire commissioning team in attendance. The Commissioning Authority will distribute meeting minutes to all parties. Information gathering

from this meeting will allow the Commissioning Authority to prepare and finalize the commissioning plan, which will also be distributed to all parties.

B. Other meetings will be planned and conducted by the Commissioning Authority as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Contractors. The Commissioning Authority will plan these meetings and will minimize unnecessary time being spent by Contractors. These meetings may be held monthly, until the final three months of construction when they may increase in frequency to one per week.

3.02EXAMINATION

A. Inspect commissioned equipment and confirm that it is clean and ready for operation. All shipping tags removed, nameplate installed and equipment manuals in place.

B. Verify that startup plan and equipment verification/startup checklist are completed and approved for commissioned equipment prior to beginning functional testing.

C. Verify that startup and functional testing are complete prior to starting the building integration test.

3.03PREPARATION

A. Provide required personnel with tools and equipment necessary to perform functional testing.

B. Provide equipment factory representative for startup and commissioning Work as necessary or as required by the Specifications.

C. Provide certified independent Testing Agency personnel for startup and commissioning Work as required by the Specifications.

D. Provide any necessary temporary power provisions, load banks, diesel fuel, equipment and sundries to complete startup and commissioning Work.

3.04REPORTING

A. The Commissioning Authority will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

B. Testing or review approvals and non-conformance and deficiency reports are made regularly with the required action by the Contractor.

3.05EQUIPMENT VERIFICATION AND PRE-STARTUP CHECKLISTS

A. The following procedures apply to all systems and all equipment to be commissioned.

B. Contractor will perform equipment verification and pre-startup checklist to ensure that the equipment and systems are in compliance with that specified, submitted and reviewed, and per the Manufacturers written instructions for installation. The checklist for given equipment must be completed and signed-off by all parties prior to formal functional testing of equipment.

C. The Commissioning Authority shall witness, at their discretion, the equipment verification and pre-startup checklist. The primary role of the Commissioning Authority in this process is to ensure that there is written documentation that equipment installation meets the requirements of the contract documents prior to further testing. Parties responsible for checklists are identified in the commissioning scope meeting and in the checklist forms.

D. Equipment verification:

1. The Contractor shall verify the equipment condition and conformance to the submittal when it arrives on site.
2. The Contractor shall maintain a record of installation and coordination to verify the proper installation of equipment and system.
3. Nameplate information shall be verified against that of the equipment submittal.

E. Pre-startup checklist:

1. The Contractor shall complete the pre-startup checklist items outlined in the Specification along with any items recommended by the manufacturer.
2. Checklist shall be completed and reviewed by the Commissioning Authority.
3. All parties shall sign-off on the checklist when complete and prior to commencing equipment startup.

3.06STARTUP AND FUNCTIONAL TESTING

A. At the conclusion of the Commissioning equipment verification and startup checklist, and sign-off by all parties, the system and/or equipment will be released for startup and functional testing.

B. The following procedures apply to all systems and equipment to be commissioned.

C. The Contractor will perform the startup and functional testing to be witnessed by the Commissioning Authority. The testing for a given system or equipment must be successfully completed prior to formal acceptance or proceeding to building integration test.

D. Startup:

1. The Contractor and Commissioning Authority shall develop a startup protocol to identify the procedure for starting new equipment, scheduling startup tests and the minimum requirements to start equipment. In general the startup protocol shall include the following requirements:
    a. Equipment shall not be energized for startup until the equipment verification and pre-startup checklist is signed-off by all parties, signifying the equipment readiness for startup test.
    b. Startup tests shall be conducted to verify the basic equipment operation is satisfactory and to prepare equipment for functional testing.
    c. The Contractor will verify the completion of preliminary steps, (checklists, schedule manufacturer's representative, completion of necessary controls, etc) and advise team when the equipment is ready.
    d. The startup test shall be scheduled and conducted using the Test Agency (or other designated party) recording required data as well as the initial test readings when applicable.
    e. Manufacturers shall be present for all items requiring manufacturer's startup. The Contractor copies the manufacturer's startup and initial checkout procedures from O&M manuals and includes with checklist. Items on the manufacturer's startup sheet do not need to be completed if these same items also appear on the Commissioning checklist.

E. Functional testing:

1. Functional testing will be complete and approved by the Commissioning Authority prior to substantial completion. This does not mean all items on the test must have been passed, but the essential function for safety and operating control must be verified as meeting the design intent.

2. Objective:

   a. The objective of the functional testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient are identified and corrected, improving the operation and functioning of the systems.

   b. Each system shall be operated through all modes of operation where there is a specified system response. Verification of each sequence in the sequence of operation is required. Proper responses to such modes and conditions shall also be tested.

3. The Commissioning Authority shall direct and verify functional tests unless this responsibility is specifically assigned to the Contractor.

4. The Contractor shall verify sequences and operations in the functional test procedures prior to notifying the Commissioning Authority the system is ready for functional testing.

5. Non-conformance:

   a. The Commissioning Authority will record the results of the functional test on the test forms. All deficiencies or non-conformance issues shall be noted and reported to the Contractor on a standard non-compliance form.

   b. Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Authority. In such cases the deficiency and resolution will be documented on the procedure form.

   c. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Authority will not be pressured into overlooking deficient Work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Contractor.

   d. As tests progress and a deficiency are identified, the Commissioning Authority shall discuss the issue with the executing Contractor:
      1) When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
         a) The Commissioning Authority documents the deficiency and the Contractor's response with their intentions to correct and continues on with the testing. After the day's Work, the Commissioning Authority submits the non-compliance reports to the Contractor. The Contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and submits it back to the Commissioning Authority.
         b) The Commissioning Authority reschedules the test and the test is repeated.
      2) If there is a dispute, regarding whether it is a deficiency or determining who is responsible:
         a) The deficiency shall be documented on the non-compliance form with the Contractor's response and a copy given to the Contractor.
         b) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive

authority is with the Architect/Engineer. Final acceptance authority is with the Project Manager.

c) The Commissioning Authority documents the resolution.

d) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and submits it to the Commissioning Authority.

e) The Commissioning Authority reschedules the test and the test is repeated.

3.07BUILDING INTEGRATION TEST

A. The test procedures for the building integration test shall be developed and prepared by the Commissioning Authority with the assistance of the Contractor.

B. Integrated building tests are intended to verify the operation of all building system's under condition to simulate as closely as possible actual building operations.

C. Interactive test of all Division 26 systems and/or equipment in conjunction with other effective Division of Work simultaneously to simulating anticipated building operating conditions and parameters, in varying modes of operation, primarily to verify continuous operation and baseline operation data as a building whole.

D. Resolution of deficiencies will follow the same general procedure as used for functional testing. In the case of integrated tests identification of deficiencies and determination of solution will occur on a daily basis.

3.08TRAINING

A. The Contractor shall be responsible for training coordination, scheduling and ultimately to ensure that the training is completed in accordance with the Specifications.

B. The Commissioning Authority shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

C. The Contractor shall have the following training responsibilities:

1. Provide the Commissioning Authority with a training plan two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
3. Training shall normally start with classroom sessions, followed by hands-on training on each piece of equipment or system, which shall illustrate the various modes of operation.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manuals, Specifications or sequence of operation, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or Manufacturer's representative shall provide the instructions and hands-on training on each major piece of equipment or system. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific equipment or system is required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the O&M manuals and illustrate whenever possible the use of the O&M manuals for reference.

7. Training shall include:

   a. Use of printed installation, operation and maintenance instruction material included in the O&M manuals.

   b. A review of the written O&M instructions emphasizing safe and proper operating procedures, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown and emergency procedures.

   c. Discussion of relevant safety issues and concerns.

   d. Discussion of warranties and guarantees.

   e. Common troubleshooting problems and solutions.

   f. Explanatory information included in the O&M manuals and location of all plans and manuals in the facility.

   g. Discussion of any peculiarities of equipment or system installation or operation.

8. Training shall occur after functional testing is complete, unless approved otherwise by the Commissioning Authority.

END OF SECTION

WIRING DEVICES
SECTION 262726

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Wall switches.
2. Wall dimmer switches.
3. Receptacles.
4. Floor mounted service boxes.
5. Coverplates.

B. Related work: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1. Division 03: Cast-in-place concrete.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified.

1. Federal Specification (FS):
   FS W-P-455A; Plate, Wall Electrical.
   FS W-C-596; Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
   FS W-S-896; Switch, Toggle.

2. National Electrical Manufacturer's Association (NEMA):
   NEMA WD-1; General-Purpose Wiring Devices.
   NEMA WD-2; Semiconductor Dimmers for Incandescent Lamps.
   NEMA WD-5; Specific-Purpose Wiring Devices.

3. Underwriter's Laboratories (UL):
   UL 20 General-Use Snap Switches.
   UL 231; Power Outlets.
   UL 310; Electrical Quick-Connect Terminals.
   UL 498; Attachment Plugs and Receptacles.
   UL 514A; Metallic Outlet Boxes.
   UL 514D; Cover Plates for Flush-Mounted Wiring Devices.
   UL 943; Ground-Fault Circuit-Interrupters.
   UL 1681; Wiring Device Configurations.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 00 10: Basic Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

3. Provide color finishes for Architect/Engineer to select from.

4. Submit manufacturer's installation instructions.

B. Where inscribed device coverplates are noted on the drawings or in the specifications, conform to the requirements of Section 26 05 53: Electrical Identification.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Only products and applications listed in this Section may be used on the project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided.

1. Devices not specified on plans:

a. Hubbell.

b. Pass & Seymour.

c. Leviton.

B. Substitutions: Under provisions of Section 26 00 10: Basic Electrical Requirements.

2.2 WALL SWITCHES: WILL BE PER PLAN

2.4 RECEPTACLES

A. Standards:

1. Provide general purpose 15 and 20-amp, 125/250 VAC receptacles that conform to NEMA WD-1 specifications. Specialty receptacles shall conform to NEMA WD-5 specifications as applicable.

2. Provide NEMA 5-20R, specification grade as noted herein, 20-amp, 125 VAC, 2 pole, 3 wire grounding type receptacles.

3. Receptacles shall be the standard conventional device.

B. Color:

1. Device color shall be as selected by the Architect/Engineer, unless otherwise noted.

C. General purpose single outlets:

1. Provide self-grounding back and side wired with binding head staked terminal screw.

2. Use Hubbell #5361 series, Pass & Seymour #5361 series Leviton #5361 series.

D. General purpose duplex receptacles:

1. Provide self-grounding, back and side wired with binding head staked terminal screws and break-off strip for two-circuit wiring.

2. Use Hubbell #5362 series, Pass & Seymour #5362 series, or Leviton #5362 series

E. Ground fault circuit interrupting (GFCI) receptacles:

1. Provide 20 amp, 125 VAC, receptacles consisting of NEMA 5-20R duplex device with integral solid state sensing and signaling circuitry capable of detecting and interrupting a maximum 5 milli-amp line-to-ground fault current in approximately 1/40th of a second.

2. Provide visual device with trip indication, manual reset, and test mechanisms and with point of use and multi-outlet protection.

3. Use Pass & Seymour #2091-S series, Hubbell GF-5362 series, Leviton #6898 series, for specification grade GFCI receptacles.

F. Special purpose receptacles: Provide specification grade devices with the NEMA configuration, voltage, and current rating, number of poles and ground provisions as noted on the Drawings.

2.5 FLOOR MOUNTED SERVICE BOXES

A. Cast flush floor box:

1. Single or multi-gang floor box for flush applications in concrete floor. Box shall be cast iron with brass coverplates and carpet flange. Furnish with provisions for adjustments before and after pour. Provide with all accessories such as receptacles, compartment dividers, coverplate options, rings, etc. as indicated for application on drawings.

2. Furnish box in either shallow or deep sizes as determined by the concrete floor depth and in ganged configurations shown on drawings.

2.6 COVERPLATES

A. General:

1. Provide all coverplates with rounded edges and corners, smooth and free of grooves, embossing or other embellishment.

2. Provide mounting screws to match the plate finish.

3. Provide gang type coverplates where two or more devices are installed at one location. Individual gangable coverplates are not acceptable.

4. Provide plates of one design, standard conventional throughout the project unless otherwise specified.

B. Color: Coverplate color shall be as specified by the Architect/Engineer, unless otherwise noted.

C. Metal coverplates:

1. Provide smooth, type 430 stainless steel coverplates, 0.035" thick with rounded edges and corners.

2. Provide openings to accommodate the devices indicated on the Drawings and in the Specifications.

3. Provide removable plastic film to protect coverplates during installation. Remove film at time of final acceptance.

D. Weatherproof coverplates:

1. Non-public areas:

a. Provide horizontal mounted, weatherproof in-use coverplate for one duplex or one GFCI receptacle. Provide gasketed, spring loaded, vertically self-closing covers suitable for use in damp and wet locations as described in UL 514 and NEC 406. Covers shall allow the use of the device with the cover closed.

b. Furnish base plates, covers, hinge pins, spring and screws of corrosion resistant type 302 stainless steel.

2. Public area receptacles:

a. Provide horizontal mounted weatherproof in-use coverplate for one duplex or one GFCI receptacle. Provide gasketed, spring loaded, lockable, vertically self-closing covers suitable for use in damp and wet locations as described in UL 514 and NEC 406. Covers shall allow the use of the device with the cover closed.

b. Furnish base plates, covers, hinge pins, spring and screws of corrosion resistant type 302 stainless steel.

c. Provide two (2) keys for each locking type coverplate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine site conditions for acceptance of wiring device installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

A. Coordinate device heights in vending, kitchen and utility areas with benches and counters.

B. Coordinate switch mounting location with Engineer's details. Unless otherwise noted, locate switches on latch side of door.

3.3 INSTALLATION

A. Install wiring devices in accordance with manufacturer's written instructions, as shown on the drawings and as specified herein.

B. Install devices with the vertical centerline plumb and with all edges of the device flush against the adjacent wall surfaces.

C. Mount switches at 42-inches above finished floor unless otherwise noted.

D. Mount receptacles vertically with the centerline 15-inches above finished floor and with grounding slot at bottom.

E. Mount receptacles horizontally when mounting above counters, mount with grounding slot to the left.

F. Mount GFCI receptacles above counters in bathrooms and at counters within 6'-0" of sinks, whether indicated as GFCI type or not.

G. De-rate ganged dimmer switches as instructed by manufacturer. Do not use common neutrals in dimmer circuits.

H. Provide cover plates for all outlet boxes, switches, receptacles, etc.

I. Install blank coverplates on all outlet boxes in which no device is required or installed.

J. Provide coverplates that completely cover wall opening and seat against wall.

K. Provide stainless steel coverplates for all devices in kitchen/food service equipment areas.

3.4 FLOOR MOUNTED SERVICE BOXES

A. Installation:

1. Install floor boxes to be level or within 1/16-inch below screed line.

2. Make conduit connections and anchor box to sub-flooring.

3. Core drill hole in floor (core sized based on manufacturer's installation instructions) for insert of poke-through device.

4. Make conduit connection to poke-through box from floor below.

B. Coordination: Contractor shall mark the location of all floor boxes with paint prior to installation or core drilling for review and approval by Engineer.

3.5 FIELD QUALITY CONTROL

A. Electrical testing:

1. Test proper polarity of all receptacles.
2. Test ground continuity of all wiring devices.
3. Test ground fault interrupting device operation.

B. Visual and mechanical inspection:

1. Check proper operation of all switches.
2. Visually inspect and replace damaged or defective devices.

3.6 CLEANING

A. Clean interior of all boxes from dirt and paint prior to installation of devices.

B. Clean wiring devices and coverplates from dirt and paint over spray.

END OF SECTION

LIGHTING
SECTION 26 50 00

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of this section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

A. Scope: Provide all labor, materials, equipment and incidentals required and install complete ready for operation and field test the interior and exterior lighting system as Indicated on the Lighting Fixture Schedules shown on the Drawings and as described in the Specifications.

B. Related Work Specified Elsewhere:

1. DIVISION 26 00 10, GENERAL REQUIREMENTS, ELECTRICAL
2. DIVISION 26 05 31, CONDUIT
3. DIVISION 26 05 19, BUILDING WIRE AND CABLE
4. DIVISION 26 27 26 WIRING DEVICES
5. DIVISION 26 27 16, CABINETS AND ENCLOSURES
6. DIVISION 26 05 26, GROUNDING AND BONDING

1.03 QUALITY ASSURANCE

A. All light fixtures shall comply with applicable standards of the Underwriter's Laboratories, Inc.

B. Prior to final inspection, all fixtures must be clean and operate as described on the Drawings. Any fixtures with defective, broken, bent, or cracked parts, or fixtures that are not properly secured must be repaired or replaced, and reinstalled at the Contractor's expense.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES AND ACCESSORIES

A Acceptable Manufacturers:

1. Approved Manufacturers: Provide products of firms regularly engaged in the manufacture of lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than five (5) years. The manufacturer of the lighting fixtures shall comply with the provisions of the appropriate code and standards.

2. UL or CSA US Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the “Standards for Safety" to UL 8750 or others as they may be applicable. Luminaire shall be DLC Certified (Design Lights Consortium).

2.02 REFERENCES

1. American National Standards Institute (ANSI):

   a. ANSI C62.41- IEEE Recommended Practice for Surge Voltages in Low- Voltage AC Power Circuits

2. Illuminating Engineering Society of North America (IES):

   a. IES Lighting Handbook.

   b. UL 8750 - The Standard for Safety of Light Emitting Diode (LED) Equipment for use in Lighting Products.

2.03 LUMINAIRES – LED SURFACE AMBIENT

1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. LEDs are light-emitting diodes, a semiconductor device that emits visible light when an electric current passes through it. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.

2. Each luminaire shall be designed to operate at an average operating temperature of seventy-seven degrees (77°F). The operating temperature range shall be -4°F to +104°F.

3. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.

4. Luminaires shall be fabricated from cold rolled steel with a powder coat finish and stainless steel mounting brackets or continuous seam welded 16-gauge type 304 stainless steel.

2.04 LED SOURCES

1. LED's shall be manufactured by Nichia, Samsung, Osram, ATG, Philips, or equal.

   a. Lumen Output – minimum initial lumen output of the luminaire shall be as follows for the lumens exiting the luminaire in the 0-90-degree zone - as measured by IESNA Standard LM-79-08 in an accredited lab.

   b. Lumen output shall not decrease by more than thirty percent (30%) over the minimum operational life of 80,000 hours.

2.05 LIGHT COLOR/QUALITY

1. Correlated Color temperature (CCT) range as per specification, between 3500K, 4100K and 5000K shall be correlated to chromaticity as defined by the absolute (X, Y) coordinates on the 2- D CIE chromaticity chart.

2.06 POWER SUPPLY AND DRIVER

1. Drivers: 120 – 277 volt, or as indicated in the plans, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.

2. All drivers should be UL Recognized under the component program and shall be modularly detachable for simple field replacement. Drivers that are not UL recognized or not suited for field replacement will not be considered.

3. The electronics/power supply enclosure shall be internal to the SSL (Solid State Lighting) luminaires and be accessible per UL requirements.

4. The surge protection which resides within the driver shall protect the luminaires from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002.

5. All electrical components shall be RoHS compliant.

6. Emergency Battery Pack (if required) shall be factory installed and provide 1400 lm of light output for ninety (90) minutes

2.07 THERMAL MANAGEMENT

A. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.

B. The luminaire shall have an UL IC rating.

C. There shall be no visible change in light output with a variation of plus/minus ten (10) percent of line voltage input.

D. Dimmable drivers shall be able to withstand up to a 1,000-volt surge without impairment of performance as defined by ANSI C62.41 Category A.

2.08 OPTICS

A. The optical assembly shall provide volumetric distribution to eliminate cave effect and provide uniform illumination in the space and increased luminance on vertical surfaces.

2.09 FIXTURE MOUNTING HARDWARE

A. Provide fixtures with brackets, straps, canopies and stems, if specified, and miscellaneous hardware suitable for the mounting method specified.

2.10 LUMINAIRE IDENTIFICATION

A. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside each unit and the outside of each packaging box.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lighting fixtures are to be installed as indicated on the drawings and specification. Provide all brackets, hangers, and other hardware as may be required for each particular condition of installation.

B. Contractor shall not use installed, project specified, luminaries for work light at any time during construction, nor shall they be illuminated for any other reason, except testing. Failure to complying with this requirement will require the contractor to re-lamp all used luminaries with specified lamps at the time of final inspection by the Inspector of Record (IOR) at no additional cost to the Owner.

C. In surface mounted locations, fixtures shall be rigidly mounted to the indicated surfaces with screws or bolts to supporting structure beyond. Install additional blocking or structures as necessary to accomplish this. Use of nails, "molly bolts", or "wing nuts" will not be allowed.

D. Where fixtures are recessed into framed ceilings, suitable structural members shall be provided for fixture support independent of the ceiling surface material. Fixtures shall be attached to these members with fixture mounting clamps, frames, or other devices provided with the fixture by the manufacturer specifically for this purpose in accordance with manufacturer's instructions.

E. Recessed fixtures in suspended ceilings shall be suspended from structure above independently from the ceiling suspension system. Suspension wires shall be #12 galvanized steel of the same type as the wires used for the ceiling system. 2'x4' fixtures or smaller units shall each be suspended by 2 wires. 4'x4' fixtures shall be suspended by 4 wires. Eye screws or bolts shall be used to secure the hanger wires to structure. Wires shall be attached to fixtures at diagonally opposite corners and secured with at least 4 tight turns in 1-1/2".

F. Contractor shall comply and provide sway bracing(s) per California State Title 24 for all suspended light fixtures requiring such restraints. All suspended light fixtures that are prevented, after final installation, from completing a full 45^0 degree sway distanced to the nearest object (structural beam, mechanical duct, wall, etc.) without contact shall require sway bracing, whether specifically shown on the drawings or not.

G. Where building is of "fire rated" construction, recessed fixtures are to be enclosed in an approved "firebox" suitable for the type of ceiling or wall construction encountered and of sufficient volume to prevent the fixtures form overheating. Firebox penetrations shall be as specified by the ceiling system manufacturer where applicable or they shall be sealed with approved "fire stop" sealing compound - 3M fire barrier or accepted equal.

H. The Contractor is required to focus and adjust all pole mounted parking lot luminaries, after dark, at a time mutually agreeable to the Contractor, Lighting Designer and Owner/District. Adjustments shall be made in accordance with the Lighting Designer’s stated intent, under the Lighting Designer’s observation.

3.02 CLEANING

A. Clean lighting fixtures prior to final acceptance.

END OF SECTION

SITE CLEARING
SECTION 31 10000

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation indicated to be removed.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling infield soil.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing site utilities.
8. Staging Area.

1.2 REFERENCES

A. Standard Specifications, latest edition, issued by California Department of Transportation (CSS).

B. Latest Edition Greenbook: Standard Specifications for Public Works Construction.

C. Perform demolition of existing improvements as noted on the Drawings.

D. The Contractor shall confirm with the owner's representative precise areas and elements to be removed. All other improvements shall be considered to remain and shall be protected. If the Contractor inadvertently demolishes and/or removes any items to remain, they shall be repaired or replaced to "like new" condition.

E. Refer to Section 01 57 50 “Temporary Erosion Control” for additional requirements and information.

1.3 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site. Backfill: Soil material used to fill an excavation.

1.4 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

B. Do not close or obstruct pathways, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

C. Provide alternate routes around closed or obstructed pathways if required by Owner or authorities having jurisdiction.

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. Staging area in and near the project area will be provided by the District as discussed at the Pre-construction Meeting. Staging areas within the lawn/field areas will not be allowed.

1.5 QUALITY ASSURANCE

A. All work under this section will be subject to the inspection and approval of both the Construction Manager. Compaction testing may be performed and approved by the District's independent testing laboratory, if required.

PART 2 - PRODUCTS

2.1 GENERAL

A. All fill material shall be in conformance with applicable requirements of Section 19 Earthwork, of the State Standard Specifications. Imported material shall conform to the requirements for harmful contaminants test for pollutants.

B. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

PART 3 - EXECUTION

3.1 GENERAL

A. Care shall be taken by the Contractor to minimize, insofar as possible, noise, vibration, dust and other nuisance qualities during demolition work.

3.2 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to District.

3.3 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.

E. Refer to Section 01 57 50 “Temporary Erosion Control” for additional requirements and information.

3.4 TREE AND PLANT PROTECTION

A. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect and provided in the Project Plans.

3.5 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place as shown on the Plans, specified herein, and directed by the City’s representative.

1. Arrange with utility companies to shut off utilities as needed for demolition (if applicable).

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify District not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without District’s written permission.

3.6 CLEARING AND GRUBBING

A. Remove obstructions, shrubs, and other vegetation to permit installation of new construction.

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, and compact each layer to a density equal to adjacent original ground.

3.7 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil. Retain one option for topsoil depth in first paragraph below if depth is known. Delete options if Contractor will identify and determine depth of existing topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

3.9 TURF AND GRASS REMOVAL

A. Where existing turf and grass are removed for new planting:

Withhold water from any existing turf until grass is brown and surface layer of soil is dry. Use rototiller or tractor with cultivating blades to incorporate the dead grass into the top six inches of soil. Grade and compact the planting soil to 85% maximum compaction.

3.10 IRRIGATION PROTECTION/ALTERATIONS/SALVAGE

A. Irrigation heads, pipes, and related facilities shall be protected in place. Should facilities be in conflict with the new storm drain and grading improvements, the Contractor shall temporarily relocate/adjust or cap the facilities and restore the irrigation facilities to exactly before construction location and conditions. Any modifications shall be approved by the District in writing.

B. In areas where irrigation is to be removed and reused, existing lines, heads, valves, controllers and other miscellaneous items may be reused if they conform to the standards outlined in the Drawings and Specifications regarding quality and condition of those materials. Contractor shall replace at their cost any items broken which are to be reused.

END OF SECTION 31 10000

EARTH MOVING
SECTION 31 20000

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Subbase course for concrete pavements.
4. Excavating and backfilling for utility trenches.
5. River Rock Installation and Type.

1.2 REFERENCES

A. Standard Specifications, latest edition, issued by California Department of Transportation (CSS).

B. Latest Edition Greenbook: Standard Specifications for Public Works Construction.

1.3 DEFINITIONS

A. ASTM Specificatios: The latest volume of ASTM Standards (Part 19) of the American Society for Testing and Materials, latest revision.

B. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Degree of Compaction: The ratio, expressed as a percentage of the dry density of the fill material as compacted in the field relative to the maximum dry density for the same material as determined by Test Method Number California 231-E or ASTM D 1557.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Construction Manager. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Construction Manager. Unauthorized excavation, as well as remedial work directed by Construction Manager, shall be without additional compensation.

F. Fill: Fill is all soil or soil/rock materials placed to raise the grade of the site to finish grade.

G. On-Site Material: Material obtained from the required excavations on the site.

H. Optimum Moisture Content: The moisture content at which the maximum laboratory density is achieved using the standard compaction procedure ASTM Test Designation D 1557 (AASHTO Test T-180).

I. Select Material: Soil Material meeting the requirements set forth in these specifications. Select Material includes topsoil and infield mix soil.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables.

1.4 PROJECT CONDITIONS

A. The Contractor shall be familiar with the soil conditions on the site, and shall thoroughly understand all recommendations on Project Drawings with regard to the grading of the site.

1.5 QUALITY ASSURANCE

A. All work under this section will be subject to the inspection and approval of both the Construction Manager. Compaction testing may be performed and approved by the District's independent testing laboratory, if required.

PART 2 - PRODUCTS

2.1 GENERAL

A. All fill material shall be in conformance with applicable requirements of Section 19 Earthwork, of the State Standard Specifications. Imported material shall conform to the requirements for harmful contaminants test for pollutants.

2.2 SOIL MATERIALS

A. Base Course: Class 2 aggregate base material, ¾" maximum grading, per State Standard Specifications.

B. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

C. Permeable Material: Class 1 Type B permeable material per State Standard Specification Section 68-2.02F.

D. River Rock Cobble: Varies in size from 5" to 12" in diameter, naturally rounded in shape and with smooth surfaces. Colors of cobble rock shall vary, with predominant tones of gray, tan, and gold.

E. Select Fill: The native soils encountered on site, minus organics, debris and/or other deleterious materials. All select fill soils shall be nearly free of organic or other deleterious debris and not contain rocks or lumps over 3 inches in greatest dimension. In general, well-graded mixtures of gravel, sand, silt, low to medium plastic clays and small quantities of cobbles and rock fragments shall be acceptable for use as general import fill.

F. Topsoil: Imported topsoil must:

1. Consist of fertile, friable soil of loamy character with a pH range from 6 to 7 that contains organic matter in quantities natural to the region and capable of sustaining healthy plant life.

2. Be free from deleterious substances such as litter, refuse, toxic waste, stones larger than 1 inch in size, coarse sand, heavy or stiff clay, brush, sticks, grasses, roots, noxious weed seed, weeds, and other substances detrimental to plant, animal, and human health.

G. Infield Mix: Imported material for the baseball in-field consisting of 40% clay/silt and 60% sand.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 GENERAL

A. Work done under this Section shall meet the applicable requirements of Section 19, Earthwork, of the State Specifications. The Contractor shall cut, fill, import, or export materials as required to meet the lines and grades for subgrade or grade as shown on the plans.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. The over-excavated soil that is clean and free from organic material may be used later as engineered fill, or as approved by District.

3.3 EXCAVATION, GENERAL

A. All excavations shall be carefully made true to the grades and elevations shown on the plans. The excavated surfaces shall be properly graded to provide positive drainage during construction and to prevent ponding of water.

B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1/2 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.5 EXCAVATIONS AT EDGES OF TREE- AND PLANT-PROTECTION ZONES

A. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Over-excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course, and as shown on the contract plans.

3.7 SUBGRADE INSPECTION

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Construction Manager without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by the Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

B. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within the percentage of optimum moisture content recommended by the Soils Report.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 PLACING AND COMPACTING OF FILL MATERIAL

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either aerating the material if it is too wet, or spraying the material with water if it is too dry. Each lift shall be

thoroughly mixed before compaction to ensure a uniform distribution of water content. Compact soil materials in accordance with the "minimum percent relative compaction" and "minimum percent above optimum moisture content".

D. Place backfill material in uniform layers not greater than eight inches (8") loose thickness over entire backfill area.

1. Use hand tampers or vibrating compactors at foundation walls, retaining walls, and similar locations. Do not use large rolling equipment adjacent to foundation walls and retaining walls.

2. Do not backfill against foundation walls or retaining walls until walls for bearing surfaces have reached design strength or are properly braced, and backfilling operations approved. Provide clean backfill materials or granular materials as required.

3. Provide compaction control and request testing and inspection of all fill and backfill.

4. Unless specifically approved by the engineer, water settling, puddling, and jetting of fill and backfill materials, as a compaction method is not permitted.

5. Maintain moisture content of materials during compaction operations within required moisture range to obtain indicated compaction density.

6. Provide adequate equipment to achieve consistent and uniform compaction of fill and backfill materials.

3.11 GRADING

A. General:

1. Uniformly grade areas to a smooth surface, free of irregular surface changes.
2. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Re-grading of Pathway: Pathways shall be re-graded to be uniformly smooth for access by pedestrians and maintenance vehicles. Debris shall be removed prior to re-grading. Erosion control measures shall be implemented as described on plans.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: District may engage a qualified engineering testing agency to perform tests and inspections, if required.

B. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.13 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Surplus excavated material shall become the property of the Contractor and shall be disposed of outside the project limit of work in accordance with the provisions in Section 300-2.6 of the Public Works Standard Specifications. However, the Contractor's prerogative to dispose of excavated material outside the site before all of the embankments are completed is subject to proof that environmentally clear sources of material in sufficient quantity to complete required embankments are available. The obtaining of any necessary clearances for new borrow sources or for exceeding limitations on previously cleared sources shall be the responsibility of the Contractor. No time extension or other waiver of working days requirements will be granted in the event the Contractor is delayed by reason of there being an insufficient quantity of acceptable material available from environmentally cleared sources to replace excavated material previously disposed of outside the site.

END OF SECTION 31 20000

ASPHALT PAVING
SECTION 32 1216

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot-mix asphalt patching.
2. Hot-mix asphalt (HMA).

B. Related Requirements:

1. Section 39 Hot Mix Asphalt California State Standard (CSS), latest edition.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or meeting CSS requirements.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements local DOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag or meet CSS requirements.

B. Fine Aggregate: ASTM D 1073 sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof or meet CSS requirements.

C. Mineral Filler: ASTM D 242/D 242M rock or slag dust, hydraulic cement, or other inert material, or meet CSS requirements.

2.2 ASPHALT MATERIALS

A. Aggregate Base: CSS Section 26, ¾-inch maximum size.

B. Binder: Emulsified asphalt diluted with water, CSS Section 94, Type SS1.

C. Hot mix asphalt (HMA): CSS Section 39, Type A using aggregate with 1/2 inch maximum, medium grading or such other grading as shown on the drawings, and steam refined paving asphalt meeting requirements for PG 64-10 of CSS Section 92.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles, or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Pavement Lifts: 1-1/2 inch thickness, consisting of two lifts or pourings -- a binder layer of 1-1/2 and a top layer of 1-1/2 inches or per CSS.

3.2 PLACING HOT-MIX ASPHALT FOR HMA

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at a minimum temperature of 250 deg F or per CSS Section 39-2.02C.
2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.3 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.4 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent or per CSS.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances or per CSS:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: District may engage a qualified testing agency to perform tests and inspections, if required.

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

C. Where pavement surface slopes are less than 1.3% water test pavement to insure that no ponding occurs and that the water runs to the drainage facilities indicated on the plans. If ponding occurs, the contractor must repair pavement as necessary to insure complete runoff of surface water.

D. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.7 WASTE HANDLING

A. General: Disposal of asphalt-paving waste must be done in accordance with State and Local requirements. Asphalt-paving waste materials must be legally disposed off of Owner's property, at no cost to Owner.

END OF SECTION 32 1216

CONCRETE PAVING
SECTION 32 1313

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Curbs.
2. Walks.

1.2 REFERENCES

A. Standard Specifications, latest edition, issued by California Department of Transportation (CSS).

B. Latest Edition Greenbook: Standard Specifications for Public Works Construction

1.3 ACTION SUBMITTALS

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

B. Samples: For each exposed product and for each color and texture specified.

C. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

2. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

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

B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

C. Standards: All work shall be in accordance with latest edition standards and specifications of the American Society for Testing and Materials (ASTM), California Department of Transportation (CALTRANS) Standard Specifications (CSS) and local requirements where they may apply.

D. Damage and Repair: Prevent damage to adjacent concrete curbs, walks, etc., during installation. Repair any damage to concrete edges or breaks in concrete at no cost to the Owner, by removal and replacement of complete sections. Patching will not be acceptable.

E. Contractor shall be completely responsible for the determination of concrete mixes to provide compressive strength and other requirements set forth under this Section.

F. Samples shall be supplied as required for testing.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 40; deformed.

B. Dowel Bars: ASTM A 615/A 615M, Grade 40 plain-steel bars. Cut bars true to length with ends square and free of burrs.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.2 CONCRETE MATERIALS

A. Sidewalk and Curb Concrete: Concrete and materials therefor shall conform to the applicable requirements for minor concrete in CSS Section 73 Concrete Curbs and Sidewalks and Section 90 Portland Cement Concrete. Concrete shall have a minimum 28-day compressive strength of 3000 psi, shall contain a minimum of 520 lbs cementitious material per cubic yard, and have a 4 inch maximum slump.

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

1. Portland Cement: ASTM C 150, gray portland cement Type II.

C. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source.

D. Water: Potable and complying with ASTM C 94/C 94M.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

2.4 RELATED MATERIALS

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

2.5 FORMS

A. Sidewalk: Sidewalk forms shall be of wood or steel, straight and of sufficient strength to resist springing during depositing and consolidating concrete, and of a height equal to the full depth of the finished sidewalk. Wood forms shall be surfaced plank, two-inch nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 10 feet, with a minimum of three stakes per form, at maximum spacing of four feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self-aligning. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Forms shall have a nominal length of 10 feet, with a minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips, designed for use with steel forms.

B. Curb:

1. Conform to the requirements specified for sidewalk forms.

2. Rigid forms shall be provided for curb returns, except that benders of thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together.

2.6 CROSS DRAIN MATERIALS

A. 3” Ductile Iron Pipe: ASTM A536 standards for ductile iron castings

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

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

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Sidewalk: Forms for sidewalks shall be set with the upper edge true to line and grade and shall be held rigidly in place by stakes. After forms are set, grade and alignment shall be checked with a 10-foot straightedge. Forms shall conform to line and grade with an allowable tolerance of 1/4 inch in any 10-foot long section. Forms shall have a transverse slope with the low side adjacent to the roadway unless otherwise indicated. Forms shall be coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory. Side forms shall not be removed within 12 hours after finishing has been completed.

B. Curbs: Forms for curbs shall be carefully set to alignment and grade and to conform to the dimensions of the curb. Forms shall be held rigidly in place by the use of stakes. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. The forms on the front of the curb shall be removed not less than two hours nor more than six hours after the concrete has been placed. Forms at back of curb shall remain in place until the face and top of the curb have been finished as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.3 STEEL REINFORCEMENT

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

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed paving surface with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

F. Finished surface of the walk shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Irregularities exceeding the above shall be satisfactorily corrected.

G. The surface shall be divided into rectangular areas by means of contraction joints spaced at intervals per plans. After straight edging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber- bristle brush in a direction transverse to that of the traffic.

3.6 FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

C. Medium-to-Coarse-Textured Broom Finish: Site flatwork (sidewalk, curbs, and ramps) that are exposed and subject to foot traffic shall receive a medium-to-coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
   1. Surfaces with a slope of less than 6-percent shall be at least as slip resistant as that described as a medium salted finish.
   2. Surfaces with a slope of 6-percent or greater shall be slip resistant.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing.

3.8 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Landscape Architect.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.11 CROSS DRAIN INSTALLATION

A. Ductile Iron Pipe Cross Drains shall be constructed per Detail 7/C4.0 from the “CONTRA COSTA HOUSING AUTHORITY TI – 2601 Somersville Rd” Plans dated 3/6/2026.

END OF SECTION 32 1313

CRUSHED STONE PAVEMENT

SECTION 32 1540

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Crushed aggregate surfacing. Provide all labor and material necessary for the installation of crushed rock pavements as shown on the drawings.

1.2 RELATED WORK IN OTHER SECTIONS

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

B. 31 20 00 Earth Moving

1.3 REFERENCES

A. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates

B. ASTM D2419 - Sand Equivalent Value of Soils and Fine Aggregates

C. Caltrans Standard Specifications for Public Works Construction

1.4 SUBMITTALS:

A. Products:

1. A one (1) pound bag of decomposed granite.

2. One (1) xeroxable copy of manufacturer's descriptive literature for soil cements, binders, or stabilizers.

3. Metal Header product literature.

B. Procedure:

1. Submit one (1) xeroxable copy of the above written information and a one (1) pound sack of decomposed granite to the Landscape Architect ten (10) work days after Notice to Proceed and prior to performing any work.

1.5 QUALITY ASSURANCE:

A. Codes and standards:

1. Perform and provide the work of Crushed Rock Pavement in compliance with all applicable local, state and federal codes, laws and regulations.

2. Percent Compaction: As referred to in these Specifications, percent compaction is the required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material determined by the ASTM test method, D1557-78(C).

B. Supervision:

1. A person who is thoroughly familiar with the materials being installed and the methods for their installation will be present at the job site at all times during the execution of the work defined by this section.

C. Substitution of materials:

1. Substitution of materials will not be permitted unless authorized in writing by the Landscape Architect. Suggested substitutions must be shown to be equal to the specified material. A written proposal will be considered for the use of the suggested material which includes a corresponding adjustment in contract price. The proposal will be submitted to the Architect 35 work days after Notice to Proceed.

D. Work schedule:

1. The work will proceed as rapidly as possible. The Contractor will make every effort to coordinate the work of crushed rock pavement with the work of other trades before, during and after construction.

1.6 MOCK-UP

A. Construct mockup of 10 square feet minimum of crushed aggregate blended (with binder if called for), including base course, at location approved by Landscape Architect. Build mockup 5 days prior to installation. Intent of the mockup is to demonstrate surface finish, texture, color and standard of workmanship

B. Notify Landscape Architect 5 days in advance of mockup construction.

C. Allow Landscape Architect to view and obtain approval of mock-up before proceeding with rest of crushed aggregate blended with GraniteCrete admixture surfacing.

D. Approved mock-up may remain as first in place construction.

1.7 FIELD CONDITIONS

A. Do not install crushed rock surfacing when sub-base is wet at saturated field capacity.

B. Do not install materials during rainy conditions or below 40 degrees Fahrenheit.

PART 2 - PRODUCTS

2.0 MATERIALS

2.1 CRUSHED ROCK

A. Crushed rock is called Decomposed Granite (DG) on the drawings:

1. DG shall have a 3/8" maximum gradation, produced from naturally friable rock/granite with enough fines to produce a smooth walking surface. Materials should be free from clay lumps, organic matter, and deleterious material. Blends of coarse sand and rock dust are not acceptable.

2. Use a single supply source for the entire quantity required.

3. Gradation, in accordance with ASTM C136.

4. Color shall have gold to yellow hues; and shall be selected by Landscape Architect from manufacturer's standard colors.

5. Supplier: Vineyard Rock Products, Hollister, CA. - (831) 637-6443, or approved equal.

Sieve Size	Percent Passing
#4	95-100
#30	30-50
#200	10-20
Sand equivalent	38 minimum

2.2 WATER

A. Clean and potable, free of alkali, organic matter and other materials. Provided by the Contractor.

2.3 METAL HEADERS

A. Metal headers shall be provided per plans.

B. Provide submittal.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. Protect adjacent areas and improvements during delivery and storage.
B. Protect all materials from damage caused by moisture, erosion and theft.
C. Deliver materials in original containers with labels intact and exposed for inspection\

3.2 EXISTING SURFACE CONDITIONS:

A. Examine areas to receive the work of this Section. Surfaces should be clean of extraneous material, smooth, sound, properly compacted, graded, constructed and of the correct moisture content to receive the surface layer of crushed rock.
B. Metal headers shall have been installed and be complete at locations where shown on the drawings, curving as required, securely staked and braced to hold firmly to line and grade.
C. Notify the Landscape Architect of any defects which might affect the installation of crushed rock pavement. Arrange for repairs after the Landscape Architect's review and before continuing work.

3.3 PLACING CRUSHED ROCK

A. Place crushed rock with pavement binder over compacted sub-grade in areas where shown on the drawings.

B. Place to avoid segregation of materials in maximum layers of 3-inches. Level and screed material to grades and lines shown on plan.

C. Avoid damaging headers during compaction and rolling. Damaged headers must be replaced immediately at the Contractor's expense.

D. Finish adjacent shoulders and slopes to required grade as shown on the drawings. Do not leave adjacent soil overly compacted. Leave adjacent soils clean of debris and excess crushed rock.

E. Leave headers in place, making any adjustments needed to assure proper drainage of water over the headers and off the pavement.

F. Final thickness of compacted work shall be as shown on the drawings with a maximum variable tolerance of 1/2 (0.5) inch. Make measurements by means of test holes taken at random in the finished surface as directed by the Owner. Repair test holes after inspection.

3.4 CLEAN-UP

A. Leave crushed rock pavements smooth and free of extraneous material

B. Leave the work site clean and free of debris resulting from the work.

3.5 FIELD QUALITY CONTROL

A. Owner may require testing of product and installation as follows:

1. Compressive strength: Sample and test pavement for compressive strength.
2. Stability and coefficient of friction.
3. Where tests indicate noncompliance with specified standards, test results shall be reported in writing to Landscape Architect, binder manufacturer, and Contractor within 24 hours of testing.

B. Contractor shall correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

C. Spot check slab flatness upon completion.

END OF SECTION 32 1540

DETECTABLE WARNING SURFACES
SECTION 32 1726

PART 1-GENERAL

1.1 GENERAL

A. Refer to District Standards for all Items.

B. Products provided shall comply with DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Part 2, Section 205 definition of “Detectable Warning”. Section 11B-247.1.2.2 for “Curb Ramps” and Section 11B-247.1.2.5 for "Detectable Warnings at Hazardous Vehicular Areas”.

C. Products provided shall comply with Americans with Disabilities Act (ADA) Title II Regulations, 28 CFR Part 36 "ADA Standards for Accessible Design," Appendix A, Section 4.29 for "Detectable Warnings."

D. Warranty: Tiles shall be guaranteed in writing for a period of five (5) years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and loosening of tiles.

1.2 PRODUCT INFORMATION

A. Basis of Design: Armor-Tile as manufactured by Engineered Plastics Inc, or approved equal.

B. Vitrified polymer composite with aluminum oxide particles imbedded on truncated domes; homogeneous coloring. Shall conform to the following performance requirements:

1. Compressive Strength: No less than 28,000 psi, when tested by ASTM D695.

2. Tensile Strength: No less than 19,000 psi, when tested by ASTM D638.

3. Flexural Strength: No less than 25,000 psi., when tested by ASTM D790.

4. Fire Resistance: Flame spread shall be less than 15, when tested by ASTM E84.

5. Water Absorption: Not to exceed 0.05%, when tested by ASTM D570.

6. Slip Resistance: Combined wet and dry static coefficient of friction shall not be less than 0.80 on top of domes and field area, when tested with ASTM C1028.

7. Color: Homogenous color. Color as chosen by District per available standard federal colors from the manufacturer. Contractor to ensure color chosen will meet all required local and state building codes and requirements.

C. Adhesives, Fasteners, and Sealants: Shall conform to the manufacturer’s recommendations.

END OF SECTION 32 1726

PLANTING IRRIGATION
SECTION 32 8400

PART 1-GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials, supplies, tools and transportation to perform all operations in connection with and reasonably incidental to the complete installation of the automatic sprinkler irrigation systems as shown on the Drawings.

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

1.2 RELATED SECTIONS:

A. Final Acceptance for Work of this Section is contingent on completion of Work of Section 32 90 00.

B. Division 26 - Electrical power to controller.

C. Division 32 – Exterior Improvements: Irrigation sleeving under paving.

1.3 REFERENCES

A. ASTM – American Society for Testing and Materials

1. A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

2. D1785 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40 and 80 and Classes 200 and 315.

B. ICC – International Code Council

C. NEC – National Electric Code

D. State of California, Division of Industrial Safety

1. Electrical Safety Orders

E. UPC – Uniform Plumbing Code

1.4 QUALITY ASSURANCE

A. OSHA Compliance:

1. All articles and services covered by this Specification shall meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this Specification.

2. The subcontractor shall erect and maintain barricades, guards, warning signs, and lights as necessary or required by OSHA regulations for the protection of the public or workmen.

B. Regulatory requirements: In addition to complying with all pertinent codes and regulations, comply with the latest rules of NEC and the Electrical Safety Orders of the State of California, Division of Industrial Safety, for all electrical work and materials. The materials and methods to be used in constructing the irrigation system shall conform to the applicable provisions of the UPC.

C. When the Specifications call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, the provision of the Specifications shall take precedence over the requirements of the said rules and regulations.

D. The subcontractor shall furnish without any extra charge any additional material and labor when required by the compliance with these rules and regulations, though the work be not mentioned in these particular Specifications or shown on the Drawings.

E. Any existing buildings, equipment, piping, pipe covering sewers, sidewalks, landscaping, etc., damaged by the subcontractor during the course of his work shall be replaced or repaired by the subcontractor in a manner satisfactory to the Owner's Agent and at subcontractor's own expense, and before the final payment is made. The subcontractor shall be responsible for damage caused by leaks in the piping systems being installed by him. He shall repair, at his own expense, all damage so caused, in a manner satisfactory to the Owner's Agent.

F. The subcontractor, personally or through an authorized and competent representative, shall supervise the work constantly, and shall as far as possible keep the same foreman and workmen on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workmen will be allowed on the job.

G. The subcontractor shall pay for all permits, licenses, and fees required.

H. Pre-construction conference: Contractor shall schedule and conduct a conference to review in detail quality control and construction requirements for equipment, materials, and systems used to perform the work. The conference shall be scheduled not less than 10 days prior to commencement of work. All parties required to be in attendance shall be notified no later than 7 days prior to date of conference.

1.5 SUBMITTALS

A. Materials List: Within 15 days after award of contract and prior to installation, submit six copies of materials list. Include manufacturer, model number, and description of all materials and equipment. Include sealants, cements, lubricants and other proprietary items.

B. Substitutions: Submit six copies of catalog information on materials which are to be submitted for substitution. No substitution will be permitted without prior written approval by the Architect. A complete material list shall be submitted prior to performing any work.

C. Record Drawings:

1. The subcontractor shall maintain in good order, in the field office, one complete set of bond prints of all irrigation drawings which form a part of the Contract, showing all water lines, sprinklers, valves, controllers and stub-outs. Any work not installed as indicated on the Drawings, shall be recorded and dimensioned accurately from the building walls on these prints. All as-built markups shall be indicated in red.

2. All underground stub-outs for future connections and valves shall be located and dimensioned accurately from building walls on these record drawings.

3. Upon completion of the work, obtain reproducible prints from Architect and neatly correct the prints to

show the as-built conditions.

D. Controller Charts:

1. Record Drawings shall be accepted by Architect before controller charts are prepared.

2. Provide one controller chart for each controller supplied.

3. Charts shall be the maximum size that the controller door will allow, showing areas covered by each controller. Chart shall be an electrostatic copy and a different color shall be used to indicate area of coverage for each station. Enlarge valve sequence to be readable when drawing is reduced.

4. After being completed and accepted, seal by plastic laminating. Laminating sheets shall be a minimum of 10 mil thick.

E. Operations and maintenance manuals:

1. Deliver to owner at least 10 days prior to completion of construction, 2 complete sets of the following data. Data shall be on 8 1/2 inch by 11 inch sheets, in a 3-ring binder.

a. Index sheet stating Contractor's address and telephone number and list of equipment with name and addresses of local manufacturer's representatives.

b. Catalog and parts sheets on all material and equipment installed under this Section.

c. Complete operating and maintenance instructions for all equipment.

d. Complete and dated manufacturer's warranties for all materials used.

2. Irrigation Maintenance Schedule to include, but not be limited to, routine inspection, adjustment, and repair of the irrigation system and its components.

3. Irrigation audit report by an Irrigation Association certified irrigation auditor. Irrigation audit shall be performed by auditor for final inspection and report shall be provided by auditor. For more information, see Part 3 (EXECUTION) of this Specification.

1.6 LAYOUT OF WORK

A. The irrigation contractor shall stake out the irrigation system as shown on the Drawings. Stakes shall be approved by Landscape Architect before construction is started. Any changes, deletions or additions shall be determined at this check.

1.7 INSTRUCTION

A. After the system has been installed and approved, subcontractor shall instruct the Owner's representative in complete operation and maintenance of the irrigation system.

1.8 WARRANTY

A. Provide 1 year guarantee for Work of this Section in accordance with Section 1700.

B. Provide supplemental guarantee, on Contractor's letterhead:

1. Warrant that irrigation system has been installed according to Drawings and Specifications, and that system will be free of defects in products and installation for 1 year from Substantial Completion. Manufacturer's warranties shall only supplement special warranty.

2. Agree to repair or replace defective Work, or adjacent work which is damaged by such defects, with the exception of ordinary wear and tear, abuse or neglect. This includes damage to site improvements caused by settlement of improperly compacted trench backfill.

3. Owner reserves the right to make temporary repairs as required.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Main lines (constant pressure) shall be 1120 Schedule 40 polyvinyl chloride (PVC) solvent weld pipe, Type 1, and shall conform to ASTM D1785. Use Schedule 80 PVC solvent weld fittings.

B. Lateral lines (non pressure) shall be 1120 Schedule 40 polyvinyl chloride (PVC) plastic pipe Type 1, and shall conform to ASTM D1785. Use Schedule 40 PVC solvent weld fittings.

C. Metal Pipe:

1. Steel pipe shall be Schedule 40 galvanized steel conforming to ASTM 53B. Metal pipe shall be wrapped in 2 inch wide, 20 mil thick, black PVC all weather corrosion-resistant tape with high tack adhesive. Use threaded galvanized steel fittings.

2. Provide dielectric fittings where dissimilar metals come into contact.

D. Fittings:

1. Solvent Weld socket fittings: Schedule 40, Type 1, Grade 1, PVC and shall conform to ASTM D2466. Schedule 80, Type 1, Grade 1 PVC and shall conform to ASTM D2467. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type recommended by pipe manufacturer.

E. Connections between main lines and remote control valves shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.

F. Risers shall be as follows: Schedule 80 PVC threaded nipples and Schedule 80 PVC ells as shown on the construction details.

2.2 QUICK COUPLING VALVES

A. Quick Coupling valves shall be brass construction, 3/4-inch connection, two-piece body, locking purple vinyl top, single slot and lug. Provide one 3/4-inch single lug key and 3/4-inch hose swivel for every 5-6 quick couplers.

B. Quick Coupling valves shall be restrained with ductile iron restrainers that attach securely to the base of the valve. Restrainers shall make contact with the hex flats of the valve and be secured by a single bolt.

2.3 GATE VALVES

A. 2½ inch and smaller shall be lead-free bronze construction conforming to ASTM B584 Alloy C87850 with screw-in bonnet, non-rising stem, operating wheel and threaded connections.

2.4 BALL VALVES

A. Ball valves shall be Schedule 80 PVC full port design. PVC ball valves to be installed upstream of each remote control valve.

2.5 REMOTE CONTROL VALVES

A. Remote control valves shall be globe pattern constructed of heavy duty glass-filled nylon and stainless steel with internal and external bleed. Operating pressure shall be 20 to 200 psi and flow range shall be .25-200 gpm. All internal parts shall be removable from the top.

B. Install pressure regulating module on remote control valves as shown on drawings. Pressure regulating module shall be by same manufacturer as remote control valve.

C. Each valve shall have a plastic tag denoting its controller and station number.

2.6 MASTER REMOTE CONTROL VALVE

A. Master remote control valve shall be constructed of heavy duty cast iron, bronze, stainless steel, and copper with metering pin and manual flow stem to adjust closing speed. Operating pressure shall be 3 to 200 psi and flow range shall be .01 to 3000 gpm.

B. Master Valve shall be normally open.

2.7 FLOW SENSOR

A. Flow sensors shall be capable of sensing programmed water flows during the operation of the irrigation system and shall be capable of detecting excess or inadequate water flows as per the operator entered parameters.

B. The flow sensors shall be compatible with the irrigation controller and shall be capable of transmitting water flow information to the irrigation controller.

C. The flow sensor shall meet the following requirements:

1. Brass or bronze construction.

2. Insertion type with a non magnetic, spinning impeller as the only moving part.

3. Rated for a maximum line pressure of 400 psi.

4. Accuracy of plus or minus 1 percent of full scale, linearity of plus or minus .7 percent, repeatability of plus or minus .7 percent, and a flow range of .5 to 15 feet per second.

2.8 CONTROLLERS

A. Controllers shall be as listed on the Drawings and shall have the following features:

1. Utilize either evapotranspiration or soil moisture data for irrigation scheduling.

2. UL listed, solid state, capable of automatic or manual operation.

3. Non-volatile memory.

4. Scheduling with 365 day calendar, odd/even watering, and rain delay of 1-14 days.

5. Cycle and soak feature.

6. Compatible with master valve and flow sensor.

7. Hand held remote ready.

B. Controller enclosure shall be stainless steel and as listed on the Drawings.

C. Hand held remote shall be compatible with controller.

D. Controllers shall be grounded per manufacturer's instructions and ASIC grounding guidelines.

2.9 CONTROL WIRE

A. Copper with UL approval for direct burial in ground, size #12-1 for common wire and size #14-1 for control wire. Common ground wire shall have white insulating jacket; control wire shall have insulating jacket of color other than white. Provide a separate ground wire for each controller.

B. Splices shall be made with 3M SCOTCHCAST #3570G-N epoxy packs for connectors.

2.10 VALVE BOXES

A. High density polyethylene construction with UV inhibitors. Lid shall be green in color and have stainless steel bolt-down mechanism. Boxes, lids, and bolts shall be from the same manufacturer. Plastic valve boxes shall be by Carson, NDS Pro Series, or equal.

B. The lid shall be marked as follows:

1. Remote Control Valves – "Irrigation Control Valve" or "ICV" with the station number in one inch (1") high white enamel or heat branded numbers and letters.

2. All other valves - "Irrigation Control Valve" or "ICV".

C. Valve box sizes are noted on drawing details.

2.11 SPRINKLER HEADS AND BUBBLERS

A. All sprinkler heads and nozzles shall be as listed on the Drawings.

B. All pop-up sprinkler heads shall have shut-off devices, check valves, and pressure regulation built into the sprinkler head.

C. Bubblers shall be as listed on the Drawings and shall be pressure compensating.

2.12 DRIP SYSTEM

A. Provide all components required for complete system:

1. Filter: Basket type filter pressure rated at 150 psi constructed of glass-filled polypropylene with glass-filled nylon cap. Filter screen shall be 200 mesh stainless steel basket design and reinforced with polypropylene ribs. The unit shall incorporate an indicator window that shows when the filter needs to be cleaned.

2. Pressure regulator: Built-into the Basket Filter and pre-set at 40 psi.

2.13 SUBSURFACE IRRIGATION

A. Dripline tubing and pressure compensating emitters shall be extruded from linear low-density polyethylene. The inline emitter shall have a pressure-regulating diaphragm with spring action and automatic check valve that will seal the line at 3.5 psi.. Protection from root intrusion shall be by means of a copper chip in the emitter.

B. All accessories listed below shall be furnished by the same manufacturer as the dripline.

1. Line Flushing Valves – the subsurface irrigation system shall utilize manual line flush valves at the end of each independent zone area. Manual valve shall be a PVC ball valve connected to polyethylene tubing.

2. Air/Vacuum Relief Valve – each independent irrigation zone shall utilize an air/vacuum relief valve at its high point. The air and vacuum relief valve shall seal effectively from 2 to 10 psi.

2.14 BACKFLOW PREVENTION DEVICE

A. Backflow prevention device shall be the reduced pressure type with gate valves, check valves, test cocks, reduced pressure chamber, and air vent.

B. Backflow preventer enclosure shall be cold rolled steel with green powder coating, 1/8 inch wall thickness, with stainless steel hardware. Enclosure shall be removable from base without use of tools. Enclosure shall be sized to fit backflow prevention device.

2.15 RAIN BUCKET

A. Bucket type made of gold anodized aluminum funnel in aluminum with white baked enamel housing. Tipping mechanism that measures every 0.01 inches of rainfall.

B. Accuracy of 1% at 2-inches per hour or less.

2.16 MISCELLANEOUS INSTALLATION MATERIALS

A. Solvent cement and primer for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Use only Weld-On 795 Cement for flexible PVC to rigid PVC connections. Cement shall be maintained at proper consistency throughout use. Assembly practice shall be in accordance with ASTM D2855. Active Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

B. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as Christy Ultra Seal Thread Sealant T10,000..

C. Drain rock: 3/4 inch washed pea gravel.

2.17 MISCELLANEOUS EQUIPMENT

A. Provide all equipment called for by the Drawings.

B. Provide to the Owner, at completion of the Maintenance Period, three (3) each of all operating and

servicing keys and wrenches required for complete maintenance and operation of all heads and valves. Include all wrenches necessary for complete disassembly of all heads and valves.

C. Provide two (2) each of quick coupler keys and hose swivels and three (3) sets of keys to both controller cabinets and enclosures.

PART 3 - EXECUTION

3.1 PREPARATION

A. Schedule and coordinate placement of materials and equipment in a manner to effect the earliest completion of work in conformance with construction and progress schedule.

B. Contractor shall field verify the static water pressure at the project site prior to commencing work or ordering irrigation materials. If contractor fails to verify static water pressure prior to commencing work, contractor shall assume responsibility for all costs required to make system operational.

C. Examine areas and conditions under which work of this section is to be performed. Do not proceed with work until necessary conditions have been corrected.

3.2 HANDLING AND STORAGE

A. Protect work and materials from damage during construction and storage as directed by Architect.

B. Handle plastic pipe carefully; especially protecting it from prolonged exposure to sunlight.

C. Store sub-surface dripline and polyethylene tubing in cool dry place out of sunlight during installation.

3.3 LAYOUT

A. Layout work as accurately as possible in accordance with diagrammatic drawings.

B. Where site conditions do not permit location of piping, valves and heads where shown, notify Architect immediately and determine relocation in a joint conference.

C. Run pipelines and automatic control wiring in common trenches whenever practical.

3.4 EXCAVATING AND TRENCHING

A. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.

B. Depth of trenches shall be enough to provide minimum cover from finish grade to top of pipe in trenches, as follows:

1. 18 inch minimum cover over main lines to the control valves and quick coupling valves.

2. 18 inch minimum cover over direct burial control wires from controller to valves.

3. 12 inch minimum cover over the valve controlled lines to sprinkler heads.

4. 24 inch minimum cover over sleeves.

C. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in a manner approved by the Architect.

D. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by Architect.

3.5 ASSEMBLING PIPELINES

A. All pipes shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.

B. Solvent Weld Joint:

1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning the pipe and fitting of dirt.

2. Dry-insert pipe into fitting to check for missizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.

3. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with primer, immediately followed by solvent weld cement liberally applied to the male end of the pipe and lightly applied to the inside of the socket. Then, apply a second coat of cement to the pipe end.

4. Insert pipe immediately into fitting and turn it 90° to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.

5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.

6. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.

C. Threaded Joint:

1. Field threading of plastic pipe or fittings is not permitted. Factory-formed threads only will be permitted.

2. Factory-made nipples shall be used wherever possible. Field-cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately on the axis with sharp dies.

3. All threaded joints shall be made up with pipe joint compound. Apply compound to male threads only.

4. Where assembling metallic pipe to metallic fitting or valve, no more than three (3) full threads shall show when joint is made up.

5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tightening.

6. Where assembling soft metal (brass or copper) or plastic pipe, use a strap type friction wrench only; do not use a metal-jawed wrench.

D. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstruction. Remove caps

or plugs only when necessary to continue assembly.

E. Where pipes or control wires pass through sleeves, provide a removable non-decaying plug at ends of sleeve to prevent entrance of earth.

F. Install copper tracer wire on top of the entire mainline, taped every fifteen feet (15'). Stub tracer wire up at backflow and isolation valves.

3.6 REMOTE CONTROL VALVES

A. Install where shown on Drawings and group together where practical. Limit one remote control valve per box with no exceptions.

B. Locate valve boxes 12 inches from and perpendicular to walk edges, buildings and walls. Provide 12 inches between valve boxes where valves are grouped together.

C. Thoroughly flush main line before installing the valve.

D. Install in shrub or ground cover areas where possible.

E. Label control line wire at each valve with a 2 1/4" x 2 3/4" polyurethane I.D. tag, indicating identification number of the valve (controller and station number). Attach a label to control wire.

3.7 QUICK COUPLING VALVES

A. Install quick coupling valves on double swing-joint assemblies of Schedule 80 PVC risers and fittings.

B. Thoroughly flush main line before installing the valve.

C. Install 12 inch from hardscape areas.

3.8 VALVE BOXES

A. Install one valve box for each type of valve unless otherwise noted.

B. Install boxes 12 inches from walk or header and 12 inches apart. Short side of rectangular boxes shall be parallel to walk or header. Install 2 inches above finish grade in groundcover areas and flush with grade in lawn areas.

C. Install common bricks as shown and as required to keep box stable. Install gravel sump after compaction of all trenches.

3.9 FLOW SENSOR

A. Install flow sensor a minimum of 10 times pipe diameter upstream and 5 times pipe diameter downstream of any valves, fittings, pipe bends, etc.

B. Use only sensor cable approved by the controller manufacturer. Install cable in a separate 1 inch conduit routed to controller. Leave enough flexibility in the cable to allow for future service of sensor.

3.10 SPRINKLER HEADS AND BUBBLERS

A. Thoroughly flush lines before installing heads, drip tubing, or bubblers.

B. Locate heads and bubblers as shown in the Drawings and Detail.

C. Set sprinkler heads perpendicular to grade unless otherwise shown.

D. Adjust sprinkler heads for proper distribution and trim, providing complete coverage with minimal overspray.

3.11 SUB-SURFACE IRRIGATION

A. Install per manufacturer's instructions.

B. Install dripline in a grid pattern 2 inch below finish grade.

C. Install air/vacuum relief valve at the highest point of each circuit on a line that is perpendicular to the dripline rows (exhaust header or lateral connecting dripline.) Install in 6 inch round valve box.

D. Install flush valve at a point farthest away from source or along exhaust header. Install in 6 inch round valve box.

3.12 AUTOMATIC CONTROL WIRING

A. Run lines along mains where practical. Tie wires in bundles with pipe wrapping tape at 10' intervals and allow slack for contraction between strappings.

B. Loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire.

C. Connections shall be made as shown on plans.

D. Splicing will be permitted only on runs exceeding 2500'. Locate all splices at valve locations within valve boxes.

E. Where control lines pass under paving, they shall pass through Schedule 40 electrical PVC conduit.

F. Common wire and control wires shall be tagged with 1/4" wide embossed plastic labeling tape, showing controller and station number designation.

3.13 AUTOMATIC CONTROLLER

A. Provide and install automatic irrigation controller in approximate locations shown on Drawings. The exact location will be determined on the site by Architect. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.

B. Connect control lines to controller in sequential arrangement according to assigned identification number of the valve. Each control line wire shall be labeled at controller with a permanent non-fading label indicating station number of the valve controlled. Attach label to control wire.

C. Contractor is responsible for programming the controller. Provide optimum amounts of water for each plant type to maintain plants in vigorous healthy condition. Reprogram as required at end of maintenance period.

D. Contact controller manufacturer for certification of the installation.

3.14 BACKFLOW PREVENTION ASSEMBLY

A. Local codes shall govern installation requirements.

B. Install a minimum of 12 inches and a maximum of 30 inches above grade.

C. Install enclosure on concrete pad as shown on drawings.

3.15 BACKFILLING

A. Backfill only after piping has been tested, inspected and approved.

B. Backfill material shall be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials.

C. A stable and uniform bedding of at least 2" shall be provided for the pipe and any protruding features of its joints and/or fittings. The middle of the bedding, equal to 1/3 of the pipe outside diameter, may be loosely packed with the remainder compacted to a minimum of 90 percent standard proctor density. Pipe bedding material shall be Class II, clean, course grained materials, such as gravel, coarse sands and gravel/sand mixtures (1 ½ inches maximum in size.)

D. All pipe under asphalt paving shall be backfilled with 4 inches of clean sand on all sides of pipe.

E. Place backfill materials in 6 inch layers and compact by jetting or tamping to a minimum compaction of 90 percent of original soil density.

F. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed.

G. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod, or paving to the proper level or the permanent grade, subcontractor, as part of the work under this Contract, shall make all adjustments without extra cost to the Owner.

3.16 PIPE TESTS

A. Notify Architect at least three (3) days in advance of testing.

B. Perform testing at his own expense

C. Center load piping with a small amount of backfill to prevent arching or slipping under pressure. No fitting or joint shall be covered.

D. For constant pressure mainlines, do not connect remote control valves, quick couplers or any other valve assembly until testing is satisfactorily complete.

E. Apply the following tests after weld plastic pipe joints have cured at least 24 hours.

1. Test live (constant pressure) and quick coupling valve lines hydrostatically at 125 PSI minimum. Lines shall be filled with water and pressure gauge connected to the pipe line. After lines have reached the 125 PSI, (use hydraulic pump or other safe method – do not use an air compressor) cut off the source of pressure. Lines will be approved if test pressure (with an allowable drop of 2 PSI) is maintained for two (2) hours. Should leaks develop during the test period, they shall be located and repaired and retested in the same method. The subcontractor shall make tests and repairs as necessary until test conditions are met.

2. Test remote control valve controlled lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

F. Remake faulty joints with new materials. Do not use cement or caulking to seal leaks.

3.17 SYSTEM ADJUSTMENT

A. Adjust pressure regulating modules to proper and similar pressure to provide optimum and efficient coverage.

B. Adjust sprinkler heads by fully opening the sprinkler furthest from control valve. Open manual adjustment of control valve slightly to obtain a 12-inch spray at sprinkler mentioned above. After this condition has been met, adjust all other sprinklers in the section for equal height sprays, regulating the control valve as required to maintain this condition. With a pressure gauge on the sprinkler first opened, adjust control valve to obtain the catalog-rated pressure for sprinkler installed. Adjust nozzle sizes and degree of arc and install pressure compensating screens as required to cover planting areas without overspray. Adjust all sprinklers to keep spray in confines of planted area. Minimize overspray onto paving.

C. Drip System Check

1. Immediately after installation, flush lateral line piping by removing automatic flush valve, figure 8 fitting, or by opening the shut-off flush valve.

2. Clean filter screens. Open filter flush valve for at least 10 seconds. Clean or replace clogged elements

3. Adjust pressure regulator to system design pressure.

4. Verify that emitters are producing specified water output. If not, replace emitters, check filter element, check pressure at emitters, and review system for clogs and leaks. Correct deficiencies.

D. Spray and Bubbler Check

1. Perform coverage test in the presence of Architect to establish that coverage of all planting areas is complete and adequate.

2. Correct deficiencies and repeat test until approved.

3.18 IRRIGATION AUDIT

A. Before planting and mulch are installed, Contractor must hire a third-party auditor to complete an irrigation audit.

B. A certified Landscape Irrigation Auditor shall conduct an irrigation audit. Landscape audits shall not be conducted by the person who designed or installed the landscape. An irrigation audit includes, but is not limited to inspection, system tune-up, system test with distribution uniformity or emission uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. The audit must be conducted by an Irrigation Association certified irrigation auditor. Irrigation audit shall be performed by auditor for final inspection and report shall be provided by auditor.

C. Contractor must create and install a reduced size laminated copy of the irrigation as built plan showing hydrozones information for each valve.

3.19 GUARANTEE

A. It shall be the responsibility of subcontractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one year following completion and acceptance of the job.

B. The subcontractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, any and all defective parts that may be found.

3.20 CLEANUP

A. When work of this section has been completed, and at such other times as may be directed, remove all trash, debris, surplus materials and equipment from the site.

END OF SECTION 32 8400

PLANTING
SECTION 32 9000

PART 1 - GENERAL

1.1 SUMMARY

A. Scope: Furnish all labor, equipment and materials necessary for soil sampling and testing, top soil placement, soil preparation, planting and maintenance period as shown and specified.

B. Related Sections:

1. 01 5639 Tree Protection;

2. 31 2000 Moving

3. 32 8400 Planting Irrigation;

1.2 REFERENCES

A. Standards Institute (American National ANSI) Publications:

1. ANSI Z60.1 - 1973, Nursery Stock

2. ANSI Z133.1 - 1972, Safety Requirements for Tree Pruning, Trimming, Repairing or Removal

B. American Joint Committee on Horticultural Nomenclature Publications:

1. Second Edition l972, Standardized Plant Names

1.3 SUBMITTALS

A. Physical Samples. Submit the following samples for approval together with information from the supplier that describes the material sources, break-down by particle size and fertility information (where applicable):

1. Import soil (if needed): 0.5 cubic foot bag.

2. Soil Amendment: 0.5 cubic foot bag.

3. Mulch: 0.5 cubic foot bag.

B. Soil Analysis: Contractor shall provide lab analysis and test results of 0.5 cubic foot sample of site soil. Acceptable laboratories include the following:

a. Waypoint Laboratories of Anaheim, California. 714.282.8777

b. Wallace Laboratories of El Segundo, California. 310-615-0116

C. Informational Submittals

1. Soil Amendments. Prior to planting, submit copies of all trucking or packaging tags to Landscape Architect for all soil amendment, fertilizer and other additives so that quantities may be verified.

2. Plant Orders. Copy of orders from Contractor to supplier for plant materials.

3. Provide four copies each of Manufacturer's standard catalog cut sheets, shop drawings, performance specifications, and manufacturer's installation instructions for Root Barriers, tree stakes, tree ties, and Steel Header for crushed rock paving

1.4 QUALITY ASSURANCE

A. All work to be in accordance with the latest Safety Orders of the Division of Industrial Safety, O.S.H.A., and applicable State and local laws or regulations.

B. Grading: Contractor shall be responsible for maintaining finish grades in all planting areas and for executing any fine grading as may be necessary or incidental to all planting operations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. In order to receive plant materials in a timely fashion, Contractor shall order plant materials within ten (10) days of the Notice to Proceed and provide evidence of same as indicated in Item 1.3, above. Any potential delays in delivery or requests for substitution shall be brought to the attention of the Owner's Representative immediately.

B. Storage:

1. Plants not installed on the day of arrival at the site shall be stored and protected as follows:

a. Outside storage shall be shaded and protected from the sun and wind.

b. Plants stored on the project shall be protected from drying out at all times by covering the balls or roots with moist sawdust, wood chips, shredded bark, peat moss or other similar mulching material.

c. Plants, including those in containers, shall be kept in a moist condition until planted, by watering.

d. Lime and fertilizer shall not be stored with any landscape materials.

e. Soil sterilant shall not be stored with any other landscape materials.

f. Herbicide shall not be stored with any other landscape materials.

2. Storage of materials shall be only in areas designated or as approved by the Owner.

C. Handling

1. Care shall be taken to avoid damaging plants being moved from the nursery or storage area to the planting site. Plants shall be protected from drying out. Plants shall not be handled by the trunk or stem. Plants shall be protected from freezing or drying out by a covering of burlap, tarpaulin,

mulching material during transportation from the heeling-in bed to the planting site. Damaged plants shall be rejected and shall be removed from the site.

1.6 ENVIRONMENTAL CONDITIONS

1. Planting of trees, shrubs, vines and groundcovers shall be done only during periods which are normal for such work as determined by the season, weather conditions and accepted practices.

2. Install protective covering to limit soil compaction (if project construction of project occurs during rainy season).

PART 2 - PRODUCTS

2.1 IMPORT SOIL

A. The import soil, if necessary, shall sustain healthy plant life, without admixture of subsoil, free from rocks larger than 1-inch size, sticks, seeds and other foreign matter. Imported soil shall be USDA classification of sandy loam, sandy clay loam or loam with maximum gravel content no more than 15 percent, rock content no more than 5 percent and maximum organic content no more than 15 percent.

1. The soil chemistry suitability considerations:

a. Salinity: Saturation Extract Conductivity (ECe) less than 3.0 ds/m @ 25˚ C

b. Sodium: Sodium Adsorption Ration (SAR) less than 6.0

c. Boron: Saturation Extract Concentration less than 1.0 ppm

d. Reaction: PH of Saturated Paste: 5.5-7.5 without high lime content

2. Submittal of import soil sample shall include a soil fertility test and amendment/fertilizer recommendations in the same manner and destination as shown on the soil test results described in Part 1.3 Submittals.

2.2 SOIL AMENDMENT

A. Soil amendment, upon approval of landscape architect, shall follow the recommendations of the rate indicated in Part weed free. It shall be derived from one or more locally sourced organic materials such as: food waste or urban plant debris, agricultural crop residue or herbivore animal manures with a preference for urban plant debris and food waste. It shall not contain mixed solid waste. The product shall contain no substances toxic to plants, will possess no objectionable odors and shall not resemble the feedstock (the original material from which it was derived). Compost shall be tested through the US Composting Councils USCC Seal of Testing Assurance Program (STA). A lab analysis shall be performed by a STA certified laboratory using the test methods used in the Seal of Testing Assurance program found in the Test Methods for Examination of Compost and Composting Manual (TMECC). Verifying current participation in the STA program can be confirmed by logging onto the USCC website at www.compostingcouncil.com. The compost lab analysis shall be submitted as part of the “Compost Technical Data Sheet” before delivery of compost. Physical properties of compost shall meet the following characteristics

1. Physical properties of compost:

a. Particle size: A minimum of 90% of the material by dry weight shall pass through a 1/2-inch screen or smaller.

b. Color: Dark brown to black.

c. Odor: No odor, soil-like, musty, and moldy are acceptable. Sour, ammonia-like, or putrid is unacceptable.

d. Particle characterization: Identifiable wood pieces are acceptable, but the balance of material should be soil-like without recognizable grass or leaves.

e. Organic matter content: 35% minimum based on dry weight and determined by ash method. Minimum 250 lbs organic matter per cubic yard of compost

f. Carbon to Nitrogen ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized.

g. pH shall be in the range of 6.5 to 8.5.

h. Soluble salt concentration may vary but must be reported: 2.5 dS (mmhos/cm) or less is the preferred salt content.

i. Moisture contents shall be between 35% and 60%.

j. Contaminants: The compost shall be free of contaminants such as glass, metal and visible plastic.

k. Stability: Based on Carbon Dioxide evolution rate, it should be less than 8 Mg CO2-C/g OM per day.

l. Maturity indicator: Must pass maturity tests or demonstrate its ability to enhance plant growth.

2.3 MULCH

A. Mulch shall be an interlocking mix of wood particles in varying sizes from two-inches and smaller derived from tree and shrub trimmings aged for several weeks. No Eucalyptus sources are permitted.

B. Mulch shall be recycled from local, organic materials such as, tree trimmings, plant or clean wood waste OR provided by on-site chipping OR other recycled mulch materials including peach pits.

C. It cannot include forest industry products and byproducts such as redwood bark, peat moss, or gorilla hair, recycled tires or other inorganic materials.

D. Light in color. Black mulches or grape seed pumice mulch is not allowed

E. Mulch for planting areas less than eight-percent (1 in 12 slope) shall be fir or redwood chips, 3/4 inch to one (1) inch size. "Walk on Bark" or approved equal from Sequoia Forest Industries Co., depth as specified on Drawings and elsewhere in these Specifications.

2.4 STAKING AND TREE PROTECTOR MATERIALS

A. Stakes: Peeled, smooth, lodgepole pine, factory treated, (and/or metal pipe), diameter and lengths as required on Drawings.

B. 24" x 1" hard rubber ties, attached to stakes as shown on Drawings.

2.5 HEADER BOARDS

A. Wood Headerboards, benderboards and stakes shall be as noted on Drawings. Unless noted otherwise on the drawings, wood shall be pressure-treated Douglas fir.

B. Nails shall be hot-dipped galvanized steel.

2.6 PLANT MATERIALS

A. The plants listed on the plans have been selected to comply with recommendations and requirements of the ReScape California Rated Scorecard. Plants have been selected to avoid invasive species and for low water use, diversity of species, appropriate spacing to reach mature size without shearing, and percent native species. Plants have also been carefully grouped into hydrazones. No substitutions will be allowed without prior written approval of the Landscape Architect.

B. All plant material must be neonicotinoid free.

C. Quality and size shall conform to best nursery practice. Nursery grown stock only shall be used. Secure Landscape Architect's approval for quality and size of all plant materials.

D. Measurements shall be as shown; where not shown, shall be of uniform and standard size—neither over-grown and root bound nor too recently canned so that the root system is not thoroughly established throughout the can. Pruning shall not be done prior to delivery except by approval.

E. Contractor shall be responsible for inspection of plant materials required by the City, County or State at any time before and during progress of the work. Rejected plants shall be removed from the site immediately.

F. Contractor shall adequately protect plants from sun and wind, on site and in transit.

G. Plant label shall identify each species and variety. Substitutions are not desired; requests for substitution shall be made at least 30 days prior to planting.

H. Quantities necessary to complete the work as shown on the Drawings shall be furnished. Quantities shown on Plant List are approximate only and shown for convenience of the Contractor.

2.7 PROTECTING COVERING FOR SOIL COMPACTION

A. Wood planks (minimum 3/4-inch plywood) or 6 inches of coarse organic mulch shall be placed on paths in planting areas for construction crews to use when it is not possible to wait until the soil dries before beginning construction. Protective materials should be reused or recycled when they are no longer needed.

PART 3 - EXECUTION

3.1 IMPORT SOIL PLACEMENT (if necessary)

A. Following completion of rough grading, when planting areas are free from weeds and the heavy traffic associated with the construction of building and pavements, Contractor shall:

1. Rip and scarify subgrade in all planting areas to a depth of (six) 6 inches. Extreme care shall be taken to work around planting marked to be saved.

2. Remove from soil surface all miscellaneous debris, including items from construction such as gravel, wire, stucco etc., and rocks over two (2) inches in size. All aggregate base rock, concrete pieces or asphalt must be removed from plant areas that are greater than 12-inches from the inside face of all curbs. Leave nothing except scarified native soil.

3. Import soil shall be spread in all planting areas as noted on the plans in sufficient depth that when broken down, leveled, and settled, the resultant thickness shall [not be less than six (6) inches.]/ [within one-inch of the top of curb at the edge of the plant island. The finished profile of the soil, AFTER SETTLEMENT, shall have a crown at the center of the island and pitch to the edges at a slope of no less than 3-percent (3/8-inch per foot).

4. Soil and level of planting areas shall be one (1) inch below top of headerboards, pavements, walks and curbs. Particular attention shall be given to the installation of surface drainage swales.

3.2 TREE AND SHRUB PLANTING

A. Finished surfaces in planting areas shall be smooth, true to slopes and grades. Areas to be planted shall be free of weeds, rocks, debris and heavy construction traffic.

B. Place trees and shrubs in designated locations and secure Landscape Architect's approval before excavating pits, making such adjustments as may be required.

C. Dig pits circular in outline with vertical sides as detailed on Drawings. After pits are dug, break sides to open wall of pit for root penetration.

D. Install perforated pipe watering tubes as shown in the plans and details.

E. Backfill in planting holes shall be a mixture of loose soil in a finely divided condition free from rocks, clods or lumpy material, thoroughly mixed with an equal volume of soil amendment.

F. Fertilize trees and shrubs with per requirements in Section 2.03 and applied at the rate recommended by manufacturer.

G. Plants shall be set in backfill mixture, in flat bottom holes, to such depth that the top of the plant ball will be two (2) inches above finish grade.

H. Backfill shall be watered until the backfill is saturated to the full depth of the hole.

I. Build basins around plants except trees in paving areas. Basins shall be formed with level bottoms and walls as detailed.

J. Mulch basins with wood chips, depth as specified in Drawings, and thoroughly water.

K. All trees in groundcover and shrub areas shall be staked. Stakes shall be driven alongside rootball. Tie trees as detailed.

L. All trees in paved areas shall be installed as shown in the plans and details.

M. Place three (3) inch mulch in all shrub areas between plants.

N. Cut leader stakes so that top of stakes do not wear on trees. Alternatively, with permission of Landscape Architect, leader stakes may be removed.

3.3 GROUNDCOVER PLANTING

A. All Planting Areas - Areas to be planted shall be free of weeds, rocks, debris and heavy construction traffic. After completion of finish grading, disc or rototill a minimum of twelve (12) inches in depth and cultivate to a loose friable condition the top layer of soil to a minimum of six (6) inches, free of clods.

B. Unless indicated otherwise in the soil analysis results attached to these Specifications, spread soil amendment at the rate of 6-cubic yards per 1000 square feet (2-inch layer) and mix uniformly into the top six-inches of soil. Rake to a smooth, even surface. Finished surfaces shall be smooth, true to slopes and grades.

C. Plant groundcover plants in evenly spaced rows with staggered plant spacing. Water immediately after planting and in sufficient quantity to wet the soil around the plants to a depth of eight (8) inches.

D. Place three (3) inch mulch in all groundcover and shrub areas between plants.

E. Fertilize at the rate specified in Section 2.0 - Products.

F. After the plants have been thoroughly watered, allow the soil to adequately dry to provide a workable surface. Rake the area to provide a uniform, even surface.

3.4 LANDSCAPE EDGING INSTALLATION

A. Install per manufacturer's instructions and as directed in the field.

3.5 PRELIMINARY INSPECTION AND APPROVAL

A. Contractor shall request a preliminary inspection of planting work upon completion of all planting. Inspection and approval of the completed work shall establish the beginning of the maintenance period. No partial approvals will be given.

3.6 IRRIGATION AUDIT

A. Before planting and mulch are installed contractor must hire a third-party auditor to complete an irrigation audit. See Irrigation specifications for additional information.

3.7 PRELIMINARY INSPECTION AND APPROVAL

A. Contractor shall request a preliminary inspection of planting work upon completion of all planting. Inspection and approval of the completed work shall establish the beginning of the maintenance period. No partial approvals will be given. 3.06 IRRIGATION AUDIT

B. Before planting and mulch are installed contractor must hire a third-party auditor to complete an irrigation audit. See Irrigation specifications for additional information.

3.8 MAINTENANCE

A. Maintenance shall be as specified below; shall immediately follow, coincide with and be continuous with and during the planting operations; and shall continue for ninety (90) calendar days after all planting is complete and accepted.

1. Trees and Shrubs:

   a. Maintain as specified after acceptance in a vigorous, thriving condition by watering, pruning, cultivating, spraying and other necessary operations.

   b. Protect from damage by erosion or trespass and provide proper safeguards.

   c. Replace unhealthy, damaged or dead trees and shrubs promptly with material as specified.

2. Groundcover:

   a. Maintain constant moisture to a depth of eight (8) inches.

   b. Keep planting areas free of undesirable weeds and grasses by hand pulling. Maintain by watering, weeding, replanting, reseeding, mowing, fertilizing, rolling and top dressing, and other necessary operations to establish an even, thick and vigorous stand of grass and groundcover.

   c. Fertilize groundcover areas with commercial fertilizer at the rate specified in Section 2.0 - Products. Water thoroughly into soil.

   d. Protect areas against all damage, including erosion and trespass, and provide safeguards.

   e. Replant damaged areas and plants promptly as specified.

   f. Remove weeds from crushed rock areas.

3. Mulch:

   a. Mulch shall be reapplied every year.

3.9 INTEGRATED PEST MANAGEMENT

A. Contractor shall utilize integrated pest management (IPM) practices during installation and maintenance to control pests and disease in the landscape. IPM uses cultural, mechanical, physical, and biological control methods before using pesticides. Chemical controls are applied only when monitoring indicates that preventative and non-chemical methods are not keeping pests below acceptable levels. When pesticides are required, the least toxic and the least persistent pesticide that will provide adequate pest control is applied. Refer to BFL Guidelines and Maintenance Specification for more information.

B. Controls:

1. Cultural/Mechanical/physical methods will be used as the first choice in weed management.

a. Monitor planting areas frequently to identify and eradicate weeds early in the growth stage prior to their setting seed.

b. Cut or pull weeds using hand-operated equipment where possible.

c. Mulches shall always be maintained over soil surface that is not covered by vegetation.

C. If allowed on this project, Contractor shall apply all chemicals in a safe manner and according to label instructions and Agency, State and Federal requirements. A California Chemical Applicators license is required by the Contractor for chemical applications. The Contractor shall mix and apply chemicals to protect against accidental spills and drift to non-target areas, and to ensure safety of the applicator. Any spilled chemicals, as well as contaminated soil, water, and/or landscape materials must be removed from the Project and disposed of in accordance with the Agency requirements. The Contractor shall maintain applicator's licenses and records of applications as required by the State.

D. A Chemical Work Report shall be completed for each chemical application. The Contractor is responsible for submitting chemical usage reports to the County Agricultural Department.

1. Contractor shall maintain records of all pest management activities. Each record shall include the following information:

a. target pest;

b. type and quantity of pesticide used;

c. site of the pesticide application;

d. date the pesticide was used;

e. name of the pesticide applicator;

f. application equipment used;

g. prevention and other non-chemical methods of control used.

2. Contractor shall submit the pest management record to Owner on monthly basis.

E. Herbicides:

1. When cultural, mechanical, physical and biological controls have provided inadequate pest control; the Contractor may select and apply an appropriate least-toxic herbicide as a last resort. Only OMRI- or Our Water Our World (OWOW)- listed herbicides may be used without written permission of the Owner/Manager. Herbicides not on the OMRI or OWOW lists, including Roundup, may only be used with the written permission of the Owner/Manager.

2. Approved herbicides include:

a. Fatty acid potassium salts (herbicidal soaps e.g. Safer's Superfast Weed and Grass Killer® Dr. Bronner's Peppermint Anti-Bacterial Soap)

b. Acetic and citric acids (e.g. Nature's Glory Weed and Grass Killer RTU®)

c. Clove, citrus, mint and thyme oil (e.g. Matran II®, Xpress®)

d. Corn gluten

3. Prohibited herbicides that may not be used because they have been identified as ground water contaminants are (trade names in parentheses):

a. Atrazine (Aatrex)

b. Simazine (Princep)

c. Bromacil (Hyvar, Krovar)

d. Prometon (Pramitol)

e. Bentazon (Basagran)

f. Norflurazon (Solicam, Predict, Zorial)

4. Restricted herbicides that may not be used because they have been identified as a compost contaminant are:

a. Picloram

b. Clopyralid

3.10 CLEAN UP AND FINAL INSPECTION

A. Final inspection for approval and acceptance shall be made at the conclusion of the maintenance period. Written notice requesting such inspection shall be submitted at least ten (10) days before anticipated date.

B. Prior to being considered ready for inspection, Contractor shall have made all corrections and repairs and have the job cleared of all weeds and debris and presented in a neat, orderly fashion.

3.11 GUARANTEE AND REPLACEMENT

A. Guarantee all shrubs and ground cover in a healthy, thriving condition until the end of the maintenance period or until active growth is evident.

B. Guarantee all trees in a healthy, thriving condition until the end of the maintenance period or until active growth is evident or for one year, whichever is longer.

C. Replace all dead plants and plants not in a vigorous condition as soon as directed by Landscape Architect. Plants used for replacement must be of the same kind and size as specified, planted and maintained as outlined above. All replacement of plants shall be done before the final acceptance. All replacement of plants shall be at the sole expense of the Contractor.

3.12 DISPOSAL

A. Recycle all waste per Construction Waste Management and Disposal 17419. Reuse or return unused items such as palettes, flats and pots. All plant debris (green waste) shall be separated from other refuse and taken to a facility where it will be recycled i.e., to produce compost or mulch.

END OF SECTION 32 9000