

PROJECT MANUAL

BUILDING AND SITE IMPROVEMENTS FOR: WESTEND NAVIGATION CENTER

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FONTANA, CALIFORNIA 92337

DEVELOPED FOR:
CITY OF FONTANA

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PREPARED BY:
BORDERS ARCHITECTS

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BJSCE

BJSCE

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DISTURBANCE OF LESS THAN ONE ACRE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Control runoff and pollutants from the site during construction activities.
2. Preparation, implementation, and maintenance of construction BMPs.

B. Related Requirements:

1. Division 01 – General Requirements.

1.2 ACRONYMS AND DEFINITIONS

BMP	Best Management Practice.
CAN	Corrective Action Notice.
CASQA	California Stormwater Quality Association.
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities.
DWQ	Division of Water Quality.
NPDES	National Pollutant Discharge Elimination System.
SWPPP	Storm Water Pollution Prevention.
SWRCB	State Water Resources Control Board.
WPCD	Water Pollution Control Drawing.

1.3 REQUIREMENTS

A. CONTRACTOR shall:

1. Implement, install and maintain BMPs. Ensure that BMPs are designed to protect all exposed portions of the site, including:
 - a. Erosion, Sediment, Tracking, and Wind Erosion Control BMPs.
 - b. Preservation of natural features, vegetation, soil, and buffers around surface waters.
 - c. Drainage swales or lined ditches to control stormwater flow.
 - d. Mulching or hydroseeding to stabilize disturbed soils.
 - e. Erosion control to protect slopes.
 - f. Protection of storm drain inlets (gravel bags or catch basin inserts).
 - g. Perimeter sediment control (perimeter silt fence, fiber rolls).
 - h. Sediment trap or sediment basin to retain sediment on site.
 - i. Stabilized construction exits.

2. Implement Good Site Management "Housekeeping" BMPs to manage construction equipment, materials, non-stormwater discharges, and wastes. BMPs that should be considered for implementation as appropriate for each project include, but are not limited to, the following:
 - a. Dewatering activities.
 - b. Material handling and waste management.
 - c. Building materials stockpile management.
 - d. Management of washout areas (concrete, paints, stucco, etc.).
 - e. Control of vehicle/equipment fueling to staging area.
 - f. Vehicle and equipment cleaning performed off site.
 - g. Spill prevention and control.
3. Incorporate BMP activities into the Project Schedule. Schedule construction activity during dry weather, when possible.
4. Inform CONTRACTOR and Subcontractors personnel on the BMP procedures to prevent pollutants from entering the storm drain system, before the start of construction activities. Keep personnel informed of the BMP implementation process and of changes to the procedures. Provide record to OAR of stormwater topics discussed.
5. Conduct site inspections, at least weekly, of pollution prevention controls and repair or provide additional BMPs as required.
6. Pay fines and penalties from regulatory agencies against OWNER due to CONTRACTOR'S non-compliance with stormwater regulations. OWNER shall recover costs of fines and penalties by appropriate OWNER assessment. Review of the BMPs by OAR shall not relieve CONTRACTOR from liabilities arising from non-compliance of storm water pollution regulations.
- B. Project Inspector and OEHS Inspector will conduct inspection and examination of site storm water regulation compliance.
- C. At substantial completion, conduct post-construction BMP training of OWNER personnel and submit any post-construction BMP maintenance information.

1.4 SUBMITTALS

- A. BMP material quality, grade, type as specified in the CASCA BMP Handbook.
- B. Water Pollution Control Drawing (WPCD).
- C. BMP Implementation Schedule.

1.5 QUALITY ASSURANCE

- A. Comply with the following regulatory requirements:
 1. National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Lands Disturbance Activities; ORDER NO. 2022-0057-DWQ; NPDES NO. CAS000002, adopted by the State Water Resources Control Board.

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2. Regulations of the California Environmental Protection Agency, State Water Resources Control Board; Los Angeles Regional Water Control Board, and local ordinances.
3. CASQA Stormwater Best Management Practice Handbook for Construction Activity (BMP Handbook) current adopted edition.
4. Local jurisdiction stormwater management (SWPPP) and erosion control ordinances.

1.6 STORAGE AND PROTECTION

- A. Provide proper storage of materials and equipment to prevent rain and storm water runoff to come in contact with pollutants, such as soil stabilizers, paint or fluids from vehicles.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide quality, grade and type of materials as specified in CASQA Stormwater Best Management Practice, Handbook.

PART 3 – EXECUTION

3.1 IMPLEMENTATION

- A. Install perimeter controls prior to starting Work at the Project site.
- B. Contain on-site stormwater on the Project site. Provide storm drain inlet protection. Do not drain on-site water directly into the storm drain without proper BMP in place.
- C. Prevent pollutant discharges into the storm drain system. Prevent stormwater from coming into contact with pollutants, such as sediment, material spills, or leakage from storage tanks, waste containers or transfer areas. In the event contamination is found CONTRACTOR shall immediately notify OAR who will contact the OEHS.
- D. Protect exposed dirt, such as stockpiles, landscaping areas, and hillsides.
- E. Properly manage non-stormwater discharges such as ground water, broken utility lines and fire hydrant testing.
- F. Adjust BMP's locations and layouts in accordance to construction progress to assure compliance to regulations.
- G. Conduct inspections of pollution prevention controls and provide Site Monitoring Report to OAR immediately if pollutants are discharged into the site runoff. CONTRACTOR shall remediate contaminated water.
- H. Upon Substantial Completion: Maintain and leave post-construction stormwater pollution prevention controls in place and remove those that are not needed as determined by the OAR.

3.2 CLOSEOUT

- A. Verify the following prior to Substantial Completion:
 1. Final stabilization of site has been demonstrated.

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2. There is no potential for construction related stormwater pollutants to be discharged into site runoff.
3. Construction related equipment and temporary BMP have been removed from site.
4. Rubbish, debris, and waste materials have been removed and legally disposed of off the Project site.
5. OEHS CAN items have been closed and signed-off.
6. Post-Construction BMP Maintenance Plan has been established.

END OF SECTION 017418

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SECTION 024113 - SITE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following

- 1. Demolition and removal of site improvements and all other related contiguous improvements as required. Refer to Contract Drawings for items and location.
- 2. Demolition, dismantling, cutting and alterations as indicated, specified, and required for completion of the Contract; for new construction, modernization and rehabilitation projects, as applicable. Includes items such as the following:
 - 1. Protecting existing work to remain.
 - 2. Salvageable items to be retained.
 - 3. Cleaning soiled materials that are to remain.
 - 4. Disconnecting and capping utilities.
 - 5. Removing debris and equipment.
 - 6. Removal of items indicated on drawings.

- B. Demolition of Existing Building Foundations

- 1. Demolition and removal of all existing building foundations, footings, slabs, retaining walls, etc. shall be carried in a careful and orderly manner, and according to all applicable codes and regulations for demolition of structures, safety of adjacent structures, dust control and disposal of materials.
- 2. Sprinkle Work with water to minimize dust. Provide hoses and water connections for that purpose.

- D. Demolition and Removal of Pavements

- 1. Markup all existing utilities on site.
- 2. Sawcut all Concrete Pavements, as indicated on Drawings.
- 3. Remove all indicated pavements, walkways, curb and gutter, concrete ditches, landscape areas, etc.
- 4. Protect all manhole and valve covers, lids, vaults and other site fixtures, marked to remain.

- E. Related Sections: The following Sections contain requirements that relate to this Section:

- 1. Sections for "Photographic Documentation", "Special Environmental Procedures", "Temporary Facilities", "Tree and Plant Protection", "Cutting and Patching" as applicable.
- 2. Division 31 for "Site Clearing" and "Earthwork" as applicable.
- 3. Asbestos-Containing Materials (ACMs) and/or other Hazardous Materials Report.

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1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the owners' property.
- B. Asbestos-Containing Materials (ACMs) and other hazardous materials: As identified in the Report, remove asbestos-containing materials (ASMs) and other identified hazardous materials.
- C. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated or as directed by Owner.
- E. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect and Owner, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Historical items indicated remain the Owner's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the Owner.
- C. Historical items, archeological or paleontological findings, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, commemorative benches, antiques, and other items of interest or value to the Owner, which may be encountered during demolition, remain the Owner's property. If such items are encountered, all project operations shall cease in the area of discovery immediately. The Owner shall secure the services of an archeological consultant to assess the resources and determine a course of action.
 - 1. Cooperate with Owner's archaeological consultant or historical adviser. Mitigated Negative Declaration (MND) for related requirements.
- D. Human Remains: In the event that human remains are discovered, there shall be no disposition of such human remains, other than in accordance with the procedures and requirements set forth in the California Health and Safety Code and Public Resources Code. All project operations shall cease in the area of discovery immediately. In conjunction with the Owner, the Code provisions require immediate notification of the County Coroner and the Native American Heritage Commission.
 - 1. Cooperate with the County Coroner, the Native American Heritage Commission representative and other related officials. Refer to the Mitigated Negative Declaration (MND) for related requirements.

1.5 SUBMITTALS

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- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Proposed signage.
- E. Schedule of demolition activities indicating the following:
 - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 - 2. Dates for shutoff, capping, and continuation of utility services.
- F. Inventory of items to be removed and salvaged.
- G. Inventory of items to be removed by Owner, if any.
- H. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.
- I. Record drawings at Project closeout according to Section "Project Record Documents".
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- J. Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA & SCAQMD notification regulations before starting demolition. Observe applicable Best Practices and implementation of the Storm Water Pollution Prevention Plan (SWPPP). Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 01 Section "Project Meetings."

1.7 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical. Bidders shall make themselves fully aware of the existing conditions within the site. Scope limits scheduled for demolition and items/areas to remain protected in supplement to the Bid Drawings and Documents.
- B. If conditions are encountered that vary from those indicated on plan, notify the Architect for instructions prior to proceeding.
- C. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.

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2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from owner.
- D. Contractor to obtain all necessary encroachment and excavation permits from the local jurisdiction of authority for demolition of existing improvements in public right-of-way.

1.8 SCHEDULING

- A. Arrange demolition schedule so as not to violate city construction ordinances.
- B. Arrange demolition schedule with Owner.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork". Refer to the Geotechnical Investigation Report, dated **July 19, 2019** prepared by **Geocon West, Inc.**, for site soil requirements
 1. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped. Test lines as required.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey existing conditions of the improvements such as light standards and trees to determine the best method(s) for removal so as not to cause potential damage to persons and property during the course of removal.
- E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
 1. Do not interrupt existing utilities serving occupied or operating facilities on or off the property, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.

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- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
- C. Utility Requirements: Refer to Division 33 Sections and Contract Drawings, for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
- D. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
- E. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 1. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

3.4 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be done by experienced workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Take care not to damage concrete that is intended to remain.
- B. Extent of cutting of concrete shall be as indicated on drawings and in accordance with standard plans for public works construction plan no. 132-3. Replace concrete that is removed in excess of amount indicated or required.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities and take necessary measures to protect them from damage.
- D. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Architect.

3.5 EXPLOSIVES

- A. Explosives: Use of explosives will not be permitted.

3.6 POLLUTION CONTROLS

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- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.7 DEMOLITION

- A. Demolition: Demolish improvements completely and remove from the site. Use methods required to complete Work within limitations of governing regulations and as follows:
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction, as follows:
 - 1. Completely remove below-grade construction, including foundation walls and footings unless noted otherwise on the drawings.
 - 2. Break up and remove below-grade concrete slabs, unless indicated to remain.
- C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to requirements specified in Division 31 Section "Earthwork."
- D. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose them.

END OF SECTION 024113

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 2. Division 1 Section "Construction Waste Management" for disposal of demolished materials.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for occupants affected by selective demolition operations.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 6. Means of protection for items to remain and items in path of waste removal from building.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

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1.4 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.5 PROJECT CONDITIONS

- A. Notify Owner's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished and is scope of Work.
- C. Storage or sale of removed items or materials on-site is not permitted.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner's Representative.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

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3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 Section "Construction Waste Management."
- B. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Owner's Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Division 1 Section "Construction Waste Management."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

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3.6 CLEANING

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

END OF SECTION 024119

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SECTION 033000 - CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at 11109 Jasmine St, Fontana, CA 92337.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab

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flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- E. Samples: For vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Floor and slab treatments.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Vapor retarders.
 - 10. Semirigid joint filler.
 - 11. Joint-filler strips.
 - 12. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Minutes of preinstallation conference.

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1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

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- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

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- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- H. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

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2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type II gray.
 - 2. Fly Ash: ASTM C 618, Class F.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C 330/C 330M, 3/4-inch nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260/C 260M.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- G. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- C. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
- D. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

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2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.8 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

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2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Slag Cement: 50 percent.
 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 5. Silica Fume: 10 percent.
 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Normal-weight concrete.

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1. Minimum Compressive Strength: 5000 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 8 inches for concrete with verified slump of 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 8 inches for concrete with verified slump of 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

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

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

- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

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PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

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3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

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3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

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1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

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- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces [**not exposed to public view**] **<Insert locations>**.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces [**exposed to public view,**] [**to receive a rubbed finish,**] [**or to be covered with a coating or covering material applied directly to concrete**] **<Insert locations>**.

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- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces indicated to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

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1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
 3. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.
- H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:
1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.

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2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. 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.

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- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

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3.13 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than three days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least [one] [six] month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before

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- proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

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

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- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

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- b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 - 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

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SECTION 051200 - STRUCTURAL STEEL FRAMING

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. Structural steel.
- 2. Prefabricated building columns.
- 3. Field-installed shear connectors.
- 4. Grout.

- B. Related Requirements:

- 1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
- 2. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
- 3. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
 - 2. Welded built-up members with plates thicker than 2 inches.
 - 3. Column base plates thicker than 2 inches.
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

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- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 5. Identify members and connections of the Seismic-Load-Resisting System.
 - 6. Indicate locations and dimensions of protected zones.
 - 7. Identify demand critical welds.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.

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- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Shop primers.
 - 3. Nonshrink grout.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.

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3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 3125/F 3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Moment Connections: Type FR, fully restrained.
- B. Construction: Shear wall system.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M ASTM A 572/A 572M, Grade 50.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.
 1. Finish: Hot-dip zinc coating.
- C. Headed Anchor Rods: ASTM F 1554, Grade 36 ASTM F 1554, Grade 55, weldable straight.
 1. Nuts: ASTM A 563 hex carbon steel.
 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- D. Threaded Rods: ASTM A 36/A 36M.
 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

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- E. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- F. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.4 PRIMER

- A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.5 GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

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1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

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1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize items as shown on Drawings.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

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3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

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1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

- A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

3.7 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

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1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 051200

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SECTION 053100 - STEEL DECKING

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. Roof deck.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 2. Section 099113 "Exterior Painting" for repair painting of primed deck and finish painting of deck.
 - 3. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.

- B. Shop Drawings:

- 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Product Certificates: For each type of steel deck.

- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

- 1. Power-actuated mechanical fasteners.

- D. Evaluation Reports: For steel deck, from ICC-ES.

- E. Field quality-control reports.

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1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Verco Decking, Inc., a Nucor Company; B Roof Deck or comparable product by one of the following:
 - 1. ASC Profiles, Inc.
 - 2. Canam Steel Corporation; Canam Group, Inc.
 - 3. Epic Metals Corporation.
 - 4. Marlyn Steel Decks, Inc.
 - 5. New Millennium Building Systems, LLC.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), G90 zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: As indicated.
 - 4. Design Uncoated-Steel Thickness: As indicated.
 - 5. Span Condition: As indicated.
 - 6. Side Laps: Overlapped or interlocking seam at Contractor's option.

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2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- H. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions 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. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

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- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 3/4 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of four welds per deck unit at each support. Space welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 24 inches, and as follows:
 - 1. Mechanically clinch or button punch.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

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3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 053100

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SECTION 054000 - COLD-FORMED METAL FRAMING

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. Load-bearing wall framing.
- 2. Ceiling joist framing.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
- 2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
- 3. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

1.4 ACTION SUBMITTALS

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

- B. Shop Drawings:

- 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
- 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

- B. Welding certificates.

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- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Miscellaneous structural clips and accessories.
- E. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. 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.
- C. 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, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MBA Metal Framing; Structural Studs & Track or comparable product by one of the following:
 - 1. Clark Dietrich
 - 2. SCAFCO
 - 3. Steel-Con

2.2 PERFORMANCE REQUIREMENTS

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

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1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

- B. 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.

2.3 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, A60, AZ50, or GF30.

2.4 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: As indicated on Drawings.
2. Flange Width: As indicated on Drawings.

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

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Flange Width: As indicated on Drawings.

- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Flange Width: As indicated on Drawings.

2.5 CEILING JOIST FRAMING

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

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Flange Width: As indicated on Drawings.

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2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Bracing, bridging, and solid blocking.
 - 2. Web stiffeners.
 - 3. Anchor clips.
 - 4. End clips.
 - 5. Foundation clips.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. 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 AC01 as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: Torque-controlled expansion anchor or adhesive anchor.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- B. 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.
- C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- D. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780/A 780M or SSPC-Paint 20.
- B. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

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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 PREPARATION

- A. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- B. 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/D1.3M 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.
- C. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- D. 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.
- E. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- F. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- G. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

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3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As indicated on Drawings.
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: As indicated on Drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
 - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically as indicated on Drawings. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
 - 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.

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3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 1. Joist Spacing: As indicated on Drawings.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
 1. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 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.

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3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel framing and supports for overhead doors.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Miscellaneous framing supports.
 - 4. Miscellaneous steel trim.
 - 5. Metal bollards.
 - 6. Abrasive metal nosings.
 - 7. Wired mesh screen.
- B. Related Sections include the following:
 - 1. Division 9 Section "Painting" for field painting.
 - 2. Division 7 Section "Metal Roof Panels" for trash enclosure roofing.

1.2 DEFINITIONS

- A. Exterior: Defined as the following:
 - 1. Areas, locations, and surfaces that are unprotected, or exposed to environmental elements.
 - 2. Areas, locations and surfaces within uncontrolled environments.
 - 3. Areas, locations and surfaces of unconditioned spaces, including belowgrade/underground, partially-exposed, or "covered" parking areas.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: For items specified.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.

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1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Samples for Verification: For each type and finish of extruded nosing.

1.5 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal fabrications that fails in materials or workmanship within specified warranty period.
 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Extruded Abrasive Metal Nosings: Subject to compliance with requirements, provide either the product by named manufacturer or an equal product by one of the other manufacturers specified.
 1. Type 24 by American Safety Tread Co., Inc. (Basis of Design)
 2. Type 24 Spectra by Wooster Products Inc.
 3. Or equal.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

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2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 painting Sections.
- C. Surface Preparation: SSPC-SP2 Hand Tool Clean and /or SSPC-SP3 Power Tool Clean.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

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- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

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2.8 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.9 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Galvanize exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated.

2.10 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Fill pipe with concrete and finish with dome top.
 - 2. Pipe diameter: As indicated on Drawings.
- B. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

2.11 ABRASIVE METAL NOSINGS

- A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
 - 1. Provide anti-slip strip of contrasting color 2 inches wide, parallel to and not more than 1 inch from the front nose of each step.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply clear lacquer to concealed bottoms, sides, and edges of extruded units set into concrete.

2.12 WIRED MESH SCREEN

- A. Screen in-infill at trash enclosure: As indicated on Drawings.

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2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.
 - 2. ASTM A 153, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- D. Field Finish: Comply with Division 9 Section "Painting" for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

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4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch bolts at each bollard, unless otherwise indicated.
 1. Embed anchor bolts at least 4 inches in concrete.
- B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 INSTALLING NOSINGS

- A. Center nosings on tread widths.
- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section "Joint Sealants" to provide a watertight installation.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

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END OF SECTION 055000

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SECTION 055134 - ALUMINUM LADDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Vertical ladders for roof access.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product.
- B. Qualification Data: Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications and resources.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
- B. Record of successful in-service performance.
- C. Sufficient production capacity to produce required units.
- D. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum ladders that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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- A. Aluminum Ladders: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. O'Keeffe's Inc. (Basis of Design)
 - 2. Royalite.
 - 3. Alaco.
 - 4. Cotterman.
 - 5. ACL.
 - 6. Or equal.

2.2 MATERIALS

- A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
- B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.
- C. Fasteners: As recommended by ladder manufacturer.

2.3 VERTICAL LADDERS

- A. Product: Model 501 Heavy Duty Tubular Rails Fixed Access Aluminum Ladder by O'Keeffe's Inc. or equal.
 - 1. Rungs: Not less than 1-1/4 inches in section and 18-3/8 inches long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
 - 2. Rungs shall withstand a 1,500 pound load without deformation or failure.
 - 3. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch wall thickness by 3 inches wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces. Channel side rails are not acceptable.

2.4 ALUMINUM FINISHES

- A. Mill finish. As extruded.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor securely using fasteners specified by manufacturer or others of equivalent or greater strength and corrosion resistance.

END OF SECTION 055134

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe and tube railings.
- B. Related Sections:
 - 1. Division 9 Section "Painting" for field painting.

1.2 DEFINITIONS

- A. Exterior: Defined as the following:
 - 1. Areas, locations, and surfaces that are unprotected, or exposed to environmental elements.
 - 2. Areas, locations and surfaces within uncontrolled environments.
 - 3. Areas, locations and surfaces of unconditioned spaces, including belowgrade/underground, partially-exposed, or "covered" parking areas.

1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill of Guards:
 - a. Uniform load of 25 lbf/sq. ft. applied horizontally.
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

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- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
- C. Appearance: Galvanized articles shall be free from uncoated areas, blisters, flux deposits, acid and black spots, and dross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

1.6 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of pipe and tube railings that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:
 - 1. Local iron fabricators.
- B. Nonshrink, Nonmetallic Grout:
 - 1. 1107 Advantage Grout by Dayton Superior Chemical & Cement Products.
 - 2. Conset Grout by ChemMasters Specialty Construction Products.
 - 3. General-Purpose Grout by Symons.
 - 4. Or equal.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
- B. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- C. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

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2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form changes in direction as detailed.
- J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.

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- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123 for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153 for hot-dip galvanized hardware.
- B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.
- F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
 - 1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

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- G. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Do not apply primer to galvanized surfaces.
 - 2. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- H. Field Finish: Comply with Division 9 Section "Painting" for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.
- C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

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1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.4 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

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SECTION 061000 - ROUGH CARPENTRY

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. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Rooftop equipment bases and support curbs.
5. Wood blocking.
6. Wood sleepers.

- B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

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

1.5 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Engineered wood products.
 4. Shear panels.
 5. Power-driven fasteners.
 6. Post-installed anchors.
 7. Metal framing anchors.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

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1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
- C. 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, as published by manufacturer, shall 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: AWPAC U1; Use Category UC2.
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 that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, 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 framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Load-Bearing Partitions: No. 1 grade.
1. Application: interior load-bearing partitions.
 2. Species:
 - a. Douglas fir-larch; WCLIB or WWPA.
- B. Ceiling Joists: Construction or No. 1 grade.

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1. Species:
 - a. Douglas fir-larch; WCLIB or WHPA.

C. Joists, Rafters, and Other Framing Not Listed Above: No. 1 grade.

1. Species:
 - a. Douglas fir-larch; WCLIB or WHPA.

2.4 TIMBER FRAMING

A. Comply with the following requirements, according to grading rules of grading agency indicated:

1. Species and Grade: Douglas fir-larch; Select Structural grade; NLGA, WCLIB, or WHPA.
2. Maximum Moisture Content: 19 percent.
3. Additional Restriction: Free of heart centers.

2.5 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. RedBuilt, LLC.; RedLam LVL or comparable product.
2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal- depth members.
3. Modulus of Elasticity, Edgewise: 2,000,000 psi.

C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. RedBuilt, LLC.; Red-I Joist or comparable product.
2. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
3. Structural Properties: Depths and design values not less than those indicated.
4. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.

D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.

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2. Material: All-veneer product.
3. Thickness: 1-3/4 inches.
4. Comply with APA PRR-401, rim board grade. Factory mark rim boards with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
- B. Dimension Lumber Items: No. 1 grade lumber of the following species:
 1. Douglas fir-larch; WCLIB or WWP.
- C. Concealed Boards: 19 percent maximum moisture content and the following species and grades:
 1. Douglas fir-larch; WCLIB or WWP.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall 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: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

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- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

2.8 METAL FRAMING ANCHORS

- A. Simpson Strong-Tie Company, Inc. or comparable product
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those [indicated] [of basis-of-design products] [of products of manufacturers listed]. 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. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304.
 - 1. Use for exterior locations and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Install shear wall panels to comply with manufacturer's written instructions.

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- F. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- H. Do not splice structural members between supports unless otherwise indicated.
- I. 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.
- J. 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.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
- K. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- L. Comply with AWP A 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.
- M. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.
- O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials.

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Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

1. Comply with approved fastener patterns where applicable.
2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or 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 Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring vertically at 24 inches o.c.
- C. 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: 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. For interior partitions and walls, provide 2-by-6-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
 2. Provide continuous horizontal blocking at midheight 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.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 1. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

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3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.
- D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- F. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.
- G. Provide solid blocking between joists under jamb studs for openings.
- H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

3.6 TIMBER FRAMING INSTALLATION

- A. Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch airspace at sides and ends of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

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3.7 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
 - 1. Size: 2-by-12-inch nominal size, minimum.
 - 2. Material: Laminated-veneer lumber or solid lumber.
 - 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
 - 4. Spacing: At least three framing members for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.8 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect 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 061000

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SECTION 061600 - SHEATHING

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. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Underlayment.
5. Sheathing joint and penetration treatment.

- B. Related Requirements:

1. Section 061000 "Rough Carpentry for plywood backing panels.
2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

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

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1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

- A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exposure 1, Structural I sheathing.
 1. Span Rating: Not less than 32/16.
 2. Nominal Thickness: Not less than 15/32 inch.

2.4 ROOF SHEATHING

- A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exposure 1, Structural I sheathing.
 1. Span Rating: Not less than 32/16.
 2. Nominal Thickness: Not less than 15/32 inch.

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2.5 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Structural I, Underlayment single-floor panels.
 - 1. Span Rating: Not less than 24.
 - 2. Nominal Thickness: Not less than 3/4 inch.
 - 3. Edge Detail: Tongue and groove.

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. 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. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.
- F. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

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. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

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- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- 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. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.
 - 2. Subflooring:
 - a. Glue and nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.
 - 3. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.
 - 4. Underlayment:
 - a. Nail] [Nail or staple] to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.

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3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 FIBERBOARD SHEATHING INSTALLATION

- A. Comply with ASTM C 846 and with manufacturer's written instructions.
- B. Fasten fiberboard sheathing panels to intermediate supports and then at edges and ends. Use galvanized roofing nails[or galvanized staples]; comply with manufacturer's recommended spacing and referenced fastening schedule. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.
- C. Install sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints if any.
- D. Cover sheathing as soon as practical after installation to prevent deterioration from wetting.

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3.6 HARDBOARD UNDERLAYMENT INSTALLATION

- A. Comply with CPA's recommendations and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.

- 1. Fastening Method: Nail underlayment to subflooring.

END OF SECTION 061600

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wall sheathing.
 - 2. Weather resistant barrier (WRB).
 - 3. Sheathing joint-and-penetration treatment.

1.2 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. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheathing that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - 2. Warranty Period: 5 years.
- B. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Glass-Mat Gypsum Sheathing:
 - 1. Dens-Glass by G-P Gypsum Corporation.
 - 2. Gold Bond Brand e2XP by National Gypsum.
 - 3. Or equal.
- B. Sheet Weather-Resistant Barrier: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. Fortifiber.(Basis of Design)
 - 2. DuPont.
 - 3. WR Meadows.
 - 4. GMC Roofing.
 - 5. Or equal.

2.2 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.
 - 1. Product: Dens-Glass by G-P Gypsum Corporation or equal.
 - a. Type X.
 - b. Thickness: As indicated on Drawings.

2.3 WEATHER-RESISTANT BARRIER

- A. Sheet: Fortifiber Weather Smart Commercial by Fortifiber or equal.
 - 1. Description: Nonwoven, nonperforated wrap, employing an advanced breathable polymer technology.
 - 2. ICC-ES Evaluation Report No. 3515.
 - 3. Tested Data:
 - a. Moisture Vapor Transmission: ASTM E 96 Procedure A (Desiccant Method); 98 g/sm/day (14 perms)
 - b. Air Permeance at 75 Pascals: ASTM E2178; 0.003 L/s/sqM.
 - c. Flame Spread: ASTM E84; Class A, Pass.
 - d. Smoke Developed: ASTM E84; Class A, Pass.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Power-Driven Fasteners: NES NER-272.

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- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.5 MISCELLANEOUS MATERIALS

- A. 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).

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, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in CBC's "California Building Code."
- D. Coordinate wall 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.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. 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 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.

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4. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

3.3 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
- B. Building Wrap: Comply with manufacturer's written instructions.
 1. Seal seams, edges, fasteners, and penetrations with tape.
 2. Extend into jambs of openings and seal corners with tape.
 3. Use butyl based self-adhered flashing, or fluid applied flashing for all penetrations, transitions and terminations as needed.

3.4 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

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SECTION 061800 - GLUED-LAMINATED CONSTRUCTION

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 framing using structural glued-laminated timber.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 3. For connectors. Include installation instructions.

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.
- B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.
- C. Research/Evaluation Reports: For structural glued-laminated timber and timber connectors, from ICC-ES.

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1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed firm.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.
 - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
 - 2. Provide structural glued-laminated timber made from single species.
 - 3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
 - 4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
- B. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch that complies with structural properties combination symbols beam stress classifications indicated.
- C. Species and Grades for Beams:
 - 1. Species and Combination Symbol: DF/DF 24F-V4 or DF/DF 24F-V8.
- D. Appearance Grade: Framing, complying with AITC 110.

2.2 TIMBER CONNECTORS

- A. Simpson Strong-Tie Company, Inc. or comparable product
- B. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.3 MISCELLANEOUS MATERIALS

- A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

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- B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.4 FABRICATION

- A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 1. Dress exposed surfaces as needed to remove planing and surfacing marks.
- B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPA M4.
 - 1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
 - 2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.
- D. End-Cut Sealing: Immediately after end cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.5 FACTORY FINISHING

- A. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
- B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
 - 1. Predrill for fasteners using timber connectors as templates.
 - 2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 3. Coat cross cuts with end sealer.
 - 4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWP A M4.
 - a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
 - b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.
- D. Install timber connectors as indicated.
 - 1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
 - 2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
 - 1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
 - 2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 061800

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SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets.
 - 2. Plastic-laminate countertops.
 - 3. Solid-surfacing-material countertops.
 - 4. Stainless steel wall panels.

1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
 - 3. Apply WI-certified compliance label to first page of Shop Drawings and follow Section 1, "Guidelines for Architectural Millwork Shop Drawing".
- C. Samples for Initial Selection: For each type of product indicated requiring product selection.
- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 - 2. Solid-surfacing materials, 6 inches square.
 - 3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
 - 4. Exposed cabinet hardware and accessories, one unit for each type and finish.
 - a. Hardware samples will be returned up on approval.
- E. Product Certificates: For each type of product, signed by product manufacturer.

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- F. Woodwork Quality Standard Compliance Certificates for Product and Installation: WI-certified compliance certificates confirming conformance with Certified Compliance Program (CCP).
- G. Qualification Data: For Installer and fabricator.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Licensee of WI's Certified Compliance Program.
- C. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Before delivery to job-site, Millwork supplier:
 - a. Licensees of WI shall issue a certified compliance certificate indicating millwork products being furnished for this project, and certifying that these products and their installation, will fully meet requirements of grade or grades specified.
 - b. Non-Licensees of WI shall provide evidence that they have arranged for inspection by WI inspector after completion of fabrication and installation. If conditions are found to be compliant, inspector will issue Compliance Certificate indicating millwork products being furnished for this project, and certifying that these products and their installation, will fully meet requirements of grade or grades specified.
 - 2. Each elevation of casework and each countertop shall bear certified compliance label.
 - 3. Cabinet Design Series (CDS): CDS numbers on Drawings indicate typical designs.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

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

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1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

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

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of interior architectural woodwork that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. High-Pressure Decorative Laminate:
 - 1. Wilsonart International; Div. of Premark International, Inc. (Basis of Design)
 - 2. Lamin Art. (Basis of Design)
 - 3. Formica Corporation.
 - 4. Nevamar Company, LLC; Decorative Products Div.
 - 5. Arpa.
 - 6. Abet Laminati.
 - 7. Or equal.
- B. Solid Surfacing Materials:

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1. Formica Corporation. (Basis of Design)
 2. Corian by E. I. du Pont de Nemours and Company.
 3. Nevamar Company, LLC; Decorative Products Div.
 4. Wilsonart International; Div. of Premark International, Inc.
 5. LG Hausys.
 6. Or equal.
- C. Medium-Density Fiberboard:
1. Medex, Medex NC, Medite II, or Arreis SDF by SierraPine Ltd.
 2. Weyerhaeuser Company; Premier Plus by Weyerhaeuser.
 3. Or equal.
- D. Particleboard:
1. Rodman Industries, Inc.
 2. Acadia Board Company.
 3. PrimeBoard, Inc.
 4. Or equal.
- E. Cabinet hardware:
1. Accuride.
 2. Hafele.
 3. Rockford Process Control, Inc.
 4. Or equal.

2.2 MATERIALS

- A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Core and Substrates: Comply with the following:
1. Backs of cabinets, book cases, etc.
 - a. Hardboard: AHA A135.4.
 2. Plastic-laminates:
 - a. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
- C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- D. High-Pressure Decorative Laminate (HPDL): NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
- E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
1. Type: Standard type, unless Special Purpose type is indicated.

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2.3 CABINET HARDWARE AND ACCESSORIES

- A. Adjustable Shelf Pilaster Standards: Side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
 - 1. Product: 255/256 Mortise-Mount Pilaster Shelving System by Knape & Vogt or equal.
 - a. Holds up to 500 lbs. per shelf.
 - b. 23 gauge high strength steel.
 - c. 39/64" wide x 11/64" deep.
 - d. BHMA Grade 1 approved.
 - e. Self supports: KV #256.
 - f. Mortise-Mount system.
 - g. 1/2" vertical slot adjustment.
 - h. Numbered slots for fast, accurate clip insertion.
 - i. Punched nail/screw holes.
 - j. Limited Lifetime Warranty.
 - k. Made in USA.
- B. Shelf Support Pins:
 - 1. Product: KV #330 by Knape & Vogt or equal.
 - a. Stainless steel.
 - b. Pin diameter for 5 mm hole (approx 13/64 inch).
- C. Grommets: Plastic, 2 inch diameter, locations as indicated. If locations are not indicated, as selected by Architect during shop drawing review.
 - 1. Doug Mockett, Sugatsune, Wood Technology, or equal.
- D. Drawer and Door Pulls: For all, including accessible casework.
 - 1. "U" shaped wire pull, aluminum with satin finish, 4 inch centers.
- E. Cabinet Locks: Casework shall lock. Casework in a room shall be keyed alike and each room shall be keyed differently. All locks shall be master keyed with one master key for all casework.
- F. Hinges: Model 376 by Rockford Process Control, Inc. or equal.
 - 1. Heavy duty, .090" cold rolled steel, 5-knuckle institutional hinge; mill ground with hospital tips, 270 degree opening angle.
 - 2. 2-3/4 inch height, drilled knuckle ID with precision drawn pins.
 - 3. All mounting holes are countersunk for #8 flat head screws.
 - 4. Non-removable knurled pin.
 - 5. Exceed ANSI/BHMA 156.9 Grade 1 requirements.
- G. Drawer Slides: Heavy-duty, full extension, ball bearing, soft closing, drawer glides by Blum or equal.
- H. Counter Support Brackets:
 - 1. Model #EH-1824 by Rakks or equal.
 - 2. Description: Used to support up to 30" deep counters. Manufactured from 2" x 3" "T" to provide maximum stiffness. When the 24" leg is against the wall, this bracket can also be used to support 24" deep counters.

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2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal 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.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. 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. Contact Adhesive: 250 g/L.
- E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect 7 days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- E. Drawer bottoms to be fully let-in, glued and blocked. Joinery must be lapped and mitered, no butt joints.

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2.6 PLASTIC-LAMINATE CABINETS

- A. WI Construction Style: Style A, Frameless.
- B. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
- C. WI Door and Drawer Front Style: Flush overlay.
- D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS, 0.048 inches (1.2 mm) thick.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS, 0.048 inches (1.2 mm) thick.
 - 4. Edges: Self-edge banded.
- E. Semi-Exposed Surfaces: Any of one of following.
 - 1. Low pressure decorative polyester overlay.
 - 2. Low pressure decorative melamine overlay.
 - 3. HPL cabinet liner.
 - 4. Solid Phenolic core (SPC).
 - 5. Vinyl at cabinet backs and drawer bottoms only.
- F. Concealed Surfaces: Any of one of following.
 - 1. Solid Wood or Plywood: Any hardwood or softwood species, with no defects affecting strength or utility. Hardwood and softwood lumber kiln dried to 7 and 10 percent moisture content, respectively.
 - 2. Particleboard: ANSI A208.1, Grade M-2.
 - 3. Medium-Density Fiberboard: ANSI A208.2.
 - 4. Solid Phenolic core (SPC).
- G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range.

2.7 PLASTIC-LAMINATE COUNTERTOPS

- A. High-Pressure Decorative Laminate Grade: HGS, 0.048 inches (1.2 mm) thick.
- B. Provide Exterior grade plywood at wet locations and comply with following:
 - 1. No seams shall occur within 18 inches of sink cut-outs.
 - 2. Sink cut-outs shall be coated with opaque sealer.
 - 3. Back splash shall coordinate with size of soap and paper tower dispensers for solid attachment.
 - 4. Corners of tops shall be cut at 45 degrees if projecting or in pathway.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range.
- D. Edge Treatment: Self-edge banded.

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- E. Laminate Substrates: Medium-density fiber board (MDF). Do not use plywood.
- F. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.8 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Solid-Surfacing-Material Thickness: 3/4 inch.
- B. Edge: 1-1/2 inch thick eased edge.
- C. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
- D. Integral Cove: Provide shop fabricated integrally molded coves at back and ends where against walls or other vertical surfaces, with 3/8" radius between top and splash.

2.9 STAINLESS STEEL WALL PANELS

- A. Stainless steel sheets shall conform to ASTM A240, Type 304 Condition A, 18-8 having a No. 4 finish. No.2B finish shall be acceptable on surfaces of equipment not exposed to view. All sheets shall be uniform throughout in color, finish and appearance.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

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- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 4. Caulk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 FIELD QUALITY CONTROL

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

3.4 ADJUSTING AND CLEANING

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

END OF SECTION 064023

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SECTION 068200 - FIBER REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiber reinforced plastic (FRP) panel system for adhesive mounting.
 - 2. Moldings, adhesive, and joint sealants.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- C. Maintenance Instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.4 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fiber reinforce plastic panels that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fiber Reinforced Plastic Panels: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Standard FRP by Marlite (Basis of Design)
 - 2. Crane Composites (formerly Kemlite).
 - 3. Glasteel.
 - 4. Or equal.

2.2 PANEL SYSTEM

- A. Plastic Panel System: Factory finished panels, trim, sealant, and accessories.
- B. Panels: Fiberglass reinforced polyester, USDA approved for incidental food contact.
 - 1. Surface Burning Characteristics: Flame spread index of 200 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E 84 (Class C/III).
 - 2. Thickness: 3/32 inch, nominal.
 - 3. Width: 48 inches.
 - 4. Height: 96 inches.
 - 5. Flexural Strength: 17,000 psi, when tested in accordance with ASTM D 790.
 - 6. Flexural Modulus: 600,000 psi, when tested in accordance with ASTM D 790.
 - 7. Tensile Strength: 8,000 psi, when tested in accordance with ASTM D 638.
 - 8. Tensile Modulus: 9,430 psi, when tested in accordance with ASTM D 638.
 - 9. Barcol Hardness: 40, when tested in accordance with ASTM D 2583.
 - 10. Impact Resistance: 7 ft-lb/in, when tested in accordance with ASTM D 256, Izod method.
 - 11. Coefficient of Thermal Expansion: 0.0000157 in/in/degree F, measured in accordance with ASTM D 696.
 - 12. Water Absorption: 0.17 percent, when tested in accordance with ASTM D 570.
 - 13. Specific Gravity: 1.53, when tested in accordance with ASTM D 792.
 - 14. Front Finish:
 - a. Surface Texture and color: As indicated on Drawings.
- C. Panel Trim: Extruded PVC, in manufacturer's standard colors.
 - 1. Outside corners, inside corners, edge trim, and division molding.
- D. Sealant: Marlite Silicone Sealant; gunnable silicone rubber; clear.
 - 1. Low-Emitting Materials: Sealants shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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3.2 PREPARATION

- A. Take panels out of cartons and allow to acclimatize to room conditions for at least 48 hours prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation.
- D. Protect existing surfaces from damage due to installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use the adhesives recommended by the panel manufacturer unless prohibited by local regulations; obtain manufacturer's approval of alternative adhesives.
- C. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch expansion space.
- D. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.
- E. Protect installed products until completion of project.
- F. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION 068200

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SECTION 071909 - CONCRETE MOISTURE AND ALKALINITY TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for independent testing and inspection requirements for concrete moisture and alkalinity.
- B. Related Sections include the following:
 - 1. Division 7 Section "Concrete Moisture and Alkalinity Barrier" for concrete sealers to reduce moisture and alkalinity level when testing fails.

1.2 SUBMITTALS

- A. Independent testing agency qualifications: Past 4 year history of testing of comparable project size and scope.
- B. Product data: Moisture test kit.
- C. Testing Results: Provide interior temperature, humidity, moisture vapor and alkalinity results for testing period.
 - 1. Alkalinity and Adhesion Test Report.
 - 2. Moisture Test Report.
- D. Locations Map: Provide each testing result documented on a locations map. Map may be finish floor plan by Architect or similar representation.
- E. Record Submittals: Testing reports and locations map.

1.3 SCHEDULING

- A. Site Meeting: Testing Agency, Owner, Architect and Contractor shall meet 30 days prior to flooring installation to discuss testing requirements, specifications and locations prior to testing.

PART 2 - PRODUCTS

2.1 MOISTURE TESTING

- A. Test Method: ASTM F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - 1. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride is NOT acceptable method.
- B. The In-Situ Method:

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1. In-situ probes deepen concrete moisture measurement. For decades, builders used (and some still do) the anhydrous calcium chloride test for concrete moisture vapor emissions rate (MVER). The MVER is defined as the rate of water vapor emissions from the surface of concrete and is determined with the use of a desiccant material sealed to the slab surface for a specified time period, then measured. It has been believed that the change in the desiccant weight could be translated into a moisture ratio for the concrete beneath.
 2. In-situ concrete moisture testing places sensors, or probes, inside the slab itself. As concrete dries, moisture migrates from the bottom of the slab to the surface where it can evaporate away. Logically then, moisture levels at the bottom of a slab will read higher from those at the surface. In-situ probes provide relative humidity (RH) measurements at 40% of the slab's depth*, a position proven to more accurately portray the final RH levels of the slab if it were to be sealed at that point in time and the slab moisture allowed to fully equilibrate.
- C. Acceptable Testing Devices for ASTM F2170 Test:
1. Wagner Meters Rapid RH® system by Wagner.
 2. Protimeter by T Equipment.
 3. Relative Humidity Meter system by American Moisture Test.
 4. Or equal.

2.2 ALKALINITY TESTING

- A. Alkalinity Test, ASTM F 710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
1. Digital wide range 1–14 pH meter.
 2. Waterproof flat tip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site: Weatherproofed, doors installed and windows secured. Do not start testing process when site has standing water, surface contaminates, exposed to exterior conditions or concrete installation is less than 90 days of age.

3.2 PREPARATION

- A. Clean concrete substrates of adhesives residue, paint, curing, sealing, floor coverings a minimum of 24 hours prior to installation of testing equipment.
- B. Temperature & Humidity: Maintain site at the temperature and humidity conditions to those anticipated during normal occupancy and maintain these conditions minimum of 7 days (exceed ASTM F1869 requirements) prior and during testing period.
- C. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with testing results.

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3.3 MOISTURE TESTING

- A. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F2170.
- B. Floor shall have reading of 95% or less per ASTM F2170; unless finish flooring product require better value.

3.4 ALKALINITY TESTING

- A. Test: Perform pH testing per ASTM F710.
- B. pH range between 8 and 10; unless finish flooring product require better value.

3.5 FIELD QUALITY CONTROL

- A. Testing: Engage and pay for qualified independent testing agency specified to perform the following field tests and inspections and prepare test reports:
 - 1. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.
 - 2. Testing agency shall verify thickness of coatings during traffic coating application.
 - 3. If test results show coating materials do not comply with requirements, remove noncomplying materials, prepare surfaces, and reapply coatings.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 071909

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SECTION 071910 - CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes concrete sealer.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include manufacturer's printed statement of VOC content.
- B. Samples: For each type of sealer and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.
- C. Manufacturer Certificates: Signed by manufacturers certifying that water repellents comply with requirements.
- D. Qualification Data: For Installer.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.
- F. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
 - 1. Ambient temperature is above 40 deg F.
 - 2. Concrete surfaces and mortar have cured for more than 28 days.
 - 3. Concrete or brick masonry walls are not treated prior to 30 days after building close-in.
 - 4. Rain or snow is not predicted within 24 hours.
 - 5. Application proceeds more than 24 hours after surfaces have been wet.
 - 6. Substrate is not frozen, or surface temperature is above 40 deg F.
 - 7. Windy conditions do not exist that may cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

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1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Patching compound, cementitious, thin patching and skim-coating material, designed for reducing surface defects on interior floors. : Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Degussa.
 - 2. ChemMasters.
 - 3. Or equal.
- B. Concrete Clear Sealer for protecting floors: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Consolideck LS by Prosoco. (Basis of Design)
 - 2. Scofield.
 - 3. Degussa.
 - 4. ChemMasters.
 - 5. Or equal.

2.2 PENETRATING WATER REPELLENTS

- A. General: Sealants applied on the interior of the building envelope shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.3 PATCHING COMPOUND

- A. Patching compound, cementitious, thin patching and skim-coating material, designed for reducing surface defects on interior floors.
 - 1. Composition and Materials:
 - a. Complex, precisely engineered, polymer-modified, cementitious, thin patching material produced by a proprietary manufacturing and intergrinding process.
 - b. Designed for ease of mixing and installation, superior adhesion without priming, and rapid strength gain, it is a single-component, non-gypsum-based, powdered material containing no sand or calcium chloride.

2.4 SEALER

- A. Product: Consolideck LS by Prosoco or equal.

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1. Premium hardener, densifier and sealer for concrete surfaces.
2. Penetrating lithium silicate treatment reacts with the concrete to produce insoluble calcium silicate hydrate within the concrete pores.
3. Treated surfaces resist damage from water and surface abrasion.
4. Reduces dusting and simplifies maintenance.
5. Will not trigger or contribute to surface ASR (alkali silicate reaction).
6. Technical Data:
 - a. Form: Clear, water-like liquid.
 - b. pH: 11.0.
 - c. Active Content: 14.5 percent.
 - d. Total Solids: 14.5 percent.
 - e. VOC Content: 0 grams per Litter. Complies with all known national, state and district AIM VOC regulations.
 - f. Flash Point: Not flammable.
 - g. SCS Certified: Indoor air quality, Gold.
 - h. NSF: nonfood compounds program listed R2, Registration #142259.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Freshly Placed, Uncured Steel-Troweled Concrete
 1. After final finishing, soft cut control joints. Clean concrete of any dirt, residue or soft cut saw debris.
 2. Using a low pressure sprayer fitted with a 0.5 gallon per minute tip, apply a single coat of Consolideck® LS®. Lightly apply sufficient product to wet the surface without producing puddles.
 3. Use a clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
 4. If surfaces dry immediately, increase the rate of application. Surface should remain wet for 5 to 10 minutes. Adjust rate of application to eliminate puddles. Allowing excess material to puddle on the floor will extend dry times and create white residues which must be removed immediately. Allow treated surfaces to dry.
 5. Immediately apply the specified curing compound or initiate the specified curing procedure.
 6. When the curing process is complete, use an automatic floor scrubber equipped with cleaning pads or brushes appropriate for removal of accumulated construction soiling and surface residues. Avoid pads or brushes which may damage the finished floor.
- B. Cured, Steel Troweled Concrete
 1. Remove all dirt, debris, or curing compounds using the appropriate surface prep cleaner. Allow cleaning waters used in surface preparation to dry.
 2. The prepared surface must wet uniformly. Confirm surface absorbency with a light water spray. In hot, dry weather, pre-wet the concrete with fresh water. Allow any standing water to evaporate.
 3. Apply a single coat using a low pressure sprayer fitted with a 0.5 gallon per minute spray tip. Apply sufficient product to wet the surface without producing puddles. Use a clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.

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4. If surfaces dry immediately, increase the rate of application. Surface should remain wet for 5–10 minutes. Adjust rate of application to eliminate puddles. Allowing excess material to puddle on the floor will extend dry times and create white residues which must be removed immediately.
 5. Allow treated surfaces to dry.
 6. Remove any dried powder residue using a stiff broom, power sweeper or auto-scrubbing machine.
- C. Cleanup: Before product dries, clean tools and equipment with fresh water. Immediately wash off over spray from glass, aluminum, polished or other surfaces with fresh water.

3.2 APPLICATION OF SEALER

- A. Concrete substrate shall be completely dry.
- B. Apply sealer according to manufacturer's written instructions at a rate of 300 to 500 square feet per gallon per coat. Two coats are required.
- C. Maintain a wet edge at all times.
- D. Allow sealer to completely dry before applying additional coats.
- E. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.
- F. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.3 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071910

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SECTION 071920 - CONCRETE MOISTURE AND ALKALINITY BARRIER

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Concrete moisture and alkalinity barrier when moisture or alkalinity test fails.
- B. Related Sections include the following:
 - 1. Division 7 Section "Concrete Moisture and Alkalinity Testing" for independent moisture and alkalinity testing prior to installation of flooring materials.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include manufacturer's printed statement of VOC content.
- B. Samples: For each type of barrier and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.
- C. Manufacturer Certificates: Signed by manufacturers certifying that barrier comply with requirements.
- D. Qualification Data: For Installer.
- E. Product Test Reports: Independent third party testing results:
 - 1. ASTM E 96 Water Vapor Transmission: up to 95% Vapor Reduction
 - 2. ASTM D 4541 Concrete Adhesion: 500psi or concrete cohesive failure
 - 3. ASTM D 1308 Chemical Resistance: 100% resistant to acid and alkali
- F. Field Quality Control Documents: Post installation testing by independent testing agency per ASTM F1869, ASTM D 4541.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Extended Warranty Period: Barrier warranty for 15 years covering performance, concrete adhesion, moisture or alkalinity damage to barrier and installed floor coverings. In the event of barrier failure, manufacturer shall cover labor and material cost to replace moisture or alkalinity damaged flooring or coatings, reapply barrier, adhesives, patching compounds and installation accessories.
 - 1. Moisture Vapor Reduction: No upper performance limitations.
 - 2. Alkalinity Control: No upper performance limitations.
 - 3. Manufacturing defects warranties are not acceptable.

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- B. Warranty shall not exclude ACI documents, dew point, concrete salts, admixtures, resin and silicate surfaces treatments. Installations on slab surfaces deems acceptance of on site conditions. Barrier manufacturer is responsible for complete review of concrete mix designs, admixtures, sub slab vapor barrier installed and curing methods for written acceptance prior to installations.
- C. Installer: Submit 15 year warranty covering installation defects and improper installations on workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Concrete Moisture and Alkalinity Barrier: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. VAP-1 2000 FS by Koster. (Basis of Design)
 - 2. Vapor-Guard DC by Advance Moisture Control.
 - 3. MES 100 by Floor Seal Technology Inc.
 - 4. Or equal.

2.2 CONCRETE MOISTURE AND ALKALINITY BARRIER

- A. Product: VAP I 2000 FS by Koster or equal.
 - 1. Fast-setting, one-coat, membrane-forming, moisture vapor control system consisting of a unique combination of epoxy resins and other compounds formulated to prevent floor covering failures on concrete slabs with elevated levels of moisture.
 - 2. Meets or exceeds the performance requirements in ASTM F3010-13 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.
 - 3. Has no upper limit for water vapor emission from concrete floor slabs. It can be applied to concrete slabs with relative humidity up to 100% RH and it provides protection from sustained exposure to pH 14.
 - 4. Low permeance of 0.047 perms, moisture blocker for virtually all types of flooring, including low permeance flooring such as sheet goods and rubber tile.
 - 5. Compliant with all state and federal VOC regulations, having VOC content of 0 g/L, which allows installation in sensitive areas such as hospitals, schools, and grocery stores.
- B. Concrete Topcoat: Cement based self-leveling underlayment product acceptable to sealant manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to barrier manufacturer's written instructions, to ensure that surface is dry enough.
 - 1. Shot blast surface to allow maximum penetration and adhesion. Grind near walls and edges.

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- B. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.
- C. Coordination with Sealants: Do not apply barrier until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
 - 1. Barrier work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Barrier: Apply by squeegee and roller application methods to saturate entire surface. Spread rates shall produce results of up to 95% moisture reduction per ASTM E 96 and post installation testing rate specified.
- B. Roller and squeegee methods to saturate concrete porosity. Final surfaces shall be light reflective white.
- C. Joint and Crack Treatment: Apply barrier directly over cracks, holes, and slab imperfections for maximum flexibility, moisture vapor and alkalinity control.
- D. Cement Topcoat: As required for applications under resilient flooring for sealants installed after curing of concrete.

3.3 FIELD QUALITY CONTROL

- A. Site Tests:
 - 1. Conduct moisture-alkalinity test by an independent testing company prior to resilient flooring and carpet installation.

3.4 CLEANING

- A. Immediately clean barrier from adjoining surfaces and surfaces soiled or damaged by barrier application as work progresses. Repair damage caused by barrier application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071920

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SECTION 072100 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Concealed thermal and sound insulation.

1.2 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 WARRANTY

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- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of building insulation that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Glass-Fiber Batt/Blanket Thermal and Sound Insulation: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Johns Manville (JM). (Basis of Design)
 - 2. CertainTeed Corporation.
 - 3. Guardian Fiberglass, Inc.
 - 4. EcoBatt with ECOSE technology by Knauf Fiber Glass.
 - 5. Owens Corning.
 - 6. Lamtec.
 - 7. Or equal.

2.2 GLASS-FIBER BATT/BLANKET INSULATION

- A. Unfaced, Glass-Fiber Batt/Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics. Glass-fiber bonded with acrylic thermosetting binder.
 - 1. For walls and partitions: Unfaced Batts.
 - 2. Formaldehyde-free, Unfaced Batts by JM or equal.
- B. Faced, Glass-Fiber Batt/Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft vapor-retarder membrane on 1 face.
 - 1. For ceilings under decks: FSK-25 Faced Batts with 2 inch tabs or Panel Deck FSK-25 Faced Batts with 5 inch tabs.
 - 2. Formaldehyde-free, FSK-25 Faced Batts by JM or equal.
- C. Thermal Rating: R values as indicated on Drawings.
- D. Sound Attenuation Ratings: Minimum R-11 on interior walls and partitions, unless otherwise indicated on Drawings.

2.3 ACCESSORIES

- A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inches wide.

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- B. Nails or Staples: Steel wire; electroplated, or galvanized; type and size to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

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- C. Install insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

3.5 PROTECTION

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

END OF SECTION 072100

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SECTION 074113 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal roof panels for open frame applicaton.
- B. Related Sections:
 - 1. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.2 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: Negative 1.57 lbf/sq. ft.
 - 2. Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft.
 - 3. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
 - 4. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- D. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
 - 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
 - 3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

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- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class UL90:
 - 1. UL Construction Number: Manufacturer's product shall be listed in UL Certification Directory.
- F. Fire Rating: UL-263, Class A Roof System:
 - 1. UL Construction Number: Manufacturer's product shall be listed in UL Certification Directory.
- G. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- H. Thermal Performance: Provide insulated metal roof panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 518.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
 - 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
- C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Metal Roof and Soffit Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal roof panel accessories.
 - 2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
 - 3. Accessories: 12-inch- long Samples for each type of accessory.
- E. Qualification Data: For qualified Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
 - 1. Performance test requirements.
 - 2. ICC ES Legacy Report: ER report number.

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- G. Maintenance Data: For metal roof panels to include in maintenance manuals.
- H. Warranties: Samples of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of metal roof and soffit panels from single source from single manufacturer.
- C. Fire-Resistance Ratings: Where indicated, provide metal roof panels 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.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
 - 2. Combustion Characteristics: ASTM E 136.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including fascia, and soffit as shown on Drawings; approximately four panels wide by full eave width, including insulation, underlayment, attachments, and accessories.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, deck Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
 - 4. Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 5. Review structural loading limitations of deck during and after roofing.
 - 6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - 7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
 - 8. Review temporary protection requirements for metal roof panel assembly during and after installation.
 - 9. Review roof observation and repair procedures after metal roof panel installation.
 - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years.
- B. Special Installer's Weathertightness Warranty: On standard form in which installer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

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1. Warranty Period: 2 years.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Metal Roof Panels: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
1. Metal Sales. (Basis of Design)
 2. Taylor Metal.
 3. MBCI.
 4. Atas International Inc.
 5. Or equal.

2.2 METAL ROOF PANELS

- A. Product: 7/8" corrugated metal roof by Metal Sales or equal.
1. Panel coverage: 32 inches.
 2. Rib Height: 7/8 inch.
 3. Material: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, AZ50 coating designation, structural quality.
 - a. Minimum Thickness:
 - 1) 0.0296-inch (22 gage), Grade 50.
 4. Minimum Roof Slope Capability: 1:12.
 5. Attachment: Exposed direct fastened panel.
 6. Application: Designed for application over open framing or solid substrate.
 7. Rib Configuration: Sinusoidal.
 8. Performance Data:
 - a. ICC Evaluation Services: ESR-2385.
 - b. Fire Resistance Rating: Comply with UL 263 and UL 790 Class A Fire Resistance Ratings.
 - c. Impact Resistance: Comply with UL 2218, Class 4.
 - d. Wind Uplift Resistance: Comply with UL 580, Class 90 Wind Uplift, Construction #649.
 - e. Air Leakage: 0.004 cfm/sq. ft. at 6.24 psf when tested according to ASTM E 283.
 - f. Air Leakage: 0.007 cfm/sq. ft. at 6.24 psf when tested according to ASTM E 1680.
 - g. Water Penetration: None at 12 psf when tested according to ASTM E 331.
 - h. Water Penetration: None at 12 psf when tested according to ASTM E 1646.
 - i. Code and Testing Agency Approvals: Comply with 2010 State of Florida Building Code Approval 10999.1.
 9. Surface Finish: PVDF (Kynar 500).
 - a. Color: As selected by Architect from manufacturer's standard colors.
 - b. Color: As selected by Architect from manufacturer's full range.

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2.3 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: As required to meet performance requirements.
- C. Cold-Rolled Furring Channels: Minimum 1/2-inch- wide flange.
 - 1. Nominal Thickness: As required to meet performance requirements.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.
 - 1. Nominal Thickness: As required to meet performance requirements.
- E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.
- F. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 - 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - 3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- I. Gutters:
 - 1. Furnish gutter supports spaced 36 inches o.c.
 - 2. Provide bronze, copper, or aluminum wire ball strainers at outlets.
 - 3. Material and Finish: Same as metal roof panels.
 - 4. Sizes and Shapes: Varies, as indicated on Drawings.

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5. Gutter Expansion: Comply with SMACNA's maximum distance between expansion joints.
 6. Roof Pitch: As indicated.
- J. Downspouts:
1. Schedule 40 black iron pipe.
 - a. Color: Field paint match metal roof panels or as selected by Architect.
- K. Termination: Precast concrete splash block.

2.4 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. End Seams for Other Than Aluminum: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 5. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.
 6. Provide minimum 1/2 inch hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
 7. Provide minimum 1/2 inch hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
- B. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
- C. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
- D. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.
 - 1. Soffit Framing: Wire tie furring channels to supports, as required to comply with requirements for assemblies indicated.

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3.3 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
 - 1. Point of Fixity: Fasten each panel along a single line of fixing located at eave center of panel length.
 - 2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Install metal roof panels as follows:
 - 1. Commence metal roof panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
 - 2. Field cutting of metal panels by torch is not permitted.
 - 3. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 4. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
 - 5. Install ridge and hip caps as metal roof panel work proceeds.
 - 6. End Splices: Locate panel end splices over, but not attached to, structural supports. Stagger panel end splices to avoid a four-panel splice condition.
 - 7. Install metal flashing to allow moisture to run over and off metal roof panels.
- D. Fasteners:
 - 1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
- E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
 - 1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
 - 1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

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3.4 METAL ROOF PANEL INSTALLATION

- A. Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-drilling fasteners.
 - 2. Apply battens to metal roof panel seams, fully engaged to provide weathertight joints.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Membrane Flashing below Metal Coping:
 - 1. Material: 40 mil total thickness self-adhesive, cold applied tape consisting of 0.8 mm of rubberized asphalt integrally bonded to 8 mil high density, cross laminated polyethylene film. The rolls are interwound with disposable silicone-coated release sheet
 - 2. Product: Perm-A-Barrier by Grace.
- C. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- D. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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3.8 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sheet metal flashing and trim not specifically specified in other sections.
 - 2. Roof drainage sheet metal fabrications.
- B. Related Sections:
 - 1. Division 9 Section "Painting" for painting of sheet metal flashing and trim.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 - 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 7. Details of special conditions.
 - 8. Details of connections to adjoining work.

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1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheet metal flashing and trim that fails in materials or workmanship within specified warranty period.
 - 1. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Galvanized Sheet Metal Flashing and Trim:
 - 1. Fry Reglet Corporation.
 - 2. Hickman, W. P. Company.
 - 3. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - 4. Or equal.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.

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1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40; structural quality.
2. Field painted finish per Division 9 Section "Painting".
 - a. Color: As selected by Architect.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

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- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
 - 1. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen.
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
- B. Downspouts: Fabricate downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - 5. Install sealant tape where indicated.
 - 6. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
 - 1. Coat back side of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

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- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
- G. Flashing corners shall be shop fabricated and fully soldered such that corner assemblies are single monolithic units for 18" in all directions from corners.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.
 - 2. Loosely lock straps to front gutter bead and anchor to roof deck.
 - 3. Anchor and loosely lock back edge of gutter to continuous cleat.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
 - 2. Connect downspouts to underground drainage system indicated.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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END OF SECTION 076200

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SECTION 076500 - FLEXIBLE SHEET FLASHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Flexible sheet flashing for windows, doors, louvers, vents, and other openings and where indicated on Drawings.

1.2 SUBMITTALS

- A. Concurrent Review Requirements: Submit submittals of this section with doors and windows sections.
- B. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of flexible sheet flashing.
- C. Shop Drawings: Show locations and extent of flexible sheet flashing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- D. Samples: For the following products:
 - 1. 12-by-12-inch square of flexible sheet flashing.
- E. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- F. Qualification Data: For Installer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for flexible sheet flashing.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is acceptable to flexible sheet flashing manufacturer for installation of flexible sheet flashing required for this Project.
- B. Source Limitations: Obtain flexible sheet flashing materials through one source from a single manufacturer.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup with doors and windows.
- D. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to flexible sheet flashing including, but not limited to, the following:

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1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the flashing to be coordinated with the finishing of doors and windows.
3. Review, discuss, and coordinate the interrelationship of flexible flashing with other exterior wall components. Include provisions for sealants and fasteners.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by flexible sheet flashing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of flexible sheet flashing that fails in materials or workmanship within specified warranty period.
 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Flexible Sheet Flashing: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 1. WR Grace (Basis of Design).
 2. FortiFlash by Fortifiber.
 3. FlexWrap and StraightFlash by DuPont.
 4. Or equal.

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2.2 FLEXIBLE SHEET FLASHING

- A. Product: Vycor Plus by WR Grace or equal.
 - 1. Self-Adhered, cross-laminated high-density polyethylene (HDPE) sheet, backed by aggressive pressure-sensitive rubberized asphalt adhesive.
 - 2. Thickness: 25 mil minimum per ASTM D3767, Method A.
 - 3. Low temperature flexibility: Unaffected at minus 45 degrees F. per ASTM D1970.
 - 4. Elongation, ultimate failure of rubberized asphalt: 200 percent minimum per ASTM D412.
 - 5. Cracked cycling 100 cycles: Unaffected at minus 25 degrees F. per ASTM C836.
 - 6. Lap adhesion at minimum application temperature: 60 plf width per ASTM D1876 modified.
 - 7. Adhesion to concrete at minimum application temperature: 60 plf width per ASTM D903.
 - 8. ICBO: ER-6141.
 - 9. Recommended exposure limit: 30 days.
 - 10. Perm-A-Barrier by Grace is not acceptable.

2.3 AUXILIARY MATERIALS

- A. Mastic, Joint Sealant, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by flexible sheet flashing manufacturer.
 - 1. Caulking, sealants, and adhesives applied on the interior of the building envelope shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by flexible sheet flashing manufacturer.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install flexible sheet flashing in accordance with the manufacturer's written instructions, AAMA Publication 2400, and the applicable code.

END OF SECTION 076500

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SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Roof hatches.
- B. Related Sections:
 - 1. Division 5 Section "Aluminum Ladders" to roof hatches.
 - 2. Division 9 Section "Painting" for field finishes.

1.2 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
 - 1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes.

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1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of roof accessories that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Roof Hatches: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Bilco Company (The). (Basis of Design)
 - 2. Milcor Inc.; a Gibraltar Company.
 - 3. Nystrom, Inc.
 - 4. O'Keeffe's Inc.
 - 5. ThyCurb; Div of Thybar Corporation.
 - 6. Or equal.

2.2 METAL MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653, G90 coated and mill phosphatized for field painting.
 - 1. Comply with Division 9 Section "Painting" for field finishes.
- B. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123.
- C. Galvanized Steel Pipe: ASTM A 53.

2.3 MISCELLANEOUS MATERIALS

- A. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.
- B. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

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- D. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
 - 1. Caulking and sealants applied on the interior of the building envelope shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.4 ROOF HATCHES

- A. General: Fabricate roof hatches with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
- B. Product: Type S or E depending on size by Bilco.
 - 1. Type: Galvanized steel single (S) or double-leaf (E) lid as indicated on Drawings.
 - 2. Size: As indicated on Drawings.
 - 3. Integral Curb and Framing Material: Galvanized steel sheet, 0.079 inch thick.
 - 4. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.
 - 5. Finish: Comply with Division 9 Section "Painting".

2.5 FINISH

- A. Galvanized Steel: Field finish per Division 9 Section "Painting".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 - 2. Verify dimensions of roof openings for roof accessories.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.

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- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof Hatch Installation:
 - 1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
 - 2. Attach ladder safety post according to manufacturer's written instructions.
- F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, whether indicated on drawings or not, and other openings indicated.
- B. Related Sections include the following:
 - 1. Division 7 Section "Fire-Resistive Joint Systems."
 - 2. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers, and smoke barriers.
 - 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
 - 3. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 deg F.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

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2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
1. Types of penetrating items.
 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

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- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

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- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of through-penetration firestop system that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Through-Penetration Firestop Systems: Subject to compliance with requirements, provide one of the through-penetration firestop systems for each application that are produced by one of the following manufacturers.
 - 1. Hilti, Inc.
 - 2. Specified Technologies Inc.
 - 3. 3M; Fire Protection Products Division.
 - 4. Or equal.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.

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3. Substrate primers.
 4. Collars.
 5. Steel sleeves.
- C. Caulking, sealants, and adhesives applied on the interior of the building envelope shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a

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nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

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3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 - 1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.
- B. Marking and Identification: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces.
 - 2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partitions.
 - 3. Include lettering not less than 0.5 inch in height, incorporating the suggest wording: "fire and/or smoke barrier – protect all openings," or other wording.

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3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM LOCATION

- A. Provide assemblies as indicated on Drawings. Provide following products for additional locations not identified on Drawings.
- B. For penetrations by non combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following materials are acceptable:
 - 1. Hilti FS 601 Elastomeric Firestop Sealant.
 - 2. Hilti FS ONE High Performance Intumescent Firestop Sealant.
 - 3. 3M Fire Stop Sealant 2000 4. 3M Fire Barrier CP25 WB.
 - 4. Tremco Tremstop Fyre Sil Sealant.
 - 5. Or equal.
- C. For penetrations by combustible items (penetrants consumed by high heat flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems) the following materials are acceptable:
 - 1. Hilti FS ONE High Performance Intumescent Firestop Sealant.
 - 2. Hilti CP 618 Firestop Putty.
 - 3. Hilti CP 642 Firestop Jacket.
 - 4. Hilti CP 643 Firestop Jacket.
 - 5. 3M Fire Barrier CP25 WB.
 - 6. 3M Fire Barrier FS 195 Wrap/Strip.
 - 7. Tremco Tremstop WBM Intumescent Firestop Sealant.
 - 8. Or equal.

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- D. For penetrations by combustible plastic pipe (open piping systems), the following materials are acceptable:
1. Hilti CP 642 Firestop Jacket.
 2. Hilti CP 643 Firestop Jacket.
 3. Hilti FS ONE High Performance Intumescent Firestop Sealant.
 4. 3M Fire Barrier PPO Plastic Pipe Device.
 5. Or equal.
- E. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways' the following materials are acceptable:
1. Hilti FS 635 Trowelable Firestop Compound.
 2. Hilti FIRE BLOCK.
 3. 3M Firestop Foam 2001.
 4. 3M Fire Barrier CS 195 Composite Sheet.
 5. Or equal.

END OF SECTION 078413

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SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire-resistive joint systems for interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.
- B. Related Sections include the following:
 - 1. Division 7 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
 - 2. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
- C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Field quality-control test reports.

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- F. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC308, from the ICBO Evaluation Service.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

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1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fire-resistive joint systems that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fire-Resistive Joint Systems: Subject to compliance with requirements, provide one of the through-penetration firestop systems for each application that are produced by one of the following manufacturers.
 - 1. Hilti, Inc.
 - 2. Specified Technologies Inc.
 - 3. 3M; Fire Protection Products Division.
 - 4. Or equal.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

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3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.
- B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
 - 1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM LOCATION

- A. For fire rated construction joints and other gaps, the following materials are acceptable:
 - 1. FS 601 Elastomeric Firestop Sealant by Hilti.
 - 2. CP 601 s Elastomeric Firestop Sealant by Hilti.
 - 3. CP 606 Flexible Firestop Sealant by Hilti.
 - 4. CP 672 Firestop Joint Spray by Hilti.
 - 5. Firestop Sealant 2000 by 3M.
 - 6. Tremstop Fyre Sil Sealant by Tremco.
 - 7. Or equal.
- B. For openings between structurally separate sections of wall and floors. Top of walls, the following materials along with Thermafiber Safing are acceptable:
 - 1. FS 60t Elastomeric Firestop Sealant by Hilti.
 - 2. CP 601s Elastomeric Firestop Sealant by Hilti.
 - 3. CP 606 Flexible Firestop Sealant. by Hilti

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4. FS ONE High Performance Intumescent Firestop Sealant by Hilti.
 5. Fire Barrier CP 25 WB by 3M.
 6. Or equal.
- C. Firestopping at Electrical Boxes and Utility Outlets.
1. CP 618 Firestop Putty Stick by Hilti.
 2. CP 617 and CP 617L Firestop Putty Pad by Hilti.
 3. Or equal.

END OF SECTION 078446

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Qualification Data: For Installer.
- F. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

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- C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

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

1.6 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
- C. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 2 years.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Joint Sealants: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Sika Corporation
 - 2. Pecora Corporation.
 - 3. Bostik.
 - 4. Dow Corning Corp.
 - 5. GE Plastics.
 - 6. Sonneborn Building Products, ChemRex, Inc.
 - 7. Tremco, Inc.
 - 8. The Sherwin-Williams Company.
 - 9. Or equal.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants:
 - 1. As selected by Owner's Representative from manufacturer's full range.
 - 2. Areas where concrete joint sealant will be adjacent to concrete other than standard gray, sealant color shall match adjacent color as approved by Owner's Representative.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form-release agents from concrete.
 - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

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- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.
- I. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

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- J. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 CLEANING

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

3.5 PROTECTION

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

3.6 JOINT-SEALANT LOCATION

- A. General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component.
 - 1. Products:
 - a. SikaFlex 1A or 15LM by Sika Corp.
 - b. Dynatrol I-XL by Pecora.
 - c. Stampede 1 by The Sherwin-Williams Company.
 - 2. Color: Standard colors matching finished surfaces.
 - 3. Applications:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- B. Exterior Metal Lap Joint Sealant: Silicone, Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
 - 1. Products:
 - a. SikaSil WS-295 Silicone by Sika Corp.
 - b. 895 Silicone or Sil-Span by Pecora.
 - 2. Color: Standard colors matching finished surfaces.
 - 3. Applications:
 - a. Concealed sealant bead in sheet metal work.
 - b. Concealed sealant bead in siding overlaps.
- C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
 - 1. Products:

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- a. AC-20 manufactured by Pecora.
 - b. 950A manufactured by The Sherwin-Williams Company.
 2. Color: Standard colors matching finished surfaces.
 3. Applications:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- D. Interior Floor Joint Sealant: Polyurethane, chemically-curing, cold-applied, self-leveling elastomeric sealant; ASTM C 920, Grade P, Class 25, Uses T, M and A; two-part.
 1. Products:
 - a. SikaFlex 2C SL or NS with TG Additive by Sika Corp.
 - b. NR-200 self-leveling polyurethane and/or DYNATRED non-sag, traffic-grade polyurethane sealants by Pecora.
 - c. Stampede 2SL by The Sherwin-Williams Company.
 2. Primer: SikaFlex 429 Primer; P-150, P-75 or P-200.
 3. Color: Standard colors matching finished surfaces.
 4. Applications: Use for joints up to 1-1/2 inches.
 - a. Expansion joints in floors.
- E. Concrete Paving Joint Sealant: Polyurethane, chemically-curing, cold-applied, self-leveling elastomeric sealant; ASTM C 920, Class 25, Uses T, I, M and A; two-part.
 1. Products:
 - a. NR-200 Urexpand and/or DYNATRED non-sag, traffic-grade polyurethane sealant by Pecora or equal.
 - b. Stampede 2NS by The Sherwin-Williams Company.
 2. Primer: SikaFlex 429 Primer; P-150, P-75 or P-200.
 3. Color: Gray or Limestone.
 4. Applications:
 - a. Joints in sidewalks and vehicular paving.
- F. Butyl Sealant: ASTM C 920, Grade NS, Class 12-1/2, Uses NT, M, A, G, O; single component, solvent release, non-skinning, non-sagging.
 1. Products:
 - a. BC-158 sealant by Pecora.
 - b. WL Silicone Rubber by The Sherwin-Williams Company.
 2. Color: Standard colors matching finished surfaces.
 3. Movement Capability: Plus and minus 12-1/2 percent.
 4. Service Temperature Range: -13 to 180 degrees F.
 5. Shore A Hardness Range: 10 to 30.
- G. Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
 1. Products:
 - a. SikaSil WS 290 or WS 295 by Sika Corp.
 - b. 864 LM Architectural silicone or 890 silicone sealant by Pecora.
 - c. 790 by Dow Corning Corporation.
 - d. WL Silicone Ultra WL09210.
 2. Color: Standard colors matching finished surfaces.
 3. Movement Capability: Plus and minus 25 percent.
 4. Applications:

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- a. Interior or exterior for joints 1/8 to 1-1/2 inch wide.
- b. Exterior use at expansion joints in masonry where substantial movement is expected.
- c. Glazing application.

END OF SECTION 079200

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SECTION 081113 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
 - 2. Division 9 Section "Painting" for field painting hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.
- B. Other Action Submittals:
 - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference designation for details and openings as those on Drawings. Coordinate with door hardware schedule.
 - a. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - b. Indicated specific model number of door and frame.
 - c. Indicate steel sheet type (galvanized, non-galvanized, etc.)
 - d. Indicate door and frame type (A, A1, B, C, etc.)
 - e. Indicated hardware group.
 - f. Indicate dimensions and locations of mortises and holes for hardware.
 - g. Indicate dimensions and locations of cutouts.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with CBC 716.5 Opening Protection Ratings and Markings and NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL-10C.

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1. Temperature-Rise Limit: Where required, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure per CBC Section 716.5.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with CBC 716.5 Opening Protection Ratings and Marking and NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to CBC Section 716.6 Fire-Protection-Rated Glazing. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with CBC Section 716.5.5.1 Glazing in Exit Enclosure and Exit Passageway Doors.
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

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

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of steel doors and frames that fails in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:

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- a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- 2. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Doors and Frames: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Anemostat. (Basis of Design)
 - 2. Steelcraft; an Ingersoll-Rand company.
 - 3. Ceco Door Products; an Assa Abloy Group company.
 - 4. Curries Company; an Assa Abloy Group company.
 - 5. Or equal.
- B. Factory Finished Frames: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Timely Industries, a Division of SDS Industries, Inc. (Basis of Design).
 - 2. Or equal.

2.2 MATERIALS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications for interior doors and frames.
- C. Galvannealed (Metallic-Coated) Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; with minimum A60 metallic coating for exterior doors and frames.
- D. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

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- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection indicated.
 - b. Standard Core: Honeycomb, U-factor of 0.69, R-value of 1.45.
 - 3. Vertical Edges for Single-Acting Doors: Beveled edge.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
 - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
 - 7. Vision, Narrow Lite, Half Glass Doors: Size as indicated on Drawings.
- B. Exterior Doors: Face sheets fabricated from galvanized (metallic-coated) steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush):
 - a. Face thickness: 16 gage (0.053 inch).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless galvanized (metallic-coated) sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush):
 - a. Face thickness: 18 gage (0.042 inch).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frame: 16 gage (0.053-inch) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.

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1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded. Knocked down is not allowed.
 3. Frame: 16 gage (0.053-inch) thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

- A. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- B. Provide Screw-In Top Cap for exterior doors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances:
 - 1. Standard doors and frames: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

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- a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
- H. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
 - 1. Maximum Rate: 0.3 cfm/sq. ft. of area at an inward test pressure of 1.57 lbf/sq. ft.
 - 2. Maximum Rate: 0.1 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.

2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Field-Applied Paint Finish: Comply with Division 9 Section "Painting".

PART 3 - EXECUTION

3.1 EXAMINATION

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

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- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to CBC 716 and NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

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- g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

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3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

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SECTION 081216 - ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes interior aluminum frames for doors installed in gypsum board partitions.
- B. Related Sections include the following:
 - 1. Division 8 Section "Flush Wood Doors" for wood doors installed in interior aluminum frames.
 - 2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for aluminum-framed glass doors installed at exterior.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 2. Locations of reinforcements and preparations for hardware.
 - 3. Details of each different wall-opening condition.
 - 4. Details of anchorages, joints, field splices, and connections.
 - 5. Details of accessories.
 - 6. Details of moldings, removable stops, and glazing.
 - 7. Details of conduits and preparations for power, signal, and control systems.
- C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include similar Samples of seals, gaskets, and accessories involving color selection.
- D. Samples for Verification: For interior aluminum frames, prepared on Samples of size indicated below:
 - 1. Framing Member: 12 inches long.
 - 2. Corner Fabrication: 12-by-12-inch- long, full-size window corner, including full-size sections of extrusions with factory-applied color finish.
- E. Schedule: For interior aluminum frames. Coordinate with door hardware schedule and glazing.
- F. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain interior aluminum frames from single source from single manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

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1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver interior aluminum frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic. Store interior aluminum frames under cover at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum Frames and Windows: Subject to compliance with requirements, provide products by one of the following:
 - 1. Arcadia Inc. (Basis of Design)
 - 2. Western Integrated Materials, Inc. (Basis of Design)
 - 3. InFrame by Kawneer.
 - 4. Modulex, Inc; Division of Pacific National Group.
 - 5. RACO Interior Products, Inc.
 - 6. Or equal.

2.2 ALUMINUM FRAMES

- A. Product: AF300 Series by Arcadia or equal.
 - 1. Type: 2" X 3" Offset Glazed for 1/4" Glass storefront.
 - 2. Aluminum Framing: ASTM B 221, Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than 0.062 inch thick.
 - 3. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.
 - 4. Glazing Frames: Extruded aluminum, for glazing thickness indicated.
 - 5. Ceiling Tracks: Extruded aluminum.
 - 6. Trim: Extruded aluminum, not less than 0.062 inch thick, with removable snap-in casing trim and door stops without exposed fasteners.

2.3 ALUMINUM WINDOWS

- A. Product: 52 Series by Arcadia or equal.
 - 1. Type: Single/Double Hung Windows.

2.4 POCKET DOOR FRAMES

- A. Product: 300 Series Pocket Frame by Western or equal.
 - 1. Complete, pre-fabricated frame track built in, the rolling hardware and the trim.
 - 2. Compatible with the Western Integrated aluminum swing door or a wood or aluminum door.
 - 3. Frame and pocket are shipped completely assembled, less door and pull.
 - 4. Pocket cavity is completely incombustible.
 - 5. Snap on trim can be removed to allow for the installation of a replacement door.
 - 6. Floor anchor at the pocket opening allows for precise spacing of the pocket opening.

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7. 2" profile snap on trim completes an appealing look, designed to closely resemble door frames.
8. Gypsum boards are installed after the frame, allowing all the rough work to be completed prior to installation of the finish trim.

2.5 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. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate glazing thickness indicated.
- C. Glazing: Comply with requirements in Division 8 Section "Glazing."

2.6 FABRICATION

- A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.
- B. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
 1. Locate removable stops on the inside of spaces accessed by keyed doors.
- C. Fabricate components to allow secure installation without exposed fasteners.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 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. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of the Work.
- B. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install interior aluminum frames plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.
- B. Set frames accurately in position and plumbed, aligned, and securely anchored to substrates.
- C. Install frame components in the longest possible lengths; components up to 72 inches long must be one piece.
 - 1. Fasten to suspended ceiling grid on maximum 48-inch centers, using sheet metal screws or other fasteners approved by frame manufacturer.
 - 2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
 - 3. Secure clips to extruded main-frame components and not to snap-in or trim members.
 - 4. 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.

END OF SECTION 081216

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid-core doors.
- B. Related Sections include the following:
 - 1. Division 8 Section "Steel Doors and Frames" steel door frames.
 - 2. Division 8 Section "Aluminum Frames" for interior aluminum frames.
 - 3. Division 8 Section "Door Hardware" for door hardware.
 - 4. Division 8 Section "Glazing" for glass view panels in flush wood doors.
 - 5. Division 9 Section "Painting" for field painting of doors.

1.2 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.
- B. Other Action Submittals:
 - 1. Schedule: Provide a schedule of flush wood door work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
 - a. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - b. Indicated specific model number of door and frame.
 - c. Indicated hardware group.
 - d. Indicate dimensions and locations of mortises and holes for hardware.
 - e. Indicate dimensions and locations of cutouts.
 - f. Indicate fire ratings for fire doors.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with NWWDA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. Performance duty Level: Extra Heavy Duty.
 - 2. Factory machined for door hardware and high density hardware blocking.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.

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- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

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

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch top to bottom, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty:
 - a. Solid-Core Interior Doors: Life of installation.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Flush Wood Doors: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Masonite (Marshfield-Algoma, Graham-Maiman) Inc. (Basis of Design)
 - 2. Eggers Industries; Architectural Door Division (VT Industries).
 - 3. Marlite.
 - 4. Haley Brothers, Inc.
 - 5. Or equal.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Adhesives: Do not use adhesives containing urea formaldehyde.
- B. Doors for Opaque Finish:
 - 1. Grade: Custom.
 - 2. Faces for Interior Doors: Medium-density overlay.
 - 3. Apply medium-density overlay to standard thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.

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2.3 SOLID-CORE DOORS

- A. Core:
 - 1. Structural-Composite-Lumber-Core: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
 - 2. Fire-Resistant Composite Core.
- B. Doors:
 - 1. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- C. Hardboard-Faced Doors:
 - 1. Construction: Three plies with stiles and rails bonded to core, then entire unit abrasive planed before faces are applied.

2.4 DOOR FRAMES

- A. Aluminum Frames: Comply with Division 8 Section "Aluminum Frames".
- B. Steel Frames: Comply with Division 8 Section "Steel Doors and Frames".

2.5 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Field-Finished Doors: Refer to the following for finishing requirements:
 - 1. Division 9 Section "Painting."

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Sections include the following:
 - 1. Division 9 Section "Painting" for field applied finishes.

1.2 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Size Variations: Obtain Owner's Representative's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of access doors and frames that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

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- a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 3 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Access Doors and Frames: Subject to compliance with requirements, provide products by one of the following:
- 1. Acudor.
 - 2. Milcor Inc.
 - 3. Nystrom, Inc.
 - 4. Karp Associates Inc.
 - 5. MIFAB.
 - 6. Or equal.

2.2 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- 1. ASTM A 123, for galvanizing steel and iron products.
 - 2. ASTM A 153, for galvanizing steel and iron hardware.
- B. Steel Sheet: Cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.
- C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- 1. Factory Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Field Finish: Factory prime for field painting as specified in Division 9 "Painting".
- D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Recessed Door to Receive Drywall Type:
- 1. Fire-Rated: Model 450FR by Karp.
 - 2. Non-Fire-Rated: Model RDW by Karp.
 - a. Stainless steel in wet areas.
 - b. 14 gage steel frame and shall be 16 gage steel doors in other areas.
 - 3. Door shall be recessed 1 inch.

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4. Trim shall be galvanized steel dry wall bead.
5. Hinge shall be concealed pivoting rod type.
6. Locks shall be flush and screwdriver operated with stainless steel cam and studs, or shall be key operated cylinder lock with automatic dust shutter.
7. Finish shall be prime coat of rust inhibitive electrostatic powder, baked grey coat.
8. Door Sizes: As indicated on Drawings.
9. Field Finish: Comply with Division 9 Section "Painting".

B. Flange Type:

1. Fire-Rated: Model KRP-250 by Karp.
2. Non-Fire-Rated: Model DSC-214M by Karp.
 - a. Stainless steel in wet areas.
 - b. 14 gage steel frame and shall be 16 gage steel doors in other areas.
3. Flange: One-piece construction, 3/4 inch wide.
4. Hinge shall be concealed continuous piano hinge.
5. Locks shall be flush and screwdriver operated with stainless steel cam and studs, or shall be key operated cylinder lock with automatic dust shutter.
6. Finish shall be prime coat of rust inhibitive electrostatic powder, baked grey coat.
7. Door Sizes: As indicated on Drawings.
8. Field Finish: Comply with Division 9 Section "Painting".

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.5 FINISHES

- A. Field finish per Division 9 Section "Painting".

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of electric-motor-operated overhead coiling doors:
 - 1. Counter doors.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for lock cylinders and keying.

1.2 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes.
- D. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Curtain Slats: 12 inches long.
 - 2. Bottom Bar: 6 inches long.
 - 3. Guides: 6 inches long.
 - 4. Brackets: 6 inches square.
 - 5. Hood: 6 inches square.
- E. Qualification Data: For Installer.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.

1.4 WARRANTY

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- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of overhead coiling doors that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Overhead Coiling Doors: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Cookson Cornell. (Basis of Design).
 - 2. Overhead Door Corp.
 - 3. CHI.
 - 4. Or equal.

2.2 COUNTER DOORS

- A. Product: Type ERC20, Integral frame and sill by Cookson Cornell or equal.
 - 1. Smoke Detector Activated:
 - a. Auto Test Doors with Test-A-Fire System.
 - b. Motor Operated Counter Fire Door.
 - 2. Curtain Slats: 20 gauge 300 series stainless steel: #4 finish.
 - 3. Counter:
 - a. The rolling counter fire door shall include the Firestop Fire Rated Countertop and shall include the following:
 - 1) The Firestop countertop shall be a uniform 1-5/8" thick throughout and shall be labeled for 1-1/2 hour on interior openings.
 - 2) The top and edge surfaces shall be stainless steel.
 - 3) Any notching of the countertop shall be performed by the installing distributor.
- B. Motor Operation:
 - 1. AlarmGard Advanced Fire Shutter Motor Operation: UL, listed NEMA 1 enclosure, horsepower as recommended by manufacturer. Provide a totally enclosed non ventilated motor, removable without affecting the setting of limit switches; thermal overload protection, planetary gear reduction, adjustable rotary limit switch mechanism and a transformer with 24v secondary output. All internal electrical components are to be prewired to terminal blocks.
 - 2. Provide a failsafe motor operated door assembly requiring no ancillary or externally mounted release devices, cables, chains, pulleys, reset handles or mechanisms.
 - 3. Provide an internal electrical failsafe release device that requires no additional wiring, external cables or mounting locations.

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4. Provide an internal solenoid brake mechanism to hold the door at any position during normal door operation.
5. Provide logic for fully monitored safety reversing devices such that the failure of any single monitored device will cause the motor operator to automatically revert to constant pressure to close.
6. Electrically activate door system automatic closure by notification from central alarm system.
7. Provide an automatic alarm closure selectable time delay of zero or ten seconds.
8. Control automatic closure speed with an internal, totally enclosed, variable rate centrifugal governor without the use of electrical pulsation, constant rate viscosity, oscillation type or other exposed governing devices.
9. Maintain automatic closure speed at not more than 9" (229 mm) per second
10. Enable safety edge function during alarm closing while power is present for 3 cycles. Enable door to rest upon obstruction following this sequence.
11. Electrically reset internal failsafe release device and door operating system upon restoration of electrical power and upon clearing of the alarm signal without requiring human supervision.
12. Provide selectable ability for the door system to automatically self-cycle to the fully open position following automatic reset without requiring human supervision
13. Provide an integral, non-resettable cycle counter.
14. Ensure that manual resetting of spring tension, release devices, linkages or mechanical dropouts will not be required.
15. Provide minimum #50 roller chain for drive connection from motor drive assembly to the door drive shaft
16. Install system only with manufacturer supplied or specified fasteners.
17. Notify electrical contractor to mount control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the door system wiring instructions
18. Drop test and reset door system twice by all means of activation and comply fully with NFPA 80 Section 5

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

3.2 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

END OF SECTION 083323

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum-framed storefronts.
 - 2. Manual-swing aluminum doors: Medium and wide stile entrances.
 - 3. Aluminum windows.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
 - 2. Division 8 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 4. Dimensional tolerances of building frame and other adjacent construction.
 - 5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units to function properly.
- B. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
- C. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

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1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not less than 10 seconds.
- D. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- E. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- F. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.
- G. Average Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having average U-factor of not more than 0.69 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
1. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
 2. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.
- D. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units

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in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

- B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- C. Accessible Entrances: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water leakage through fixed glazing and framing areas.
 - e. Failure of operating components to function properly.
 - 2. Warranty Period: 2 years.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
- C. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Entrance, Storefronts, and Windows: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Arcadia Inc. (Basis of Design)
 - 2. Kawneer.
 - 3. EFCO Corporation.
 - 4. US Aluminum.
 - 5. Vistawall Architectural Products.
 - 6. Or equal.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

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- E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.
- F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.
- G. Product: AG451 Series by Arcadia or equal.
 - 1. 2" x 4½" Non-Thermal; center glazed, screw spline, shear block, compensating stick or punched opening fabrication for 1" glass.
 - 2. Framing Materials and Accessories:
 - a. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10a T6).
 - b. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM.A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
 - 3. Glazing Gasket:
 - a. Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
 - b. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.
 - 4. Fabrication:
 - a. Continuous sub-sill shall be provided under sill members to collect water infiltration and divert from the interior of the system.
 - b. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
 - c. Fasteners shall be so located as to ensure concealment from view in the final assembly.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 DOORS AND FRAMES

- A. Products:
 - 1. MS362 Series, Medium Stile Door by Arcadia.
 - a. Frame thickness: 1-3/4 inches.
 - b. Vertical Stiles: 3-1/2 inches.
 - c. Top Rail: 3-5/8 inches.

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- d. Bottom Rail: 10-1/2 inches.
 2. WS512 Series, Wide Stile Door by Arcadia.
 - a. Frame thickness: 1-3/4 inches.
 - b. Vertical Stiles: 5 inches.
 - c. Top Rail: 5-1/8 inches.
 - d. Bottom Rail: 10-1/2 inches.
 3. Glazing Stops: Square snap-in type.
 4. Glazing: As specified in Division 8 Section "Glazing".
 5. Glazing Gasket: Compression-type design.
 6. Major portions of the door stiles a nominal .125 inches and glass stops .050 inches thick.
 7. Door members: Extruded 6063-T6 aluminum alloy (ASTM B221-Alloy G.S. 10a T6).
 8. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164. Shall be aluminum or steel, providing the steel is properly isolated from aluminum.
 9. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, with optional MIG weld. Exposed screws not permitted.
 10. Each door leaf equipped with an adjusting mechanism, located in the top rail near the lock stile.
 11. Prepare internal reinforcement for door hardware.
 12. Weatherstripping: Hard-backed poly pile in door and/or frame. Meeting stile of all pair of doors have a double line hard-backed poly-pile astragal.
- B. Door Hardware: Factory hardware and as specified in Division 8 Section "Door Hardware."
 1. Door hardware supplier shall be responsible for furnishing physical hardware to the entrance manufacturer prior to fabrication, and for coordinating hardware delivery requirements with the hardware manufacturer, the general contractor and the entrance manufacturer to insure the building project is not delayed. Coordinate master-keyed requirements.

2.6 WINDOWS

- A. Products: 52 Series single hung windows by Arcadia or equal.
- B. Products: AF300 Series fixed windows by Arcadia or equal.

2.7 ACCESSORY MATERIALS

- A. Insulating Materials: As specified in Division 7 Section "Building Insulation."
- B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

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2.8 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).
- E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Doors: Reinforce doors as required for installing hardware.
 - 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Hardware Installation:
 - 1. Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
 - 2. Hardware supplier shall furnish hardware to door manufacturer prior to fabrication and coordinate hardware delivery with door manufacturer to insure project is not delayed.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 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.

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- C. Interior Application:
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- D. Exterior Application:
 - 1. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - a. Color: Dark bronze to match existing as approved by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, without warp or rack.
- F. Entrances: Install to produce smooth operation and tight fit at contact points.
 - 1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.

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2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- G. Install insulation materials as specified in Division 7 Section "Building Insulation."
- H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.
- I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:
 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

END OF SECTION 084113

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SECTION 086210 - TUBULAR SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Tubular skylights.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings.
- C. Verification Samples: As requested by Architect.
- D. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular skylights for minimum 10 years.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of tubular skylights that fails in materials or workmanship within specified warranty period.

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1. Warranty Period: 10 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Tubular Skylights: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 1. Solatube International, Inc (Basis of Design)
 2. Tru-Lite.
 3. Velux.
 4. Or equal.

2.2 TUBULAR SKYLIGHTS

- A. Product: Model 750 DS-C (penetrating ceiling) by Solatube or equal.
 1. Tubular Daylighting Devices General : Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ATI Evaluation Service, Code Compliance Research Report.
 2. SolaMaster Series: Solatube Model 750 DS-C Penetrating Ceiling, 21 inch Daylighting System:
 - a. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - 1) Outer Dome Glazing: Type DA, 0.125 inch minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.
 - 2) Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
 - b. Roof Flashing Base:
 - 1) One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653 or ASTM A 463 or AST A792, 0.028 inch plus or minus .006 inch thick.
 - a) Base Style: Type F11, Self-mounted, 11 inches high.
 - c. Flashing Insulator: Type FI, Thermal isolation material for use under flashing.
 - d. Tube Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
 - e. Dome Seal: Adhesive backed weatherstrip 0.63 inch tall by 0.28 inch.
 - f. Reflective Tubes: Aluminum sheet, thickness 0.018 inch.
 - 1) General:
 - a) Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Specular reflectance for visible spectrum (400 nm to 760 nm) greater than 99 percent. Total solar spectrum reflectance (400 nm to 2500 nm) less than 80.2 percent.

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- b) Color: a^* and b^* (defined by CIE $L^*a^*b^*$ color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
 - 2) Top Tube Angle Adapter and Bottom Tube Angle Adapter Kit, Type AK:
 - a) Reflective 45 degree adjustable top and bottom angle adapters (one each), 16 inches long
 - 3) Extension Tube:
 - a) Reflective extension tube, Type EXX, Notched for Open Ceiling diffuser attachment, 24 inches or 48 inches long.
- g. Diffuser Assemblies for Tubes Penetrating Ceilings: Solatube Model 750 DS-C. Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube; 23.8 inches by 23.8 inches square frame to fit standard suspended ceiling grids or hard ceilings.
 - 1) Round to square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch thick.
 - 2) Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.022 inch thick. Classified as CC2.
 - 3) Supplemental Natural Effect Lens made of acrylic, classified as CC2, Class C, 0.060 inch thick, with open cell foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283.
- h. Accessories:
 - 1) Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.
 - 2) Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.
 - a) Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02: circuited, 4 conductor, size 22 cable; providing daylight output between 2 and 100 percent. Provided with dimmer switch and cable.
 - b) Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: only one switch is required per set of synchronously controlled dimmers.
 - c) Cable: Type CA, Two conductor low voltage cable (500 foot) for multiple unit DC connection.
- i. Fire-rated flexible Insulation blanket composed of high temperature fibers classified as a component in firestop designs for fire resistance rated floors, ceilings, and walls. A Fire-rated flexible Insulation wrap with fire rated sealant may be used to provide a fire-rated enclosure for the Solatube TDD. The material supplier may be able to provide an Engineering Judgement for specific projects. Consult with the material supplier and the building official, architect, or other AHJ on the project to confirm application suitability before proceeding.
 - 1) 3M™ Fire Barrier Duct Wrap 615+
 - 2) 3M Fire Barrier Sealant CP 25WB+
 - 3) FyreWrap® Elite® 1.5
 - 4) Or equal.

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2.3 ACCESSORIES

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 086210

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SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Mechanical and electrified door hardware

1.02 REFERENCES

- A. UL, LLC

- 1. UL 10B - Fire Test of Door Assemblies
- 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
- 3. UL 1784 - Air Leakage Tests of Door Assemblies
- 4. UL 305 - Panic Hardware

- B. DHI - Door and Hardware Institute

- 1. Sequence and Format for the Hardware Schedule
- 2. Recommended Locations for Builders Hardware
- 3. Keying Systems and Nomenclature
- 4. Installation Guide for Doors and Hardware

- C. NFPA – National Fire Protection Association

- 1. NFPA 70 – National Electric Code
- 2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
- 3. NFPA 101 – Life Safety Code
- 4. NFPA 105 – Smoke and Draft Control Door Assemblies
- 5. NFPA 252 – Fire Tests of Door Assemblies

- D. ANSI - American National Standards Institute

- 1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
- 2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
- 3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
- 4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
- 5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

- E. 2025 California Building Code

- 1. Chapter 11B – Accessibility to Public Buildings, Public Accommodations. Commercial Buildings and Public Housing.

1.03 SUBMITTALS

- A. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
3. Door Hardware Schedule: Submit with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI. Indicate complete designations of each item required for each door or opening, include all notes and operational descriptions from hardware groups.
4. Key Schedule: After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
5. Templates: After final approval of hardware schedule, provide for doors, frames and other work specified to be factory or shop prepared for door hardware installation.
6. Inspection and Testing: Submit written reports of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80 and NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Supplier: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

B. Certifications:

1. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80, UL 10C, and requirements of authorities having jurisdiction.
2. Smoke and Draft Control Door Assemblies: Provide door hardware that meets requirements of assemblies tested according to UL 1784 and NFPA 105.
3. Accessibility Requirements: This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference: Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
2. Pre-installation Conference: Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays. Coordinate door hardware with other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping. Deliver keys to manufacturer of key control system for subsequent delivery to Owner
- B. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint,

WEST END REGIONAL NAVIGATION CENTER

solvent, cleanser, or any chemical agent. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

1.06 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant. Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- C. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide products from manufacturers listed in hardware groups. Additional alternate products require prior written approval from Owner and are contingent upon those products providing all functions, features, and meeting all requirements of scheduled manufacturer's product.

2.02 MATERIALS

- A. Provide hardware with options specified in the hardware sets, fasteners provided by hardware manufacturer, strikes provided by hardware manufacturer, drop plates, special templates, and other devices necessary for proper hardware installation.
- B. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide each electrified hardware item and wire harnesses with enough and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware.

2.03 HINGES: IVES 5BB SERIES

- A. Provide 5-knuckle plain bearing hinges conforming to ANSI/BHMA A156.1. Provide hinges in the size, quantity, weight, and base metal according to manufacturer's published recommendations. Provide non-removable pins at out-swinging lockable doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

2.04 SPRING HINGES: IVES 3SP SERIES

- A. Provide spring hinges conforming to ANSI/BHMA A156.1. Provide spring hinges in the size, quantity, weight, and base metal according to manufacturer's published recommendations. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

2.05 ELECTRIC POWER TRANSFER: VON DUPRIN EPT-10 SERIES

- A. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 DOOR CORDS: SCHLAGE 788/798 SERIES

- A. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.07 FLUSH BOLTS: TRIMCO

- A. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.08 COORDINATORS: IVES

- A. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets.

2.09 MORTISE LOCKS: SCHLAGE L9000 SERIES

- A. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.

2.10 CYLINDRICAL LOCKS: SCHLAGE ND SERIES

- A. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.

2.11 EXIT DEVICES: VON DUPRIN 98/35A SERIES

- A. Provide smooth touchpad exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware. Touchpad must extend a minimum of one half of door

width. Provide exit devices cut to door width and height with flush end caps. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.12 ELECTRIC STRIKES: VON DUPRIN 6000 SERIES

- A. Provide electric strikes designed for use with type of locks shown at each opening, UL Listed as burglary resistant and tested to a minimum endurance test of 1,000,000 cycles. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.13 POWER SUPPLIES: SCHLAGE/VON DUPRIN PS900 SERIES

- A. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
- B. Scheduled Manufacturer and Product: **Schlage Everest 29 S**
- C. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein. Provide Conventional Patented Open: cylinder with **permanent interchangeable** core with open keyway.

2.14 KEYING:

- A. **NEW SYSTEM:** Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. As Directed by Owner: Provide permanent cylinders/cores keyed by the manufacturer according to the Master Keying system and forward to Owner separately from keys. Forward bitting list and keys separately from cylinders in proper quantities. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts. Failure to comply with these requirements will be cause for replacement of cylinders/cores/keys involved at no additional cost to Owner.

2.15 KEY CONTROL SYSTEM: TELKEE

- A. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.

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2.16 SURFACE CLOSERS: LCN 1460 SERIES

- A. Provide cast iron door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.

2.17 DOOR TRIM: TRIMCO

- A. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.18 PROTECTION PLATES: TRIMCO

- A. Provide protection plates with beveled four edges as scheduled. Size plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS: GLYNN-JOHNSON

- A. Provide overhead stop at doors where specified and where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.20 THRESHOLDS, WEATHERSTRIPPING, AND GASKETING: ZERO INTERNATIONAL

- A. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items. Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

2.21 SILENCERS: TRIMCO

- A. Provide "push-in" type silencers for hollow metal or wood frames. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame. Omit where gasketing is specified.

2.22 MAGNETIC HOLDERS: LCN

- A. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.23 DOOR POSITION SWITCHES: SCHLAGE

- A. Provide door position switches as specified. Coordinate door and frame preparations with door and frame suppliers.

2.24 FINISHES

- A. Provide hardware with finishes as indicated in hardware sets.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.
- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

3.02 PREPARATION

- A. Where on-site modification of doors and frames is required, prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - 1. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - 2. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - 3. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install hardware in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

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- D. Lock Cylinders: Install construction cores to secure building and areas during construction period. Replace construction cores with permanent cores as indicated in keying section. Furnish permanent cores to Owner for installation.
- E. Coordinate Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for wiring and connections of related components.
- F. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- G. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- H. Stops: Do not mount floor stops where they may impede traffic or present tripping hazard.

3.04 FIELD QUALITY CONTROL

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

3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to 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.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:


END OF SECTION

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149750 OPT0484714 Version 2

Legend:

 Link to catalog cut sheet










 Electrified Opening

Hardware Group No. 001

For use on Door #(s):

166

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		630	IVE
1	EA	CLASSROOM LOCK	L9070T 17A		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER
3	EA	SILENCER-METAL	1229A			TRM

Hardware Group No. 002

For use on Door #(s):









122

157A

157B

161

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	224XY		628	IVE
1	EA	PANIC HARDWARE	CD-PA-AX-3549A-EO-LBL		626	VON
1	EA	PANIC HARDWARE	CD-PA-AX-3549A-T-360T-LBL-CYL		626	VON
3	EA	FSIC CORE	23-030		626	SCH
1	EA	MORT CYLINDER HOUSING	26-064		626	SCH
2	EA	MORTISE CYLINDER	26-064 X XQ11-948 36-083		626	SCH
1	EA	OFFSET PULL	1191-3		630	TRM
2	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
2	EA	PA MOUNTING PLATE	1460-18PA SRT		689	LCN
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR AS DETAILED		A	ZER

WEATHER SEAL AND EDGE SEAL BY ALUMINUM DOOR AND FRAME MANUFACTURER










WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 003

For use on Door #(s):

158A

Provide each SGL door(s) with the following:










QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		630	IVE
1	EA	ENTRANCE W/DEADBOLT	L9453T 17A 17A 09-544		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER

Hardware Group No. 004

For use on Door #(s):

225

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	AX-98-L-NL-17		605/63 0	VON
1	EA	RIM CYLINDER	20-057		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER

NEW HARDWARE TO PREFIT TO EXISTING FRAME - FIELD VERIFY EXISTING CONDITION AND COMPATIBILITY

WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 005

For use on Door #(s):

186A 187A 188A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8		✓ 652	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-AX-98-L-NL-F-17-ALK 9-VOLT BATTERY WITH HARDWIRED OPTION		✓ 630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	MORTISE CYLINDER	20-061		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER
1	EA	DOOR CONTACT	679 SERIES		✓ BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS		✓	VON

LOCAL ALARM ALK TO BE HARDWIRED TO POWER SUPPLY PS902

Hardware Group No. 006

For use on Door #(s):

171A 189A 219

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8		✓ 630	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-AX-98-L-NL-F-17-ALK 9-VOLT BATTERY WITH HARDWIRED OPTION		✓ 630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	MORTISE CYLINDER	20-061		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER
1	EA	DOOR CONTACT	679 SERIES		✓ BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS		✓	VON

EXISTING DOOR AND FRAME TO BE MODIFIED FOR NEW SPECIFIED HARDWARE - FIELD VERIFY EXISTING CONDITION

LOCAL ALARM ALK TO BE HARDWIRED TO POWER SUPPLY PS902










WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 007

For use on Door #(s):

111A

Provide each SGL door(s) with the following:









QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	LD-AX-98-L-17		605/630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER

Hardware Group No. 008

For use on Door #(s):

100A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	PANIC HARDWARE	CD-35A-NL-OP-388		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	MORTISE CYLINDER	26-064 X XQ11-948 36-083		626	SCH
1	EA	OFFSET PULL	1191-3		630	TRM
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	PA MOUNTING PLATE	1460-18PA SRT		689	LCN
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	547A-NH-223		A	ZER

EXISTING ALUMINUM STOREFRONT DOOR AND FRAME TO REMAIN AND REUSED
WEATHER SEAL AND DOOR SWEEP TO BE PROVIDED BY ALUMINUM DOOR AND FRAME
MANUFACTURER

NEW HARDWARE TO PREFIT EXISTING ALUMINUM STOREFRONT DOOR AND FRAME - FIELD
VERIFY EXISTING CONDITION AND COMPATIBILITY




WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 009

For use on Door #(s):

101	102	159	160	402	403
406	407	410	422	423	

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		651	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	FLOOR STOP	1211		626	TRM




WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 010

For use on Door #(s):

106	107	137	169	170	412
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Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S SPA OS-OCC		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	WALL BUMPER	1270CV		626	TRM





WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
PRIVACY WITH INDICATOR "VACANT/OCCUPIED"

Hardware Group No. 011

For use on Door #(s):

114A	162A	175	182
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Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S SPA OS-OCC		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	1461 FC		689	LCN

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
PRIVACY WITH INDICATOR "VACANT/OCCUPIED"





WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 012

For use on Door #(s):

189B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	FIRE EXIT HARDWARE	AX-98-L-BE-F-17		605/630	VON
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM










WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 013

For use on Door #(s):

111B 124

Provide each PR door(s) with the following:








QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	AX-9827-EO-F-LBR-499F		626	VON
1	EA	FIRE EXIT HARDWARE	AX-9827-L-F-LBRAFL-17-499F		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
2	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
2	EA	MEETING STILE	328AA		AA	ZER

Hardware Group No. 013-DE

For use on Door #(s):

154 185A 185B 206A 206B

Provide each DE door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	AX-9827-EO-F-LBR-499F		626	VON
1	EA	FIRE EXIT HARDWARE	AX-9827-EO-F-LBRAFL-499F		626	VON
2	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
2	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
2	EA	ASTRAGAL	41AA		AA	ZER











WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 014

For use on Door #(s):

174

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	AX-9827-EO-F-LBR-499F		626	VON
1	EA	FIRE EXIT HARDWARE	AX-9827-L-F-LBRAFL-17-499F		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
2	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
2	EA	MAG HOLDER	SEM 7800 SERIES		689	LCN
1	EA	GASKETING	188FSBK PSA		BK	ZER
2	EA	MEETING STILE	328AA		AA	ZER





MAGNETIC HOLD OPEN TO INTERFACE WITH FIRE LIFE SAFETY SYSTEM

Hardware Group No. 015

For use on Door #(s):

118A 120 144 145 146 149
150 151

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	FLOOR STOP	1211		626	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER










WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 016

For use on Door #(s):

121A

Provide each DD door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	SPRING HINGE	3SP1 4.5 X 4.5		652	IVE
2	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10	 ⚡	689	VON
1	EA	EU STOREROOM LOCK	ND80TDEU SPA CON 12V/24V DC	 ⚡	626	SCH
1	EA	SGL CYL DEADLATCH	B250TD		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SHCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	1211		626	TRM
1	EA	POWER SUPPLY	PS902	 ⚡	LGR	SCE







WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
DUTCH DOOR - TOP LEAF - B250TD AND BOTTOM LEAF ND80TDEU
BOTTOM LEAF - SPRING HINGE
BOTTOM LEAF - EPT PREP FOR ELECTRIFIED LOCK
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 017

For use on Door #(s):

127 142 147

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188S-BK		S-Bk	ZER









WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 018

For use on Door #(s):
419

Provide each PR door(s) with the following:






QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	SET	AUTO FLUSH BOLT	3800 SERIES		626	TRM
1	EA	DUST PROOF STRIKE	DP1		626	IVE
1	EA	PASSAGE SET	ND10S SPA		626	SCH
2	EA	DUST PROOF STRIKE	3910/3910N /3911		630	TRM
1	EA	COORDINATOR	3094 SERIES X 3094 FILLER BAR		BLK	TRM
2	EA	MOUNTING BRACKET	3095/3096		BLK	TRM
2	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	ASTRAGAL	41AA		AA	ZER

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 019

For use on Door #(s):
126 220

Provide each SGL door(s) with the following:







QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	1211		626	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 019-RP

For use on Door #(s):
226

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	AX-98-L-NL-F-17		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER






WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 020

For use on Door #(s):

115 116

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	WALL BUMPER	1270CV		626	TRM






WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 021

For use on Door #(s):

108A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	WALL BUMPER	1270CV		626	TRM






WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 022

For use on Door #(s):

411

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER






WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 023

For use on Door #(s):

105

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM





WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 024

For use on Door #(s):

148

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S SPA		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM



WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 025

For use on Door #(s):

400 413 414 418

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S SPA		626	SCH
1	EA	FLOOR STOP	1211		626	TRM










WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 026

For use on Door #(s):
158B

Provide each SGL door(s) with the following:











QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW8	 ⚡	652	IVE
1	EA	EU STOREROOM LOCK	ND80TDEU SPA 12V/24V DC	 ⚡	626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	1211		626	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05WD	 ⚡	BLK	SCE
1	EA	POWER SUPPLY	PS902	 ⚡	LGR	SCE

CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 027

For use on Door #(s):
165

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW8	 ⚡	652	IVE
1	EA	EU STOREROOM LOCK	ND80TDEU SPA 12V/24V DC	 ⚡	626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	GASKETING	188FSBK PSA		BK	ZER
1	EA	DOOR CONTACT	679-05WD	 ⚡	BLK	SCE
1	EA	POWER SUPPLY	PS902	 ⚡	LGR	SCE










CARD READER AND WIRING BY ACCESS CONTROL SYSTEM
OVERHEAD STOP

WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 028

For use on Door #(s):
108B

Provide each SGL door(s) with the following:







QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	ELECTRIC HINGE	5BB1 5 X 4.5 TW8	 ⚡	652	IVE
1	EA	EU STOREROOM LOCK	ND80TDEU SPA 12V/24V DC	 ⚡	626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	DOOR CONTACT	679 SERIES	 ⚡	BLK	SCE
1	EA	POWER SUPPLY	PS902	 ⚡	LGR	SCE

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
OVERHEAD STOP
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 029

For use on Door #(s):
416

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
KICK PLATE ON BOTH SIDE

WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 030

For use on Door #(s):

100B 117B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	ELECTRIC HINGE	5BB1 5 X 4.5 TW8	✓	652	IVE
1	EA	EU STOREROOM LOCK	ND80TDEU SPA 12V/24V DC	✓	626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	FLOOR STOP	1211		626	TRM
1	EA	DOOR CONTACT	679 SERIES	✓	BLK	SCE
1	EA	POWER SUPPLY	PS902	✓	LGR	SCE

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 031

For use on Door #(s):

117A 118B 177A 177B 178A 421

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW8	✓	652	IVE
1	EA	EU STOREROOM LOCK	ND80TDEU SPA 12V/24V DC	✓	626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	FLOOR STOP	1211		626	TRM
1	EA	DOOR CONTACT	679 SERIES	✓	BLK	SCE
1	EA	POWER SUPPLY	PS902	✓	LGR	SCE

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 032

For use on Door #(s):

103 109 113 136 176 427

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	WALL BUMPER	1270CV		626	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER





WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 033

For use on Door #(s):

112

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	OH STOP	100S		630	GLY









WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 034

For use on Door #(s):

110 152 153 221 222 223
227

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	SET	AUTO FLUSH BOLT	3800 SERIES		626	TRM
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	DUST PROOF STRIKE	3910/3910N /3911		630	TRM
1	EA	COORDINATOR	3094 SERIES X 3094 FILLER BAR		BLK	TRM
2	EA	MOUNTING BRACKET	3095/3096		BLK	TRM
2	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
2	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
1	EA	ASTRAGAL	41AA		AA	ZER

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER










WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 034-MHO

For use on Door #(s):

123

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	SET	AUTO FLUSH BOLT	3800 SERIES		626	TRM
1	EA	CLASSROOM LOCK	ND70TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	DUST PROOF STRIKE	3910/3910N /3911		630	TRM
1	EA	COORDINATOR	3094 SERIES X 3094 FILLER BAR		BLK	TRM
2	EA	MOUNTING BRACKET	3095/3096		BLK	TRM
2	EA	SURFACE CLOSER	1461 EDA FC		689	LCN
2	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
2	EA	MAG HOLDER	SEM 7800 SERIES		689	LCN
1	EA	ASTRAGAL	41AA		AA	ZER






WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
MAGNETIC HOLD OPEN TO INTERFACE WITH FIRE LIFE SAFETY SYSTEM

Hardware Group No. 035

For use on Door #(s):

167

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	WALL BUMPER	1270CV		626	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
DOOR CLOSER WITH BUILT-IN STOP





WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 036

For use on Door #(s):

425 426

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH/PULL PLATE HEAVY DUTY COMBO	1895-4 (4" X 16") WITH PULL 8" CTC		630	TRM
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	WALL BUMPER	1270CV		626	TRM

STONE THRESHOLD BY FLOOR SECTION






WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 036-2

For use on Door #(s):

135 138 179 180

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S SPA		626	SCH
1	EA	SURFACE CLOSER	1461 FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 1" LDW		630	TRM
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	WALL BUMPER	1270CV		626	TRM

STONE THRESHOLD BY FLOOR SECTION





WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 037

For use on Door #(s):

114B 162B 183 193 201 211
409

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	OH STOP	90S		630	GLY

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER









WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 038

For use on Door #(s):

163 164 177C

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	MANUAL FLUSH BOLT - BOTTOM	3915 X 12"		626	TRM
1	EA	MANUAL FLUSH BOLT - TOP	3915 X 24"		626	TRM
1	EA	STOREROOM LOCK	ND80TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	DUST PROOF STRIKE	3910/3910N /3911		630	TRM
2	EA	OH STOP	90S		630	GLY
1	EA	ASTRAGAL	41AA		AA	ZER






WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 039

For use on Door #(s):

128	129	130	131	132	133
134	139	140	141	168	171B
172	173	181	184	186B	187B
188B	190	191	192	195	196
197	198	199	200	203	204
205	208	209	210	213	214
215	216	217	218		

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER
DOOR CLOSER WITH BUILT-IN STOP






WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. 040

For use on Door #(s):

224 229

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	1461 SCUSH FC		689	LCN
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM

WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 041

For use on Door #(s):

121B 178B

Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
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ALL HARDWARE BY ROLL UP DOOR MANUFACTURER

Hardware Group No. G101

For use on Door #(s):

G1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	LD-OUT-PA-AX-98-L-17-WH		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	GATE CLOSER/HINGE	MAMOTH180-ZILV			LOX
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	FS18S		BLK	IVE

EXISTING GATE

EXIT GATE - RIM PANIC

GATE FABRICATOR TO PROVIDE HINGE REINFORCEMENT FOR HINGE CLOSER AND RIM PANIC REINFORCEMENT AND MOUNTING PLATE






WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. G102

For use on Door #(s):

G2 G4

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	LD-OUT-PA-AX-98-L-17-WH		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	GATE CLOSER/HINGE	MAMOTH180-ZILV			LOX
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	FS18S		BLK	IVE

EXIT GATE - RIM PANIC






GATE FABRICATOR TO PROVIDE HINGE REINFORCEMENT FOR HINGE CLOSER AND RIM PANIC REINFORCEMENT AND MOUNTING PLATE

Hardware Group No. G103

For use on Door #(s):

G5

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	LD-OUT-PA-AX-98-L-NL-17-WH		626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	GATE CLOSER/HINGE	MAMOTH180-ZILV			LOX
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	FS18S		BLK	IVE

EXIT GATE - RIM PANIC

GATE FABRICATOR TO PROVIDE HINGE REINFORCEMENT FOR HINGE CLOSER AND RIM PANIC REINFORCEMENT AND MOUNTING PLATE









WEST END REGIONAL NAVIGATION CENTER

Hardware Group No. G104

For use on Door #(s):

G3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	DOOR CORD	788C-12 WITH 20 GAUGE WIRES	 ⚡	626	SCE
1	EA	ELEC PANIC HARDWARE	LD-WPRX-OUT-PA-AX-98-L-NL-17-WH	 ⚡	626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE 12/24 VAC/VDC	 ⚡	630	VON
1	EA	GATE CLOSER/HINGE	MAMOTH180-ZILV			LOX
1	EA	KICK PLATE	K0050 10" X 2" LDW		630	TRM
1	EA	FLOOR STOP	FS18S		BLK	IVE
1	EA	POWER SUPPLY	PS902 900-2RS	 ⚡		VON

EXIT GATE - RIM PANIC

GATE FABRICATOR TO PROVIDE HINGE REINFORCEMENT FOR HINGE CLOSER AND RIM PANIC REINFORCEMENT AND MOUNTING PLATE

CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

ELECTRIC STRIKE TO INTERFACE WITH ACCESS CONTROL SYSTEM

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300.

1.3 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For each glazing products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
 - 1. List by windows and door types scheduled on Drawings.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For installers.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: For each types of glazing products specified.

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1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glass: Obtain glazing products through one source from a single manufacturer for each glass type as practical.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Safety Glazing Products:
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
 - 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications:
 - a. GANA's "Glazing Manual."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

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1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Glass Products:
 - 1. Warranty Period: 10 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Non-Fire-Rated Glass Manufacturers: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Vitro (formerly PPG).
 - 2. Oldcastle BuildingEnvelope.
 - 3. Guardian.
 - 4. Pilkington.
 - 5. Visteon.
 - 6. Or equal.

2.2 GLASS PRODUCTS

- A. Heat-Treated Float Glass (Safety Glass): ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. For uncoated glass, comply with requirements for Condition A.
 - 2. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 - 3. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
- B. Clear Insulating-Glass Units: Insulated glass units. Low-e with glass to elastomer edge seal. Outer pane of clear glass, inner pane of clear glass. Place reflective coating on No.2 surface within the unit.
 - 1. Product: Solarban 60 (low -e coating) by Vitro (Basis of Design).
 - a. Transmittance:
 - 1) Ultraviolet: 19%.
 - 2) Visible: 70%.
 - 3) Total Solar Energy: 33%.
 - b. Reflectance:
 - 1) Visible Light: 11%.

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- 2) Total Solar Energy: 30%.
- c. U-Value:
 - 1) Winter Nighttime: 0.29.
 - 2) Summer Daytime: 0.27.
- d. Shading Coefficient (SC): 0.44.
- e. Solar Heat Gain Coefficient (SHGC): 0.38.
- f. Light to Solar Gain (LSG): 1.85.
- g. Low Emissivity Coating: e=0.05.
- 2. Glazing Assembly:
 - a. Overall Unit Thickness: 1 inch.
 - b. Interspace Content: 1/2 inch of Air.
 - c. Outdoor Lite: 1/4 inch thick, tempered glass.
 - d. Indoor Lite: 1/4 inch thick, tempered glass.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Silicone complying with ASTM C 1115.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive.

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2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
 - 1. Silicone complying with ASTM C 1115.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 1. Silicone complying with ASTM C 1115.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
 - 1. Silicone complying with ASTM C 1115.
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
 - 1. Silicone complying with ASTM C 1115.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

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- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant where indicated.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

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3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

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SECTION 092116 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes gypsum board shaft-wall assemblies for the following:
 - 1. Shaft-wall enclosures.
- B. Related Sections include the following:
 - 1. Division 9 Section "Non-Load-Bearing Steel Framing for framing requirements.
 - 2. Division 9 Section "Gypsum Board" for gypsum board requirements.

1.2 SUBMITTALS

- A. Product Data: For each gypsum board shaft-wall assembly indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119 by a testing and inspecting agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures for installing gypsum board shaft-wall assemblies including, but not limited to, the following:
 - 1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
 - 2. Sprayed fire-resistive materials applied to structural steel framing.
 - 3. Wiring devices in shaft-wall assemblies.
 - 4. Doors and other items penetrating shaft-wall assemblies.
 - 5. Items supported by shaft-wall-assembly framing.
 - 6. Mechanical work enclosed within shaft-wall assemblies.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
- C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

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1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gypsum shaft-wall assemblies that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Shaftwall System: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. United States Gypsum Company. (Basis of Design)
 - 2. National Gypsum Company.
 - 3. Georgia Pacific.
 - 4. Or equal.

2.2 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

- A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
 - 1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
 - 2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.
 - 3. All components shall be from one manufacturer for unit responsibility and constructed in accordance with UL Design

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2.3 GYPSUM BOARD SHAFT-WALL ASSEMBLY

- A. Fire-Resistance Rating: As indicated.
- B. STC Rating: As indicated.
- C. Studs: USG C-H or E-studs. Flanges holding 1" liner panel to be continuous. No Tab systems. Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - 2. Minimum Base-Metal Thickness: As indicated.
- D. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches long and in depth matching studs.
 - 1. Minimum Base-Metal Thickness: As indicated and not less than 24 gauge.
- E. Firestop Tracks: Top runner system to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; Supply UL HW-D design specifically tested for shaftwall construction and the installed shaftwall system. Thickness not less than indicated for studs and in width to accommodate depth of studs.
- F. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0329 inch thick. USG Jamb Strut or equal.
- G. UL Assembly: UL 415.
- H. ER Reports: Comply with each manufacturer's tested assembly.
 - 1. National Gypsum: ICBO ER-3579.
 - 2. US Gypsum: NER-258.
- I. Room-Side Finish: As indicated.
- J. Shaft-Side Finish: As indicated.
- K. Gypsum Liner Panels: Comply with ASTM C 442.
 - 1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.
 - a. Core: 1 inch thick.
 - b. Long Edges: Double bevel.
 - c. Products
 - 1) National Gypsum, Fire-Shield Shaftliner.
 - 2) USG Shaftwall Liner, UL labeled "SLX".
 - 3) Or equal.
- L. Gypsum Board: As specified in Division 9 Section "Gypsum Board." Use proper thickness and core as indicated in UL Fire test description

2.4 NON-LOAD-BEARING STEEL FRAMING

- A. As specified in Division 9 Section "Non-Load-Bearing Steel Framing".

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2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section "Gypsum Board" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.
- C. Gypsum Board Joint-Treatment Materials: As specified in Division 9 Section "Gypsum Board."
- D. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum face-layer panels to backing-layer panels in multilayer construction.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- F. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- G. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- H. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

- A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
 - 1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
 - 2. Division 9 Section "Gypsum Board" for applying and finishing panels.
- B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
- D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.
- H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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END OF SECTION 092116

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SECTION 092216 - NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Certification of Materials: For steel framing materials.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Construction Standards: Construction not on Drawings or referenced shall be as detailed in Technical Library by SSMA Technical Services.
- D. Deflection Limits: Maximum deflection of following at 5 psf.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of non-load bearing steel framing that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Non-Load-Bearing Steel Framing: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. Marino Ware (Viperstud).
 - 2. California Expanded Metal Products Company (CEMCO).
 - 3. ClarkDietrich Building Systems
 - 4. Consolidated Systems, Inc.
 - 5. Unimast, Inc.
 - 6. Western Metal Lath & Steel Framing Systems.
 - 7. Or equal.

2.2 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653, G40, hot-dip galvanized zinc coating, unless otherwise indicated.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645; of size and properties necessary to comply with ASTM C 754 for the spacing indicated.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - 2. Depth: As indicated on Drawings
- B. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings, but not less than 0.0179 inch (25 gage).
- C. Cold-Rolled Channel Bridging: 0.0538-inch (16 gage) bare-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

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2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

END OF SECTION 092216

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SECTION 092400 - PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Exterior three-coat portland cement plasterwork (stucco).
 - 2. Integral colored finish coat.
- B. Related Sections include the following:
 - 1. Division 7 Section "Building Insulation" for thermal insulations included in portland cement plaster assemblies.
 - 2. Division 7 Section "Flexible Sheet Flashing" for flashing windows, door, and other openings.
 - 3. Division 7 Section "Joint Sealants" for acoustical sealants and sealants installed with exterior portland cement plaster (stucco).
 - 4. Division 9 Section "Graffiti-Resistant Coatings" for graffiti-resistant coatings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Showing details of construction for framing, reinforcement, and trims; including locations where each type material, mix, coating thickness, material sizes and thicknesses, and fastenings will be used.
 - 2. Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.
 - 3. Include details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details including mechanical fasteners, and connections to other work.
 - 4. Show locations and extent of weather-barrier (building paper and flashing sheet). Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - a. Include details of interfaces with other materials that form part of weather barrier.
 - b. Include details of mockups.
- C. Coordination Drawings:
 - 1. Comprehensive, completely integrated set of plans, sections, elevations, and details, drawn to scale, of separate trades work, indicating interface support/connections, and relationships between materials, and products, on which the following items are shown and coordinated with each other, based on input from fabricators and installers of the items involved:
 - a. Framing, including backing, blocking, strapping, and similar accessory/sub-framing materials.
 - b. Sheathing, including building paper.

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- c. Portland cement plaster, including trim and self-adhering flashing sheet.
 - d. Other materials and products that occur in, on, adjacent to, or contiguous with above work.
- 2. At a minimum, indicate the following
 - a. Locations/spacing of plaster trim moldings.
 - b. Locations/dimensions of self-adhering flashing sheet (underlying trim moldings).
 - c. Locations/spacings of connections/fastenings of:
 - 1) Sheathing
 - 2) Metal lath.
 - 3) Plaster trim moldings
 - d. Sequence of installation of:
 - 1) Building paper.
 - 2) Flexible flashing.
 - 3) Metal lath, and plaster trim moldings.
- D. Samples for Initial Selection: For each type of factory-prepared finish coat indicated with texture and color.
- E. Samples for Verification: For each type of factory-prepared finish coat indicated; 12 by 12 inches, and prepared on rigid backing with color selected.

1.3 QUALITY ASSURANCE

- A. Mockups: Before plastering, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Comprehensive, completely integrated mockups of separate trades work, indicating interface connections, transitions, relationships between materials and finishes, and quality of workmanship. Coordinated mockups shall include, but is not limited to, the following:
 - a. Work of this Section.
 - b. Framing, including backing, blocking, strapping, and similar accessory/sub-framing materials.
 - c. Sheathing, including building paper.
 - d. Sealants.
 - e. Penetrations of portland cement plaster assemblies.
 - f. Other materials and finishes that are within indicated area of coordinated mockups, including barrier/backing/support for above work.
 - 2. Install mockups for each type of finish indicated.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 4. Use of self-furring lath is subject to satisfactory jobsite demonstration for each project of lath installation, with approval by Inspector of Record.
- B. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

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1.5 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than 40 deg F.
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cement plaster system that fail in materials within specified warranty period. Failure includes, but is not limited to, blistering, peeling, flaking, delaminating, rusting, checking, crazing, fading beyond manufacturer's published limits, or chipping as a result of manufacturing defects.
 - 1. Warranty Period: 6 years.
- B. Special Waterproof Warranty: Submit cement plaster system manufacturer's warranty certifying that work of this Section has been properly applied in strict accordance with system manufacturer's recommended procedures, instructions, and systems current applicable specifications; has been properly integrated into building construction in accordance with sound design and building construction practices; and will remain resistant to water penetration for specified warranty period.
 - 1. Warranty Period: 3 years.
- C. Weather Resistive Barriers: 10 years.
- D. Installer's Warranty:
 - 1. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Finish-Coat Plaster: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. Omega. (Basis of Design)
 - 2. LaHabra Stucco.
 - 3. Merlex.
 - 4. Sto.
 - 5. Or equal.

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- B. Metal Lath: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. Alabama Metal Industries Corporation (AMICO).
 - 2. California Expanded Metal Products Company (CEMCO).
 - 3. Dale/Incor.
 - 4. Unimast, Inc.
 - 5. Clark Western Metal Lath & Steel Framing Systems.
 - 6. Structa Wire Corp.
 - 7. Or equal.
- C. Weather-Resistant Barrier: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. HydroTex by Fortifiber.(Basis of Design)
 - 2. GMC Roofing.
 - 3. Or equal.
- D. Zinc-Coated (Galvanized) Steel Accessories: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Stockton Products. (Basis of Design)
 - 2. Fry Reglet Corp.
 - 3. Alabama Metal Industries Corporation (AMICO).
 - 4. California Expanded Metal Products Company (CEMCO).
 - 5. Dietrich Industries, Inc.
 - 6. Brand X Metals.
 - 7. Or equal.
- E. Architectural EPS Shapes:
 - 1. StroTech. (Basis of Design)
 - 2. Foam Concepts, VEFO Inc.
 - 3. Foam Design Center.
 - 4. Or equal.
- F. Aluminum Trim and Reveals: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Fry Reglet Corp. (Basis of Design)
 - 2. Flannery, Inc.
 - 3. Gordon, Inc.
 - 4. Pittcon Industries.
 - 5. Brand X Metals, Inc.
 - 6. Or equal.

2.2 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653, G90, hot-dip galvanized zinc coating.
 - 1. Diamond-Mesh Lath: Self-furring.
 - a. Weight: 3.4 lb/sq. yd.
 - b. Use: Vertical and horizontal solid support surfaces, such as unit masonry, concrete, or sheathing. Horizontal open framing up to 16 inches on center.
 - 2. Diamond-Mesh Lath: Non-self-furring.
 - a. Weight: 3.4 lb/sq. yd.

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- b. Use: Attached with fastener when enforcing authority prohibit use of self-furring types.
 - 3. 3/8-Inch Rib Lath (High Rib):
 - a. Weight: 3.4 lb/sq. yd.
 - b. Use: Horizontal open framing 24 inches on center.
- B. Wire Lath: ES Report, ESR-2017, ASTM C847 with ASTM A641, Class 1 galvanized coating.
 - 1. Mega Lath: Self-furring.
 - a. Use: Vertical and horizontal solid support surfaces.
 - 2. V Truss Wall & Ceiling Lath : Rib Lath
 - a. Use: Vertical and horizontal open framing.

2.3 WEATHER-RESISTANT BARRIER

- A. Super Jumbo Tex 60 Minute asphalt-saturated kraft paper with a drainable polymeric housewrap layer – packaged in a single roll. Exceeds Grade D paper performance.

2.4 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Zinc-Coated (Galvanized) Steel Accessories: Fabricated from hot-dip galvanized steel sheet, ASTM A 653 G90 zinc coating.
 - 1. Foundation Weep Screed.
 - 2. Cornerite: Fabricated.
 - 3. External-Corner Reinforcement.
 - 4. Deep leg.
 - 5. Cornerbeads.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - 6. Casing Beads: Square-edged style; with expanded flanges.
 - 7. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 - 8. Expansion Joints: Folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
 - a. Internal Corners: Double-V, narrow reveal type ("No. 30").
 - 9. Two-Piece Expansion Joints: Formed to produce slip-joint and square-edged reveal that is adjustable from 1/4-to-5/8-inch wide; with perforated flanges.
 - 10. Stucco Reglet:
 - a. Product: "ST" Stucco Reglet by Fry Reglet.
 - b. Thickness: 24 gage.
 - 11. Surface Mounted Reglet:
 - a. Product: "SM" Surface Mount Reglet by Fry Reglet.
 - b. Thickness: 24 gage.
 - 12. Flashing System:
 - a. Product: Springlok Flashing System by Fry Reglet.
 - b. Thickness: 24 gage.

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- C. Aluminum Trim and Reveals:
 - 1. Aluminum shall be extruded alloy 6063 T5, with clear anodized finish.
 - a. Size: As indicated on Drawings.
 - 2. Aluminum Soffit Vents: Perforated screeds, with expanded flanges.
 - a. Soffit Vent 4 by Fry Reglet.
 - b. Vent Width: As indicated on Drawings.
- D. Architectural EPS Shapes:
 - 1. Product: Styro Tech or equal.
 - 2. Shapes: As indicated on Drawings.
 - 3. Components:
 - a. 24 gauge metal insert placed a minimum of 2.5 inches from end of Architectural EPS Shape
 - b. Metal Straps: Minimum 2 inches x 16 gauge galvanized sheet metal placed a maximum of 24 inches on center
 - c. Adhesives and Base Coat: As recommended by foam manufacturer.
 - 4. Performance Requirements:
 - a. Negative Uniform Load Testing: Ultimate failure shall not occur under 59 psf.
 - b. Pull Out Capacity of Metal Insert: When loaded from a minimum of 12 inches from any end shall ultimately fail at no less than 227 pounds, and no less than 88 pounds when loaded at 1- inch from the end.
 - c. Vertical Load Testing: Ultimate failure on 12" shape shall not occur under 3200 lbs. at edges and 6330 lbs. at the interior location.
 - d. Structural Performance Test: Ultimate failure on 24" Shape shall not occur under 2963 lbs. at edges and 3181 at the interior location.

2.5 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
 - 1. Nails, screws, and staples as specified in CBC.
 - a. Nails: For attaching metal plaster bases to wood supports, 0.1205 inch 11 gauge diameter, 7/16 inch head, barbed, galvanized roofing nails or galvanized common nails. Nails for attaching metal plaster bases to solid substrates shall be not less than 3/4 inch long.
 - b. Screws: For attaching metal plaster base shall be fabricated in accordance with either Specification ASTM C 954 or ASTM C 1002 and shall have a 7/16 inch diameter pan wafer head and a 0.120 inch diameter shank. Screws used for attachment to metal framing members shall be self-drilling and self-tapping.
 - 2. Fastener for use with concrete/masonry for attaching lath and screeds/control joints, weeps and other shapes.
 - 3. Steel Stud Applications: Galvanized steel furring nails and or screws, of type and length.
 - a. At least 2/3 inch penetration of the steel stud system.
- C. Isolation Strip at Exterior Walls: Comply with requirements of Division 7 Section "Flexible Sheet Flashing" for flashing windows, door, and other openings.
- D. Thermal Insulation: Comply with requirements of Division 7 Section "Building Insulation".

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- E. Acoustical Sealant for Exposed and Concealed Joints: Comply with requirements of Division 7 Section "Joint Sealants".

2.6 PLASTER MATERIALS

- A. Factory Mixed Scratch and Brown Coat:
 - 1. Portland Cement: ASTM C 150, Type I or II.
 - 2. Sand Aggregate: ASTM C 897.
 - 3. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
 - 4. Admixture: Admix 500.
- B. Ready-Mixed Finish-Coat Plaster:
 - 1. Product: Omegacrete by Omega or equal.
 - 2. Description: One component, polymer-modified cementitious coating designed to create a smooth finish on poured-in-place, tilt-up, precast, or other concrete surfaces. Specially formulated to be easily applied over these porous substrates. Excellent choice to cover bugholes, honeycombs, and other small imperfections in concrete surfaces to produce a clean, uniform, smooth appearance.
 - 3. Finish Texture: Smooth as approved by Architect.
 - 4. Colorant: Match Architect's sample.

2.7 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
- B. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

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3.3 INSTALLATION, GENERAL

- A. Thermal Insulation: As specified in Division 7 Section "Building Insulation".
- B. Sound Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- C. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLING METAL LATH AND WEATHER-RESISTANT BARRIER INSTALLATION

- A. Expanded-Metal Lath: Install according to ASTM C 1063.
 - 1. Lath shall be attached to framing members at spacing of not more than 6 inches o.c., 2 inches maximum from longitudinal edges, in accordance with CBC.
 - 2. Attach metal lath to concrete and masonry 16 inch on centers along the sheet, using 5 nails across the sheet. Securely wire tie side laps or lace between the cross rows per ASTM C1063 Section 7.10.5.
 - 3. Lath shall not be continuous through control joints but shall be stopped and tied at each side per ASTM C1063, 7.10.1.4.
- B. Weather-Resistant Barrier: Install 2 layers over sheathing.

3.5 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 - 1. Install lath-type external-corner reinforcement at exterior locations.
- C. Weep screed: Install at foundation plate line on all exterior stud walls per CBC.
 - 1. Minimum 4 inches above earth.
 - 2. Minimum 2 inches above paved areas.
- D. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft.
 - b. Horizontal and other Nonvertical Surfaces: 100 sq. ft.
 - 2. At distances between control joints of not greater than 18 feet o.c.
 - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 - 4. Where control joints occur in surface of construction directly behind plaster.
 - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

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3.6 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
 - 2. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, before lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least 6 inches at each jamb anchor.
 - 3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Three-Coat System: Total minimum thickness of 7/8 inch for lathing base and 1/2 inch for solid base.
 - 1. Scratch Coat:
 - a. Over Lathing Base: Apply scratch coat to a minimum thickness of 3/8 inch on vertical surface, and 1/4 inch on horizontal surface, using sufficient trowel pressure to key plaster into lath or to create bond to substrates as applicable. Prior to initial set, scratch horizontally to provide key for bond of brown coat.
 - b. Over Solid Bases: Apply first coat with sufficient pressure to insure tight contact with complete coverage of solid bases, immediately scratching to provide mechanical key for second coat.
 - 2. Brown Coat: Apply brown coat to a minimum thickness of 3/8 inch on vertical surface, and 1/4 inch on horizontal surface, using sufficient trowel pressure to insure tight contact with scratch coat.
 - a. Rod surface to screeds creating true and even plane.
 - b. Trowel to a sand float finish and uniform surface to receive finish coat.
 - c. Tool brown coat to provide a V-joint at intersection of plaster with frames or other item of wood, or metal.
 - 3. Finish Coat: Apply exterior wall finish coat to thickness recommended by manufacturer, but in no case less than 1/8 inch, using sufficient trowel pressure or spray velocity to bond finish coat to basecoat.
- C. Curing Time: Comply with CBC, or longer as needed to insure compliance with manufacturer's recommendations for quality stucco installation.
 - 1. Portland cement plaster:
 - a. Minimum period moist curing:
 - 1) First Coat: 48 hours.
 - 2) Second Coat: 48 hours.
 - b. Minimum interval between coats:
 - 1) First Coat: 48 hours.
 - 2) Second Coat: 7 days.

3.7 ASSEMBLY

- A. Exterior Side from framing out:
 - 1. Sheathing.
 - 2. Weather-Resistive Barrier.

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3. Metal Lath.
 4. 3-coat portland cement plaster.
- B. Exterior Side from Masonry/Concrete:
1. 2-coat portland cement plaster.

3.8 CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.9 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 092400

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SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
- B. Related Sections include the following:
 - 1. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 2. Division 9 Section "Painting" for primers and finishes applied to gypsum board surfaces.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
 - 2. Finishes: Level 4 gypsum board finish indicated for use in exposed locations. 4 by 4 foot sample.
 - a. Finishes: For each finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency acceptable to authorities having jurisdiction.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each finish indicated.
 - c. Each areas such as walls, ceilings, and soffits.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.4 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gypsum board that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Interior Gypsum Board: Subject to compliance with requirements, provide products by one of the following:
 - 1. USG Corporation.
 - 2. National Gypsum Company.
 - 3. G-P Gypsum.
 - 4. Or equal.
- B. Steel Trim Accessories: Subject to compliance with requirements, provide products by one of the following:
 - 1. USG Corporation.
 - 2. Amico.
 - 3. Or equal.

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2.2 PANELS, GENERAL

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

2.3 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.
- B. Type X:
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

- A. Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Aluminum Trim and Reveal: As specified in Division 9 Section "Portland Cement Plaster".

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Sealants shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Acoustical Sealant: Sheetrock Acoustical Sealant by USG or equal.

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1. Sealants shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.
- D. Thermal and Acoustical Insulation: As specified in Division 7 Section "Building Insulation."
- E. Gypsum Board Adhesives:
 1. High performance latex-based construction adhesive designed for gypsum board applications.
 2. Adhesives shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.
 3. Products:
 - a. Green Series SW-325 Shear & Drywall Adhesive by OSI.
 - b. Drywall Adhesive GDWA by Grabberman.
 - c. Or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

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1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

3.3 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Owner's Representative for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. U-Bead: Use at exposed panel edges.
 5. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.4 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Comply with GA 214 for Level definitions.
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for ceramic tile or acoustical tile.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view with paint finish.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.

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3.5 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

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SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Porcelain and Ceramic Tile.
 - 2. Waterproof membrane for tile installations.
 - 3. Cementitious backer units installed as part of tile installations.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- D. Handbook for Ceramic Tile Installation published by the Tile Council of North America (TCNA).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 - 1. Propose locations of expansion, contraction, control, and isolation joints if not indicated on Drawings.
- C. Proposed Installation Method:
 - 1. Show manufacturer's interpretation of TCNA installation method number for each tiled area in tabulated form.
 - 2. Installation warranty shall be furnished by mortar and grout manufacturer.
 - 3. TCNA does not provide warranty. TCNA installation shows minimum requirements.
- D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- E. Product Certificates: For each type of product, signed by product manufacturer.

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- F. Qualification Data: For Installer.
- G. Material Test Reports: For each tile-setting and -grouting product.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
 - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of ceramic tile and accessories that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

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1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Porcelain and Ceramic Tile: Subject to compliance with requirements, provide products by one of the following manufacturers.
 1. Daltile; Div. of Dal-Tile International Inc. (Basis of Design)
 2. American Olean; Div. of Dal-Tile International Corp. (Basis of Design)
 3. Emser Tile. (Basis of Design)
 4. Crossville Ceramics Company, L.P.
 5. Interceramic.
 6. Bedrosians.
 7. Or equal.
- B. Setting, Grouting Materials: Subject to compliance with requirements, provide products by one of the following manufacturers.
 1. Custom Building Products.
 2. LATICRETE International Inc.
 3. MAPEI Corporation.
 4. Sienna.
 5. Tec by H.B. Fuller.
 6. Or equal.
- C. Fluid Applied Waterproofing for Tile Installation: Subject to compliance with requirements, provide products by one of the following manufacturers.
 1. Mapelastic 315 by Mapei.
 2. RedGard by Custom Building Products.
 3. Laticrete 9235 Waterproof Membrane by LATICRETE International Inc.
 4. Or equal.
- D. Cementitious Backer Board: Subject to compliance with requirements, provide products by one of the following manufacturers.
 1. USG Corporation; DUROCK Cement Board.
 2. National Gypsum Company; PermaBase.
 3. C-Cure; C-Cure Board 990.
 4. Custom Building Products; Wonderboard.
 5. Or equal.
- E. Metal Edge Strips and Transitions: Subject to compliance with requirements, provide products by one of the following manufacturers.
 1. Schluter Systems (Basis of Design).
 2. Blanke.
 3. Or equal.

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2.2 PRODUCTS, GENERAL

- A. Tile Flooring shall be stable, firm, and slip resistant.
- B. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements.
- C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. Porcelain and Ceramic Tile: As indicated on Drawings.
- B. Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

2.5 FLUID-APPLIED WATERPROOFING FOR TILE INSTALLATIONS

- A. General: Manufacturer's standard product that complies with ANSI A118.10.
- B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), and fabric reinforcement.

2.6 SETTING AND GROUTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
 - 1. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.
 - a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.
 - 2. Products:
 - a. MAPEI: Ultraflex 2, Walls: MAPEI Ultralite.
 - b. 254 Platinum by Laticrete.
 - c. Custom Building Products: MegaFlex.
 - d. Or equal.

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- B. Chemical-Resistant, Water-Cleanable, Grouting Epoxy: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.
 - 2. Products:
 - a. MAPEI: Kerapoxy IEG.
 - b. SpectraLock Pro by Laticrete.
 - c. Custom Building Products: 100% Solids Epoxy Grout.
 - d. Or equal.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."
 - 1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.8 TILE BACKER UNITS

- A. Cementitious Back Units:
 - 1. Aggregated portland cement board with coated glass-mesh reinforcement scrim.
 - 2. Comply with ANSI A118.9.
 - 3. Pass ASTM E136 for non-combustibility.
 - 4. Thickness: As indicated on Drawings.
 - 5. Lengths: Maximum lengths available to minimize end-to-end butt joints.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: ADA compliant, angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, in aluminum finishes selected by Architect.
 - 1. Outside Corners: ECK-E by Schluter or equal.
 - 2. Exposed Edges: JOLLY by Schluter or equal.
- C. Transitions: ADA compliant, various shapes, height to match tile and setting-bed thickness, metallic designed specifically for flooring applications, in aluminum finishes selected by Architect.
 - 1. Reno, Reno-T, Reno-U, Reno-TK, and Reno-Ramp by Schluter or equal.

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2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
 - a. Sub-floor and Vertical Surfaces: 1/4 inch in 10 feet.
 - 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. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

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3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. 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.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
- H. Grout tile to comply with requirements of the following tile installation standards:
 - 1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

- A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile over waterproofing until waterproofing has been tested to determine that it is watertight.

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3.6 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
- B. Joint Widths: 1/16 inch unless specified otherwise.
- C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.7 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: 1/16 inch unless specified otherwise.

3.8 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. When recommended by tile manufacturer, apply 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.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.9 FLOOR TILE INSTALLATION, TCNA ASSEMBLY

- A. Tile Installation: Interior floor installation on waterproof membrane over concrete; thin-set mortar; TCNA F122 and ANSI A108.5.
 - 1. Mortar: Latex-portland cement mortar.
 - 2. Grout: Chemical-resistant, water-cleanable, tile-grouting epoxy.

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3.10 WALL TILE INSTALLATION, TCNA ASSEMBLY

- A. Tile Installation: Interior wall installation over waterproof membrane, cementitious backer units; thin-set mortar; TCNA W244F and ANSI A108.5.
 - 1. Mortar: Latex-portland cement mortar.
 - 2. Grout: Chemical-resistant, water-cleanable, tile-grouting epoxy.
- B. Tile Installation: Interior wall and shower-receptor installation over cementitious backer units; thin-set mortar; TCNA B415, TCNA W244 (W244C), and ANSI A108.5.
 - 1. Mortar: Latex-portland cement mortar.
 - 2. Grout: Chemical-resistant, water-cleanable, tile-grouting epoxy.

END OF SECTION 093000

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- D. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- E. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

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1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
 - b. Flame-Spread Classification: CBC 803 and Table 803.9.
 - 1) Flame-Spread Rating: Class 1 (0-25).

- D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical panel ceilings that fails in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

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1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acoustical Panels: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Armstrong World Industries, Inc. (Basis of Design)
 - 2. USG Interiors, Inc.
 - 3. Hunter Douglas Architectural Products.
 - 4. BPB- Celotex/CertainTeed.
 - 5. Tectum Inc.
 - 6. Or equal.
- B. Suspension Systems: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Armstrong World Industries, Inc. (Basis of Design)
 - 2. USG Interiors, Inc.
 - 3. Hunter Douglas Architectural Products.
 - 4. BPB- Celotex/CertainTeed.
 - 5. Rockfon/Chicago Metallic Corporation.
 - 6. Or equal.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Products: As indicated on Drawings.

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2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- H. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- I. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Products: As indicated on Drawings.

2.6 ACOUSTICAL SEALANT

- A. Comply with requirement of Division 7 "Joint Sealants".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. Install panels in accordance with manufacturer's written instructions.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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SECTION 096516 – RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Sheet vinyl floor coverings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Initial Selection: For each type of floor covering indicated.
 - 1. Include similar Samples of installation accessories involving color selection.
- D. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of floor covering required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- E. Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- F. Qualification Data: For Installer.
- G. Maintenance Data: For floor coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project that are competent in heat-welding techniques required by manufacturer for floor covering installation.
 - 1. Engage an installer who employs workers for this Project that are trained or certified by floor covering manufacturer for heat-welding techniques required.
- B. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

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1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheet vinyl floor coverings that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Sheet Vinyl Floor Coverings: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Armstrong World Industries, Inc.
 - 2. TOLI International.

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3. Altro Floors.
4. Forbo Industries, Inc.
5. Johnsonite.
6. Mannington Commercial.
7. Or equal.

2.2 SHEET VINYL FLOOR COVERING

- A. Product: As indicated on Drawings.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit sheet vinyl floor covering and substrate conditions indicated.
1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer.
1. Color: As selected by Architect from manufacturer's full range.
- D. Integral-Flash-Cove-Base Accessories:
1. Cove Strip: 1-inch radius provided or approved by floor covering manufacturer.
 2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by floor covering manufacturer.
 3. Corners: Metal inside and outside corners and end stops provided or approved by floor covering manufacturer.
- E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of floor coverings, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of Concrete Substrates:
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- B. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- D. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install floor coverings until they are same temperature as space where they are to be installed.
- E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Unroll sheet vinyl floor coverings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet vinyl floor coverings as follows:
 - 1. Maintain uniformity of floor covering direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
- C. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- D. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

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- H. Integral Flash Cove Base: Cove floor coverings 6 inches up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.
 - 1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from floor covering surfaces.
 - 2. Sweep and vacuum floor coverings thoroughly.
 - 3. Damp-mop floor coverings to remove marks and soil.
 - a. Do not wash floor coverings until after time period recommended by manufacturer.
- B. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Apply protective floor polish to surfaces that are free from soil, visible adhesive, and blemishes if recommended in writing by manufacturer.
 - 2. Do not move heavy and sharp objects directly over floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096516

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SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Luxury Vinyl Tile (LVT).
 - 2. Resilient wall base and accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include concrete moisture and alkalinity limits.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification:
 - 1. Full-size units of each color and pattern of resilient floor tile required.
 - 2. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

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- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of resilient floor tile that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Luxury Vinyl Tile (LVT): Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Shaw Hard Surface. (Basis of Design)
 - 2. Mohawk Group.
 - 3. Roppe Corporation.
 - 4. Or equal.
- B. Type TS Resilient Wall Base and Accessories: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Johnsonite. (Basis of Design)
 - 2. Burke Mercer Flooring Products.
 - 3. Roppe.
 - 4. Flexco.
 - 5. Nora.
 - 6. Or equal.

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2.2 LUXURY VINYL TILE (LVT)

- A. Products: As indicated on Drawings.

2.3 RESILIENT WALL BASE

- A. Products: As indicated on Drawings.

2.4 RESILIENT MOLDING ACCESSORY

- A. Types:
1. Reducer strip for resilient floor covering
 2. Joiner for tile and carpet.
- B. Material: Rubber.
- C. Profile and Dimensions: As indicated.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed resilient tile and as recommended/ required by the manufacturer for warrantee acceptance or provided by resilient tile manufacturer for the type of carpet being installed.
1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: 50 g/L.
 - b. Cove Base Adhesives: 50 g/L.
 - c. Rubber Floor Adhesives: 60 g/L.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates:
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Independent moisture and alkalinity testing prior to installation of resilient flooring as specified in Division 7 Section "Concrete Moisture and Alkalinity Testing".
 - 3. Provide barrier as specified in Division 7 Section "Concrete Moisture and Alkalinity Barrier" if test exceed floor covering limits.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

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3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.

3.5 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - 2. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096519

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SECTION 096723 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Resinous Flooring.

1.2 SUBMITTALS

- A. Product Data: Descriptive data and specific recommendations for surface preparation, mixing, and application of materials.
- B. Acceptance Sample: As required by owner, one foot square (1 ft. by 1 ft.) sample of the specified flooring system applied to hardboard or similar backing for rigidity and ease of handling.
- C. Maintenance data: Give instructions for general maintenance and repair of surfaces and finishes.

1.3 QUALITY ASSURANCE

- A. Applicator shall have minimum of 5 years experience in application of the specified type of flooring.
- B. Provide certification from the manufacturer that the applicator is approved for installation of the flooring.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Resinous Flooring:
 - 1. Concrete Protection Systems West, Inc. (Basis of Design)
 - 2. Sunbelt Flooring Inc.
 - 3. Stonhard
 - 4. Key Resin Company.
 - 5. Or equal.

2.2 RESINOUS FLOORING

- A. System: The CPS System installed by CPS West will include the preparation and instillation of the CPS High-Performance Resinous Flooring System. Furthermore, prior to flooring installation, it is the role of the General Contractor is coordinate scheduling with adequate notice, as agreed upon with CPS West.

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- B. Products: The products are as follows: (1) CPS High-Performance Resinous Flooring System, in which the color will be determined by the Owner and/or Architect and (2) primer, as recommended for conditions by CPS West. Moreover, the system will be solid and the color of CPS quartz grains, macro flakes, and micro flakes will be determined by Owner and/or Architect. Finally, it should be noted that instillation is only implemented by CPS West.

PART 3 - EXECUTION

3.1 PREPARATION OF EXISTING CONCRETE

- A. Surface preparation:
1. Existing surface will need to be clean (i.e., free of oils, grease, loose particles, dirt, etc.) and dry.
- B. Mechanical surface preparation:
1. The interior of concrete slab should be cleaned by: (1) vacuum shot blast consisting of steel pellets and (2) new flooring materials or leveling underlayment coating in designated areas. However, it should be noted that dustless diamond cup grinding will be a superior method to vacuum shot blasting in some cases.
 2. If new flooring materials are installed, the concrete will need to cure for a minimum of 28 days at 75° F. Do not allow the use of any chemical surface curing agents. The concrete will also be subject to a moisture test as expanded upon the in subsequent section.
- C. Moisture testing:
1. To verify the dryness of the newly installed concrete, the moisture vapor transmission will be testing by utilizing ASTM F 1869. ASTM F 1869 is a standard test method for measuring the moisture vapor emission rate of the concrete subfloor by utilizing anhydrous calcium chloride*. The moisture vapor emission should not exceed three (3) pounds per 1,000 square feet in a 24 hour period. If exceeded, a vapor emission system requirement system will be selected by CPS West.

3.2 INSTALLATION

- A. General: Follow manufacturer's written instructions.
- B. Throughout the installation process, barricades and precautions will be supplied to allow traffic during installation, cure time, and top coat installment. The following is a list of steps to be taken for the installation preparation and inspection, respectively:
1. Application area:
 - a. Do not apply in the direct sunlight.
 - b. Do not apply on outside concrete surfaces.
- C. Mixing:
1. A slow or variable speed drill (350 rpm maximum) with a clean PS "Jiffy" blade should be utilized in the mixing process. This heavy-duty drill can be electric or air driven.
 2. Slowly mix Part A and add the correct mixing ratio of Part B while under agitation. Please contact CPS West if any questions arise with the mixing ratio.

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3. The CPS High-Performance Resinous Flooring System should be mixed for a minimum of two minutes. While mixing, scrape the walls of the pail with a flexible spatula to ensure the resin is being properly and completely mixed. Once mixed, the material can be transferred to the designated work area to begin the application process.
 4. Do not seal the mixed material.
- D. Broadcast application
1. Once properly mixed, ribbon out the resin in a logical manner onto the floor and spread with a flat, steel trowel.
 2. Then, an applicator wearing spiked shoes is free to walk out on the material and begin to backroll while keeping a continuous wet edge.
 3. Once the material levels and rests, the applicator can walk out on the floor and begin broadcasting the CPS Quartz, Macro Frack, or Micro Flake into the epoxy until refusal. The process of broadcasting should be done up and out. The quartz, fracks, or flakes should appear to be dry and evenly disbursed. Additional quartz, fracks, or flakes may need to be applied to some areas.
 4. After cured, unused quartz, fracks, or flakes should be removed by sweeping the floor with a hard bristled broom and vacuuming the surface.
 5. Clean, steel trowel will then be used again to facilitate a tight and flat surface.
 6. If agreed upon in writing with Architect or indicated in drawing, non-skid aggregates will be broadcast onto the surface of the finish coat. Following broadcasting, the surface will be backrolled to seal the flooring.
- E. Topcoat Application:
1. Once sufficiently cured and able to support the weight on an applicator without leaving markings, a top coat should be applied to seal the flooring.
- F. After Application:
1. Floor must cure for a minimum of 24 hours prior to normal traffic and use. If time is not allotted, the use of heating equipment may be necessary.

END OF SECTION 096723

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SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wall coverings.
- B. Related Sections include the following:
 - 1. Division 9 Section "Tiling" for aluminum trim pieces.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.
- C. Samples for Initial Selection: For each type of wall covering indicated.
- D. Samples for Verification: Full width by 36-inch- long section of wall covering from lot to be used for each type of wall covering indicated for each color, texture, and pattern required.
 - 1. Mark top and face of material.
- E. Schedule: For wall coverings. Use same designations indicated on Drawings.
- F. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install wall coverings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.
- B. Lighting: Do not install wall covering until a lighting level of not less than 15 fc is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

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1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of wall coverings that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Vinyl Wall Coverings: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. D.L. Couch by Momentum Wallcoverings. (Basis of Design)
 - 2. Muraspec.
 - 3. Koroseal
 - 4. Maharam.
 - 5. MDC Wallcoverings.
 - 6. Or equal.

2.2 WALL-COVERING PRODUCTS

- A. General: Provide rolls of each type of wall covering from the same run number or dye lot.
- B. Product: As indicated on Drawings.

2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer, and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Division 9 Section "Painting" and recommended in writing by wall-covering manufacturer for intended substrate.

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1. Low-Emitting Materials: Adhesives, primers and sealers shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168.
- C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall-covering manufacturer.
- D. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity.
 3. Metals: If not factory primed, clean and apply metal primer.
 4. Gypsum Board: Prime with primer recommended by wall-covering manufacturer.
 5. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.
- G. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

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3.3 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install reversing every other strip.
- E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- F. Match pattern 72 inches above the finish floor.
- G. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.
- H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- I. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

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SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Surface Preparation.
 - 2. Field application of paints, stains, varnishes, and other coatings.

1.2 SUBMITTALS

- A. Product data - Submit product data sheets for each product.
- B. Samples:
 - 1. Submit two painted samples, illustrating selected colors and textures for each color and systems selected with specified coats cascaded.
 - 2. Submit on suitable backing, 8x10 inch size.

1.3 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
- C. Environment Requirements:
 - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be stored and applied.
 - 2. Do not paint when there is a threat of rain within 24 hours or when surface or air temperatures are at or below 40 degrees.

1.5 WARRANTY

- A. Installer Warranty: 1 year.

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1.6 EXTRA STOCK

- A. Minimum 1 gallon each product in original or new 1 gallon cans.
 - 1. Color spot each lid.
 - 2. Identify with formula, location, product and date.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Paints: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Dunn-Edwards (Basis of Design)
 - 2. Sherwin Williams.
 - 3. Vista Paint.
 - 4. Or equal.

2.2 PAINTS AND COATINGS

- A. Ready mixed, except field-catalyzed coatings.
- B. Prepare pigments:
 - 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogenous coating.
 - 2. For good flow and brushing properties.
 - 3. Capable of drying or curing free of streaks or sags.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application. Do not proceed unless substrate is suitable.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION OF SURFACE

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A. General:

1. Clean all exterior walls and surfaces of loose and scaly paint, dirt, dust, chalk, and other foreign matter by water-blasting using care not to damage substrate followed by hand scraping, sanding or wire brushing after surfaces are dry. Mildew must be treated with household bleach solution and rinsed thoroughly.
2. Patch, caulk, set protruding nails and repair all surfaces and cracks where necessary with suitable patching materials and smooth off to match adjacent surfaces.
3. Sand Glossy surfaces to dull surface and remove residue.
4. Remove mildew from affected surfaces with a solution of Tri-Sodium Phosphate and bleach. Rinse with clean water and allow to dry completely.
5. Existing surfaces to be recoated shall be thoroughly cleaned and de-glossed by sanding or other means prior to priming and painting. Patched and bare areas shall be spot primed with the same primer as specified for new work.
6. Rusty metal: Scrape, sand or wire wheel, feathering edges to sound coating. Dust surfaces. Topcoat.
7. Remove soil and body oils completely from surfaces, including handrails, door edges and posts. Treat with Liquid Sandpaper or Dull-N-Bond.
8. Remove hardware, accessories, plates, fixtures and similar items not to be finished. Reinstall at completion.
9. Paint edges of sink cut-outs.

B. Galvanized Surfaces: Remove all oils and contamination from galvanized surfaces scheduled to be painted by washing with a compliant solvent wash.

C. Ferrous Metal: Remove grease, rust, scale, dirt and dust from ferrous metal surfaces. Primer coat shall be applied not less than 30 minutes, nor more than 3 hours after preparation of surface.

D. Primed Metal: Sand and scrape shop primed metal to remove loose primer and rust. Touch-up bare, abraded and damaged areas with metal primer. Feather edges to make touch-up patches inconspicuous.

E. Gypsum Board: Gypsum board shall be dusted clean and free from encrustations and other foreign matter.

F. Preparation of other surfaces shall be performed following specific recommendations of the coating manufacturer.

3.3 PREVIOUSLY COATED SURFACES

- ### A.
- Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease, loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required per ASTM D4259.

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3.4 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust particles just prior to applying next coat.
- F. Stipple all edges and corners to conceal brush marks.
- G. Paint entire trim element with like color. Painting of faces only is unacceptable. Trim surfaces must be wrapped with the trim color and not "faced off" or "Hollywooded".
- H. Doors: Paint entire door unless otherwise noted, including door top and bottom edge surfaces.
- I. Tinting: Tint each primer a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint primer to match the color of the finish coat, but provide sufficient differences in shade of primer to distinguish each separate coat.

3.5 PROTECTION

- A. Protect work of other trades and items not intended to receive paint. Install "wet paint" signs to protect newly painted surfaces.

3.6 CLEANING

- A. Protection - Carefully protect areas where work is in progress from damage.
 - 1. Provide and spread clean drop cloths when and where required to provide the necessary protection.
 - 2. Immediately clean-up all accidental spatter, spillage, misplaced paint and restore the affected surface to its original condition.
- B. Clean-up:
 - 1. Clean up debris daily per OSHA requirements.
 - 2. At completion of work, remove all materials, supplies, debris and rubbish and leave each area in a clean, acceptable condition.
 - 3. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.7 SURFACES TO BE FINISHED

- A. Paint all new work and areas affected by new work, unless noted otherwise.

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- B. Do not paint or finish the following items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint shop primed items occurring in finished areas.
 - 3. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint.
 - 4. Paint dampers exposed behind louvers, grilles and convector and baseboard cabinets to match face panels.

3.8 PAINT SYSTEMS -INTERIOR - ZERO VOC

- A. Gypsum Board:
 - 1. Flat, Modified Copolymer, Low-Odor/Zero-VOC:
 - a. First Coat: VINYLASTIC Low odor Zero VOC Sealer (VNSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Flat Paint (SZRO10).
 - 2. Eggshell, Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: VINYLASTIC Low odor Zero VOC Sealer (VNSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Eggshell Paint (SZRO30).
 - 3. Semi-Gloss, 100% Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: First Coat: VINYLASTIC Low odor Zero VOC Sealer (VNSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Semi-Gloss Paint (SZRO50).
 - 4. Flat, Modified Copolymer, Low-Odor/Zero-VOC:
 - a. First Coat: ULTRAGRIP Select Low odor Zero VOC Sealer (UGSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Flat Paint (SZRO10).
 - 5. Eggshell, Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: ULTRAGRIP Select Low odor Zero VOC Sealer (UGSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Eggshell Paint (SZRO30).
 - 6. Semi-Gloss, 100% Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: ULTRAGRIP Select Low odor Zero VOC Sealer (UGSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Semi-Gloss Paint (SZRO50).
- B. Metals: Ferrous
 - 1. Flat, Modified Copolymer, Low-Odor/Zero-VOC:
 - a. First Coat: BLOC-RUST Red Oxide or White (BRPR00-1-RO or BRPR00-1-WH).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Flat Paint (SZRO10).
 - 2. Eggshell, Modified Copolymer, Low-Odor/Zero-VOC:
 - a. First Coat: BLOC-RUST Red Oxide or White (BRPR00-1-RO or BRPR00-1-WH).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Eggshell Paint (SZRO30).
 - 3. Semi-Gloss, Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: BLOC-RUST Red Oxide or White (BRPR00-1-RO or BRPR00-1-WH)

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- b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Semi-Gloss Paint (SZRO50).
- C. Metals: Non-Ferrous.
 - 1. Flat, Modified Copolymer, Low-Odor/Zero-VOC:
 - a. First Coat: ULTRAGRIP Select Low odor Zero VOC Sealer (UGSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Flat Paint (SZRO10).
 - 2. Eggshell, Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: ULTRAGRIP Select Low odor Zero VOC Sealer (UGSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Eggshell Paint (SZRO30).
 - 3. Semi-Gloss, 100% Acrylic, Low-Odor/Zero-VOC:
 - a. First Coat: ULTRAGRIP Select Low odor Zero VOC Sealer (UGSL00).
 - b. Two Coats: SPARTAZERO Low-Odor/Zero-VOC Interior Semi-Gloss Paint (SZRO50).

3.9 COLORS

- A. As indicated on the Drawings.

END OF SECTION 099100

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SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs (room signs).
 - 2. Parking signs.
 - 3. Traffic signs.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
- C. Qualification Data: For Installer.
- D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

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1.5 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
 - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signage fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Signs: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Best Sign Systems Inc. (Basis of Design)
 - 2. Apco Graphics Inc.
 - 3. ASI Sign Systems, Inc.
 - 4. Curcio Enterprises, Inc.
 - 5. Mohawk Sign Systems.
 - 6. Sign A Rama.
 - 7. Or equal.

2.2 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.
- B. Product: HC300 ADA Sign System by Best Sign Systems.
 - 1. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished.
 - 2. No Smoking signs.
 - 3. Room, Occupancy, Wayfinding Signs: As selected from 4 standard copy size signs.
 - a. 4" x 2" with up to 4 characters each.
 - b. 6" x 2" with up to 8 characters each.
 - c. 8" x 2" with up to 12 characters each.
 - d. 10" x 2" with up to 14 characters each.
 - 4. Toilet Room Signs: As selected from manufacturer's standard.

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5. Symbols of Accessibility: Provide 6-inch- high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.
6. Material:
 - a. 1/4 inch thick (thicker than standard) "MP", acrylic sheet, ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
7. Copy: Contracted grade 2 Braille all capital letter on tactile sign.
 - a. Font and Size: As indicated on Drawings.

2.3 PARKING SIGNS

- A. Material: 0.063" aluminum, screen printed copy on engineer grade reflective vinyl sheeting.
 1. Text: Symbols of accessibility, accessible direction, etc. as indicated on Drawings.
- B. Accessible signs are blue with white symbol.
- C. Post: 2 inch diameter, schedule 40 galvanized pipe.

2.4 TRAFFIC SIGNS

- A. Material: 0.080" aluminum, screen printed copy on engineer grade reflective vinyl sheeting.
 1. Text: Stop, Yield, Do Not Enter, etc. as indicated on Drawings.
- B. Post: 2 inch diameter, schedule 40 galvanized pipe.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

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- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
 - 2. Signs placed on glazed surfaces, backing sign of the same material and color shall be applied on the opposite glazed surface.
 - 3. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Panel Signs:
 - 1. Interior Signs on Smooth Substrates:
 - a. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
 - 2. Exterior and Interior Signs on Rough Substrates:
 - a. Mechanical Fasteners: Mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
 - 1) Fastener: Stainless steel screws, tamper-resistant flat head countersink.
 - 2) Anchors: Suitable for secure attachment to substrate.
- C. Parking and Traffic Signs
 - 1. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 2. Install sign level, plumb, and at height indicated.
 - 3. Cap post with galvanized cap.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

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SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid-polymer units as follows:
 - 1. Toilet and shower compartments.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
- C. Samples for Initial Selection: For each type of unit indicated.
- D. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of toilet compartments that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 year.
- B. Installer Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Solid-Polymer Units: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Scranton/Santana/Comtec. (Basis of Design)
 - 2. Bradley.
 - 3. Global Materials.
 - 4. Ampco.
 - 5. Or equal.

2.2 MATERIALS

- A. Solid-Polymer:
 - 1. Self Ignition: 700 F, ASTM D1929.
 - 2. Rate of Burn: 1.29 cm/min., ASTM D635.
 - 3. Smoke Density: 13.9, ASTM D2843.
- B. Aluminum: 6364-T5 aluminum extrusions, ASTM B221.

2.3 SOLID-POLYMER UNITS

- A. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

2.4 COMPONENTS

- A. Wall and Pilaster Brackets: 54-inch long, continuous plastic channel brackets.
- B. Pilaster Shoes:
 - 1. Manufacturer's stainless steel.
- C. Fasteners: "The Clean Look" 3/4 inch #14 screws (Star-Head Security Pin).
- D. Brackets: Plastic Continuous.
- E. Hardware:
 - 1. Hinge Type: Wrap-around, Aluminum.
 - 2. Door latch housing: Aluminum extrusion with clear anodized finish, surface mounted fastened to door with Type 304 stainless steel vandal resistant one-way screws. Side bolt and button shall be "Tough coat black" finish. Thumb turn type not acceptable in order to meet Accessibility code.
 - 3. Strike and keeper: 6-inch long extruded aluminum with clear anodized finish, equipped with rubber bumper, fastened to pilaster with vandal resistant one-way through bolts.
 - 4. Equip each door with sliding door latch and coat hook with bumper.

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5. Provide door pull and wall stop for outswing doors. Equip Accessible stall doors with inside and outside pulls.
 - a. Door Pull: U shape.
6. Hinge Inswing: Standard position closed.
7. Hinge Outswing: Standard position closed.
8. Hinge Accessible: Standard position closed.

F. Shower Accessories: Integrated shower curtain by Scranton or equal.

2.5 FABRICATION

- A. Fabricate partitions with finished faces, free of saw marks, and edges machined to 0.250 inch radius.
- B. Bevel corners and edges of cutouts.
- C. Doors, Shower, Panels, and Pilasters:
 1. Thickness: 1 inch minimum.
 2. Door Width:
 - a. 24 inches minimum.
 - b. Accessible type:
 - 1) Front Access to Compartment: 32 inches minimum clear opening.
 - 2) Side Access to Compartment: 34 inches minimum clear opening.
 3. Door Height: 55 inches.
 4. Pilaster Height: 82 inches.
 5. Panel Height: 55 inches, mounted 14 inches AFF.
 6. Heat-Sink Strip: Aluminum edging strips to be fastened to bottom edge of doors and panel using anti-theft fasteners.
- D. Urinal Screens:
 1. Thickness: 1 inch.
 2. Screen Width: 24 inches minimum.
 3. Screen Height: 42 inches mounted 14 inches AFF.
 4. Heat-Sink Strip: Aluminum edging strips to be fastened to bottom edge of doors and panel using anti-theft fasteners.

2.6 FINISHES

- A. Solid, high-density polyethylene:
 1. Color: As selected by Architect from manufacturer's full range.
- B. Aluminum: Clear anodized.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Attach continuous wall brackets securely to walls using stainless steel fasteners spaced maximum 12 inches on center.
 - 3. Attach panels and pilasters to continuous brackets with one-way sex bolts.
- B. Floor to Ceiling Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- C. Floor to Ceiling Anchored Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ERECTION TOLERANCES

- A. Maximum variation from true position: 1/4 inch. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 1/4 inch.
- B. Maximum variation from plumb: 1/8 inch.

3.3 ADJUSTING

- A. Hardware Adjustment:
 - 1. Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation.
 - 2. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched.
 - 3. Set hinges all accessible stalls to return to fully closed position.

END OF SECTION 102113

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SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Toilet accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Drawings.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- 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.

1.4 COORDINATION

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

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1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace toilet and bath accessories that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Toilet and Bath Accessories: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Bobrick Washroom Equipment, Inc. (District Standard)
- B. Underlatory Guards: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Handy-Shield by Plumberex Specialty Products, Inc. (Basis of Design)
 - 2. IPS Corp.
 - 3. TCI Products.
 - 4. Truebro, Inc.
 - 5. Or equal.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.
- D. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 TOILET ACCESSORIES

- A. As indicated on Drawings.

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2.4 UNDERLAVATORY GUARDS

- A. Product: Handy-Shield Maxx by Plumberex Specialty Products, Inc. or equal.
 - 1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
 - 2. PVC insulator shall be 1/8" thick.
 - 3. Meets Testing Standard ASTM E 84-07 per IBC Chapter 8.
 - a. 25 flame spread.
 - b. 450 smoke index.
 - 4. Surfaces to be soft, smooth, non-absorbent, easy to clean U/V inhibited, antimicrobial, antifungal properties.
 - 5. Insulator shall have a dual fastening system which consists of fusion bonded Velcro fastener strips for full slit enclosure and tamper resistant, smooth, non-abrasive snap-locking fasteners.

2.5 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate OFCI items with District.
- B. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- C. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

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

END OF SECTION 102800

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SECTION 104116 – EMERGENCY KEY CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Key storage cabinets. (Order through local fire marshal)

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.3 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of key storage cabinets that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Key Storage Cabinets: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Knox Company. (Basis of Design)
 - 2. Or equal.

2.2 KEY STORAGE CABINETS

- A. Product: 3200 Series Knox-box by Knox or equal.
 - 1. Housing: 1/4 inch plate steel.
 - 2. Door: 1/2 inch thick steel door, stainless steel hinge.
 - 3. Capacity: Holds up to 10 keys or 3 access cards.
 - 4. Grade: Exterior grade; resists moist conditions with weather resistant door gasket.
 - 5. Dimensions:
 - a. 5 inch W x 4 inch H x 3-1/4 inch D for surface mount.
 - 6. Lock: 1/8 inch thick stainless steel dust cover with tamper seal. UL listed. Double-action rotating tumblers and hardened steel pins accessed by biased cut key.
 - 7. Weight: 8 lbs for surface mount.
 - 8. Finish: Factory Knox-coat, a proprietary powder coat.

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- a. Color: As selected by Architect from black, dark bronze, or aluminum.
- 9. Installation Accessories: 5/16 inch Grade 5 or 8 bolt and large washers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls for suitable conditions where cabinet will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Install cabinet level, plumb, square, rigid, and true.

END OF SECTION 104116

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SECTION 104400 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 3. Mounting brackets for fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on Samples of size indicated below.
 - 1. Size: 6 by 6 inches square.
- D. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10-1998 Edition, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

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1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: 6 years.
- B. Installer Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers and Cabinets: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. JL Industries, Inc. (Basis of Design)
 - 2. Larsen's Manufacturing Company.
 - 3. Potter Roemer; Div. of Smith Industries, Inc.
 - 4. Ansul.
 - 5. Or equal.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick minimum.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Valves: Manufacturer's standard.
 - 2. Handles and Levers: Manufacturer's standard.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
 - 4. Certification Tag: Provide fire extinguisher with valid certification test tag where fire extinguishers are fully charged and ready to be used.
- B. Dry Chemical Type: Cast steel tank, with pressure gage.
 - 1. Class 2A-10B:C, UL rated.
 - 2. Nominal Capacity: Provide largest capacity fire extinguisher that will fit in the cabinet, but 5 lbs. minimum.

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3. Finish: Baked enamel, red color.
 4. Use: General purpose.
- C. Dry Chemical Type: Cast steel tank, with pressure gage.
1. Class 2A-20B:C.
 2. Nominal Capacity: Provide largest capacity fire extinguisher but 10 lbs. minimum.
 3. Finish: Baked enamel, red color.
 4. Use: At mechanical rooms and where indicated.
- D. Wet Chemical Type: Cast steel tank, pressurized, including hose and nozzle, with bracket.
1. Class 2A-K.
 2. Size 2.5 gal.
 3. Finish: Factory baked enamel, red color.
 4. Use: At kitchens.

2.4 FIRE-PROTECTION CABINET

- A. Product: Cosmopolitan series - stainless steel fire extinguisher cabinet by JL.
1. Door and Trim Construction: No. 4 stainless steel. Flush cabinet doors with a 5/8" door stop are attached by a continuous hinge and equipped with zinc-plated handle and roller catch.
 2. Trim Style and Depth: Provide semi-recessed where recessed can't be provided.
 - a. Recessed: 3/8" flat trim.
 - b. Semi-Recessed: 1-1/4", 1-1/2" Square Edge or 2-1/2", 3", 4" (recessed pull), 4-1/2" Rolled Edge.
 3. Finish: #4 Stainless Steel.
 4. Tub: Constructed of cold rolled steel with white powder-coat finish standard. Surface mount tubs are No 4 stainless.
 5. Fire-Rated: At fire-rated assembly.
 6. Door Styles: View Door Styles at Right.
 7. Door Glazing: Tempered Glass.

2.5 MOUNTING BRACKETS

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

2.6 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

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1. Weld joints and grind smooth.
 2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material.
 - a. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STAINLESS-STEEL FINISHES

- A. General: Remove tool and die marks and stretch lines or blend into finish.
1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Bright, Directional Polish: No. 4 finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged units.

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

3.2 PREPARATION

- A. Prepare recesses for recessed and semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated on Drawings.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104400

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SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. All-welded metal lockers.
 - 2. Locker benches.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide calculations and details for anchorage of lockers per ASCE 13.5.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For metal lockers and locker benches, in manufacturer's standard sizes.
- E. Qualification Data: For qualified Installer.
- F. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.
- G. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single manufacturer.
- C. Regulatory Requirements: Where metal lockers and benches are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 and California Building Code.

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- D. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver master and control keys to Owner by registered mail or overnight package service.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.6 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for All-Welded Metal Lockers: Lifetime.
- B. Installer's Warranty: 2 years.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Locks.
 - b. Identification plates.
 - c. Hooks.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All-Welded Lockers: Subject to compliance with requirements, provide products by one of the following manufacturers
 - 1. DeBourgh Mfg. Co. (Basis of Design)
 - 2. Penco Products, Inc., Subsidiary of Vesper Corporation.
 - 3. Art Metal Products, Div. of Fort Knox Storage Co.
 - 4. Lyons.
 - 5. Or equal.

2.2 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
- B. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch steel mesh, with at least 70 percent open area.
- C. Steel Tube: ASTM A 500, cold rolled.
- D. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- E. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.3 ALL-WELDED METAL LOCKERS

- A. Product: Corregidoor Physical Education (PE) Lockers by DeBourgh or equal.
 - 1. Locker Configuration: As indicated on Drawings.
 - 2. Locker Construction:
 - a. Lockers to be welded unibody construction with exposed welds sanded smooth.
 - b. No bolts, screws or rivets used in assembly of locker units.
 - c. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions.
 - 3. Body of Lockers:
 - a. Sides and Intermediate Partitions: Exterior sides constructed of 16 gauge domestic cold rolled sheet steel for maximum durability with 18 gauge intermediate partitions. Intermediate partitions to be diamond perforated for maximum ventilation.
 - b. Backs: Solid sheet of 18 gauge cold rolled sheet steel welded to frames of sides and intermediate partitions.
 - c. Shelves and Tier Dividers: Constructed of 18 gauge cold rolled sheet steel welded to sides and intermediate partition construction. Shelves provided in lockers 60 inches and taller, located to provide a minimum of 12 inches clearance.

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4. Continuous Door Strike:
 - a. Tier dividers, tops and bottoms constructed to provide four-sided, continuous door strike for a secure, sanitary and intrusion-free locker while door is in closed position.
5. Doors:
 - a. Doors are 16 gauge CRS formed outer panel with double bends on both sides and a single bend on top and bottom with 18 gauge steel formed stiffener panel.
 - b. Door stiffener runs top to bottom on hinge side of door and is securely welded to outer door to form a reinforced channel for additional torque-free strength and sound reduction when closing door. (Inner panel not available on 9 inch wide or box locker 12 inches high or less).
6. Door Ventilation:
 - a. Diamond Perforated with 1/2 inch by 1-3/8 inch diamond perforations providing 37% ventilation per square inch.
 - b. Secur-N-Vent doors with three-dimensional vertical vents formed on fronts and backs of door providing 21% ventilation per square inch.
7. Latching:
 - a. Sentry III Single-Point Latch
 - 1) Eleven gauge stationary latch welded securely to locker frame.
 - 2) Latch extends no more than 1-1/4 inch into locker opening, penetrating through cup.
 - 3) Flush-mounted, recessed stainless steel cup in a formed door with 18 gauge vertical back panel stiffener.
8. Hinges:
 - a. 16 gauge continuous piano hinge on the right side of the opening.
 - b. Hinges welded to door and riveted to locker frame.
9. Slope Tops:
 - a. Provide 18 gauge all welded slope top with 25 degree pitch, attached at factory with concealed fasteners. Slope top to be in addition to standard 16 gauge flat top.
10. Closed Base:
 - a. Provide 4 inch high, 14 gauge welded steel base enclosed on all four sides securely welded to locker bottom.
11. Reinforced Bottom:
 - a. Provide 16 gauge spacer channel welded to locker bottom from front to back for a more secure installation. Spacer channel to have full height 1/2 inch ID tube welded over anchor holes to eliminate deflection upon locker installation. Spacer channel meets all California installation seismic requirements. (When closed bases are not used).
12. Filler Panels: Manufacturer's standard fabricated from 18 gauge solid steel finished to match lockers.
13. Finish:
 - a. Complete locker unit to be thoroughly cleaned, phosphatized and sealed.
 - b. Finish to be baked powder coat with a minimum 2-3 mil thickness.
 - c. Color of lockers shall be chosen from manufacturer's 25 standard colors.
14. Accessories:
 - a. Hooks:
 - 1) Hooks to be heavy duty forged steel with ball ends and zinc plated.
 - 2) Provide two single ceiling hooks and one double ceiling hook in each locker opening 20 inches or taller.
 - b. Numbering
 - 1) Furnish each locker with black anodized laser-etched aluminum number plate.
 - 2) Locate number plate near center of each door.

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- 3) Owner to furnish numbering sequence.

2.4 LOCKER BENCHES

- A. Provide bench units with overall assembly height of 17-1/2 inches.
- B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
 - 1. Locker Benches: 24 by 48 inch minimum size for accessible use.
- C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
 - 1. Tubular Steel: 1-1/2-inch- diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
 - a. Color: As selected by Architect from manufacturer's full range.

2.5 FABRICATION

- A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
 - 3. Provide International Symbol of Accessibility.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- D. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers of lockers and to floor.
 - 3. Anchor back-to-back metal lockers to floor.
- B. All-Welded Metal Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
 - 4. Attach recess trim to recessed metal lockers with concealed clips.
 - 5. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 6. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 7. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
 - 8. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.
- D. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

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- C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

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SECTION 107315 - AWNINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Roll-formed aluminum overhead hanger rod style canopies.

1.2 SUBMITTALS

- A. Product data.

1.3 QUALITY ASSURANCE

- A. Products meeting these specifications established standard of quality required as manufactured.

1.4 FIELD MEASUREMENTS

- A. Confirm dimensions prior to preparation of shop drawings when possible.
- B. If requested, supply manufacturer s standard literature and specifications for canopies.
- C. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

1.5 PERFORMANCE REQUIREMENTS

- A. Canopy must conform to local building codes.
- B. PE Stamped calculations are not required.

1.6 DELIVER, STORAGE, AND HANDLING

- A. Deliver and store all canopy components in protected areas.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Awnings: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.

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1. Lumishade Hanger Rod Supported by Mapes Canopies. (Basis of Design).
2. MASA Architectural Canopies.
3. CR Laurence.
4. Or equal.

2.2 MATERIALS

- A. Decking shall consist of an interlocking roll-form 2 1/2 W style pan (.032" aluminum).
- B. Intermediate framing members shall be extruded aluminum, alloy 6063-T6, in profile and thickness shown in current Mapes brochures.
- C. Hanger rods and attachment hardware shall be powder coated.
- D. Fascia shall be standard 8" extruded J style.

2.3 FINISHES

- A. Finish: Factory Class II Color Anodized.
 1. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. All Mapes canopies are shipped in preassembled sections for ease of installation.
- B. All connections shall be mechanically assembled utilizing 3/16 fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
- C. Decking shall be designed with interlocking roll-formed aluminum members.
- D. Concealed drainage. Water shall drain from covered surfaces into intermediate trough and be directed to Front Scupper.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Confirm that surrounding area is ready for the canopy installation.
- B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by Mapes Industries.
- C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed

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3.2 INSTALLATION

- A. Installation shall be in strict accordance with manufacturer s shop drawings. Particular attention should be given to protecting the finish during handling and erection.
- B. After installation, entire system shall be left in a clean condition.

END OF SECTION 107315

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SECTION 113034 – CEILING FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. The ceiling-mounted circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with mounting hardware, a remote control.
 - 2. Installation of the fan, wireless network, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided by others.
- B. Related Sections:
 - 1. Division 26 sections for power and control wiring.

1.2 SUBMITTALS

- A. Product Data: Specification sheets on the ceiling-mounted fan, specifying electrical and installation requirements, features and benefits, and controller information.
- B. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods.
- C. Installation and maintenance Manuals: The manufacturer shall furnish a copy of all installation, operation, and maintenance instructions for the fan.

1.3 QUALITY ASSURANCE

- A. Certifications
 - 1. Safety:
 - a. The fan assembly, as a system, shall be Intertek/ETL-certified and built pursuant to the following standards.
 - 1) UL 1004-1. Standard for Safety for Rotating Electrical Machines - Part 1 General Requirements.
 - 2) UL 1004-3. Standard for Safety for Thermally Protected Motors.
 - 3) UL 1004-7. Standard for Safety for Electronically Protected Motors.
 - 2. Sustainability Certification:
 - a. ENERGY STAR® certification – ENERGY STAR Most Efficient 2015.
- B. Manufacturer Qualifications
 - 1. The fan and any accessories shall be supplied by manufacturer that has a minimum of ten (10) years of product experience.
 - 2. ISO 9001-certified.

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1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.
- B. The fan and its components must be stored in a safe, dry location until installation.

1.5 WARRANTY

- A. The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer (including transportation charges within the USA, F.O.B. Lexington, KY), pursuant to the complete terms and conditions.
 - 1. Industrial and Commercial Installations:
 - a. Motor: 3 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Ceiling Fans:
 - 1. Big Ass Fans. (Basis of Design)
 - 2. Or equal.

2.2 CEILING FANS

- A. Product: Mammoth by Big Ass Fans or equal.
 - 1. Fan diameter: As indicated on Drawings.
 - 2. Airflow: 15,000 CFM.
 - 3. Noise: Less than 35 dBA.
 - 4. Weatherproof: UL wet rated.
 - 5. Mounting: Universal.
 - 6. Control: Bluetooth remote and wall control.
 - 7. Finish: Black or Silver option as selected by Architect.

PART 3 - EXECUTION

3.1 REPARATION

- A. The fan location must have an appropriate ceiling-mounted outlet box marked, "Acceptable for Fan Support." If there is not an appropriate outlet box already installed at the location, one must be installed on a ceiling joist or beam and be properly wired. Additional mounting options may be available. Consult the installation guide for additional details.
- B. The fan location must be free from obstacles such as lights, cables, or other building components.

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- C. Check the fan location for proper electrical requirements. Consult the installation guide for appropriate circuit requirements.

3.2 INSTALLATION

- A. Install the fan according to the manufacturer's installation guide, which includes acceptable mounting methods.
- B. Install and set up the app according to the manufacturer's instructions.

END OF SECTION 113034

SECTION 11 40 00- FOODSERVICE EQUIPMENT

PART 1 – GENERAL

1.1. SUMMARY

- A. Section includes the furnishings and installing foodservice equipment as shown on the Drawings and per the Specifications.
- B. Section includes the responsibilities for a single-source foodservice equipment specialist.
- C. Related Sections:
 - 1. TS Divisions 15 and 16 for connections of plumbing, HVAC, and electrical systems.

1.2. SYSTEM DESCRIPTION

- A. All items shall be delivered to the site, uncrated, set-in-place, and leveled under these Specifications. Items shall be kept dry and clean.
- B. Provide all labor, materials, equipment, appliances, tools, articles, and all operations required to provide a complete food facilities equipment installation ready for continuous and satisfactory service in accordance with Specifications and applicable Drawings.
- C. The Specifications and Drawings are intended to cover the furnishing and installation of all itemized equipment including hood and walk-in refrigerators.
- D. The Foodservice Contractor shall be responsible for each item of equipment complying with the requirements of and being approved by the local and state health departments.
- E. All equipment shall be complete with all usual wiring, switches, controls, valves, vacuum breakers, regulating valves, Required Seismic Attachments and/or Restraints, etc., to conform to the requirements of:
 - 1. National Sanitation Foundation, Inc.
 - 2. National Fire Protection Association.
 - 3. American Gas Association.
 - 4. Public Health Service.
 - 5. Office of Local Fire Marshal.
 - 6. Underwriter's Laboratories, Inc. (Chicago, Ill.)
 - 7. Air Conditioning and Refrigeration Institute.
 - 8. National Electrical Code.
 - 9. Board of Fire Underwriters.
 - 10. American Welding Society.

1.3. SUBMITTALS

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- A. Product Data: For each type of product indicated. Include the following:
 - 1. Manufacturer's model number.
 - 2. Accessories and components that will be included for Project.
 - 3. Clearance requirements for access and maintenance.
 - 4. Utility service connections for water, drainage, power, and fuel; including roughing-in dimensions.
- B. Shop Drawings: Submit complete, detailed shop drawings showing all dimensions and rough-in requirements for fabrication and installation of each item of kitchen equipment and millwork in accordance with the procedure specified and obtain approval of the City's Representative before fabrication is begun.
 - 1. All equipment to be custom fabricated is to be fully detailed and dimensioned to a minimum scale of $\frac{3}{4}$ inch to the foot for plan and elevation views and 1-1/2 inch to the foot for sectional views.
 - 2. Wiring Diagrams:
- C. Coordination Drawings: For foodservice facilities.
 - 1. Indicate locations of foodservice equipment and connections to utilities.
 - 2. Key equipment using same designations as indicated on Drawings.
 - 3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment supports; and utility service characteristics.
 - 4. Include details of seismic bracing for equipment.
- D. Qualification Data: For foodservice facilities.
- E. Operation and Maintenance Data: To include in operation and maintenance manual. In addition to items specified in TS Division 1, Section 01782 – Operation and Maintenance Data, include the following:
 - 1. Product Schedule: For each foodservice equipment item, include the following"
 - a. Designation indicated on Drawings
 - b. Manufacturer's name and model number.
 - c. List of factory-authorized service agencies including addresses and telephone numbers.
- F. Warranties.
- G. Minutes of preinstallation conference.

1.4. QUALITY ASSURANCE

- A. Foodservice Equipment Specialist Qualifications: An experienced supplier and installer of foodservice products and equipment who has completed work installations similar in material, design, and extent to that indicated for Project, and whose work has resulted in construction with a record of successful in-service performance.

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1. Experience: No fewer than five completed projects that have been in operation for a minimum of five years.
 - a. Experienced in administration and supervision of work, including mechanical and electrical work, and integration of its various components.
- B. The Foodservice Equipment Specialist shall be responsible for each item of equipment complying with the requirements of and being approved by the local and state health departments, and the following:
 1. Coordinate foodservice equipment work.
 2. Furnish and install foodservice products and equipment indicated.
 3. Perform field quality-control services for foodservice equipment work.
 4. Perform demonstration and training for foodservice equipment work.
 5. Procure and pay for all permits and licenses necessary for execution of foodservice equipment work.
 6. Comply with all laws, ordinances, rules, orders and regulations relating to the performance of work, the protection of adjacent property and the maintenance of passageways, guard fences and other protective facilities, as required.
 7. Supply any and all certificates of compliance required by local government and agencies prior to acceptance of equipment.
- C. Manufacturing items are specified by manufacturer and model number and it is the intention that these items be furnished complete in detail and with all standard accessories as stated in published catalog data, shop drawings and literature existing at the time of bidding.
- D. All items of equipment shall be of the best quality. Both materials and workmanship shall conform to all rules and regulations of the National Board of Fire Underwriters and bear the National Sanitation Foundation Seal as appropriate.
- E. All specialty built equipment shall be fabricated by one manufacturer and shall be uniform throughout as to method and type of construction used. The fabricator of this equipment, as well as the Foodservice Subcontractor, must show that he has been actively engaged in the manufacture and distribution of equipment as required under this Contract as his principle product. The manufacturer shall submit evidence of having executed contracts of size comparable to this contract and of his experience and ample financial resources to enable him to handle the work in a satisfactory manner.
- F. The materials or products specified herein by trade names, manufacturer's name or catalog number shall be provided as specified. Substitutions will not be permitted unless approved by City's Representative in writing prior to bidding. This stipulation applies to all equipment and materials, including those specified as "Or equal." Equivalent Products will only be accepted as complete systems, and they will be expected to perform in all respects as well as the original specification.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in TS Division 1, Section 01310 "Project Management and Coordination."

1.5. DELIVERY, STORAGE, AND HANDLING

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- A. All equipment shall be received at the building crated and fully protected. It will be the responsibility of the Foodservice Equipment Specialist to protect the equipment until completely installed and accepted.

1.6. PROJECT CONDITIONS

- A. Field Dimensions: All sizes given are approximate and are as accurate as can be determined at this time. Foodservice Equipment Specialist shall check all measurements at the building prior to fabrication of equipment. All equipment must conform to the finished building conditions. Where obstruction occur, equipment must be neatly scribed fitted to and around same resulting in a sanitary, homogeneous fixture.

1.7. WARRANTY

- A. The Foodservice Equipment Specialist shall guarantee complete installation free of all defects of material, equipment and workmanship for 90 days beginning from date of Substantial Completion. During this 90-day period the Foodservice Equipment Specialist is responsible for proper adjustment of all systems, equipment and devices installed.
- B. All warranties shall not start until the date of Substantial Completion. AL equipment shall be provided with one year warranty on all parts. The Foodservice Equipment Specialist shall provide the City with the name, address and phone number of the local authorized service agent for emergency calls. This shall be furnished in lists form after the installation and prior to the final approval of the installation.
 - 1. Additional five year compressor warranty to be furnished with all refrigeration packages.

PART 2 – PRODUCTS

2.1. MATERIALS

- A. All materials and equipment shall be new and of best commercial grade. Use product of one manufacturer where two or more items of same kind of equipment are required.
- B. Workmanship throughout shall be of the highest grade, in accordance with the best practice and most modern methods. All parts shall fit together securely and accurately. Field joints are to be provided only for the convenience of installation and shipping and shall be held to a minimum. Joints shall be provided with butt straps on the underside of the top so that tops can be pulled together tightly forming a hairline, watertight connection. All field joints shall be welded, ground and polished to a #4 finish. There shall be no exposed bolts or rivets on the top except where construction necessitates and approval is obtained.
- C. Stainless steel (S/S) shall be type 304, extra low carbon nonmagnetic, austenitic 18 percent chrome – 8 percent nickel corrosion-resisting allow steel. Sheets shall be flat, free of all buckles and surface imperfections.

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- D. Galvanized iron (GI) shall be an approved grade copper bearing steel. Zinc coating shall be applied after fabrication (brake or die forming, drilling, fitting, welding or other operations). Finish of G.I. to be two coats of epoxy based grey hammertone paint on prime undercoat over thoroughly cleaned surfaces.
- E. All gauges for sheet iron and sheet steel shall be U.S. Standard gauges and finished equipment gauge thickness shall not vary more than 5 percent plus or minus from thickness indicated below:

Gauge	Thickness	Gauge	Thickness
#10	0.1406	#16	0.0625
#12	0.1094	#18	0.050
#14	0.0781	#20	0.0375

- F. Unless otherwise specifically called for herein, no material lighter than #20 gauge shall be incorporated into the work.
- G. Stainless steel pipe and tubing shall be seamless steel sheets.
- H. Structural sheet members used for framing consisting of angles, bands, bars, channels, etc., shall be ductile in quality, free of hard spots, runs, checks, cracks and other surface defects. They shall be smooth, galvanized by the hot dip process with all surplus removed and free of runs, blisters, excess spelter and uncoated spots or patches.
- I. White metal shall consist of corrosion-resistant metal containing not less than 30 percent nickel. All castings shall be rough ground, polished and buffed to bright luster, free from pit marks, runs, checks, burrs and other imperfections. In lieu of white metal castings, 18 X 8 stainless steel die-stamped or cast will be acceptable.
- J. All welding shall be done by the heliarc method. All welding shall be done in a thorough manner with welding rod of the same composition as sheets or parts welded. Welds shall be complete welds, strong and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces. Welds are to be free of mechanical imperfections, such as gas holes, pits, runs, cracks, etc. All joints in tops, sides and ends of fixtures, tables, drainboards, overshelves, sinks, etc. shall be continuously welded so that the fixtures shall appear as one piece construction. Butt welds made by spot welding straps under seams and filling in the voids with solder and finished by grinding will not be acceptable. Welding shall conform to American Welding Society (AWS) requirements.
- K. Spot welds shall have a maximum spacing between welds of 3 inches. Tack welds shall have at least ¼ inch length of welding material at a maximum spacing of 4 inches. Welds at the ends of channel battens shall not exceed 2 inch centers.
- L. All Exposed surfaces shall be free from bolt, screw and rivet heads. When bolts are required they shall be of concealed type and be of similar composition as the metal to which they are applied. Where bolt or screw threads on the interior of fixtures are visible or may come in contact with heads or wiping cloth they must be capped with a stainless steel acorn nut with a stainless steel lock washer.
- M. Where screw threads are not visible or readily accessible, they may be capped with a standard lockwasher and steel nut treated to prevent rusting or corroding. Where bolts or screws are welded to the underside of trim or tops, the reverse side of the weld shall be

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neatly finished uniform with the adjoining surface of the trim or the top. Depressions at these points will not be acceptable. Rivets shall not be used as a method of fastening in any location.

- N. All welds, bolts, screws, nuts, washers and rivets shall be steel except where brass or stainless steel is fastened, in which case they shall be brass or stainless steel respectively. Where dissimilar metals are fastened, the fastenings shall be of higher grade metal. Spacing and extent of welds, bolts, screws and rivets shall insure suitable fastenings and prevent bulging of metals fastened.
- O. In no case shall soldering, riveting, tack or spot welding at any time be considered as a replacement for welding, nor shall any soldering operation be done where dependence is placed on stability and strength of the joint or fixture proper.
- P. In general, fixtures shall be shop fabricated of one piece construction, shipped to the job completely assembled. Equipment too large to transport or enter the building as one piece shall be constructed so that welded field joints can be made at the job site.
- Q. Joints welded at the job site shall be equal to construction as specified above.
- R. Trim is not an acceptable substitute for accuracy and neatness; and when trim is required and accepted by the City's Representative in lieu of rejection of items of equipment, it is the Food Service Specialist's responsibility to provide same at no additional cost.
- S. All equipment that rests on masonry bases shall be set level into a bed of silicone rubber sealant and it is the responsibility of the Food Service Specialist's to coordinate his equipment to the base.
- T. All equipment that butts or is adjacent to a wall shall be scribed and sealed to the wall with silicone rubber sealant and suitably fastened to wall with fasteners a minimum of 48 inches on center.

2.2. GRINDING, POLISHING, FINISHING

- A. All exposed, welded joints shall be suitably ground flush with adjoining material and neatly finished to harmonize therewith. Wherever material has been sunken or depressed by welding operation, such depressions shall be suitable hammered and peened flush with the adjoining surface and, if necessary, again ground to eliminate low spots. In all cases the grain of rough grinding shall be removed by successive fine polishing operations. All stainless steel shall have a No. 4 finish on all exposed surfaces and a No. 4 finish on all concealed surfaces.
- B. All unexposed welded joints on undershelves of tables or counters in stainless steel construction shall be suitable coated at the factory by means of metallic base paint to prevent possible corrosion at such locations.
- C. After galvanized iron members have been welded, all welds and areas where galvanizing has been damaged shall be re-coated to prevent oxidation. Submit a sample of re-coated area complete with a detailed explanation of the method to be used for approval before proceeding.

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- D. Butt joints and contract joints. wherever they occur, shall be close fitting and shall not require solder as a filler. Wherever break bends occur they shall be free of undue extrudence and shall not be flaky, scaly or cracked in appearance of the material all such marks shall be removed by suitable grinding, polishing and finishing. Wherever sheared edges occur. they shall be free of burrs, fins or irregular projections and shall be finished to obviate all danger of cutting or laceration when the hand is drawn over such sheared edges. In no case are overlapping materials to be acceptable where miters or bull-nosed corners occur.
- E. The grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each individual item of fabricated equipment, except in the case where table or sink tops join at right angles, where the finish of the horizontal sections of each terminating in a mitered edge shall be acceptable. Where sinks and adjacent drain boards are equipped with back splash, the grain of polishing shall be consistent in direction throughout the length of the back splash and sink compartment.
- F. Where stainless steel surfaces are disturbed by the fabricating process, such surfaces shall be finished to match the adjoining surfaces.
- G. Final Polishing: At the completion of the installation work, all stainless steel shall be gone over with a portable polishing machine and buffed to perfect surfaces. All painted surfaces shall be carefully gone over and retouched as required.

2.3. FABRICATION

- A. Metal Table Tops: Construct of 14 gauge stainless steel with front, sides and backs finished in 1-1/8 inch diameter rolled edge. Round all corners, weld, grind and polish. Reinforce underside of top with hat channels. Arrange reinforcing so that gussets for legs hereinafter specified can be welded to full flat surfaces of reinforcing.
- B. Dish Table Tops: Construct of 14 gauge stainless steel with all edges turned up 3 inch and terminating in a 1 3/8 inch diameter rolled rim. Round all corners, weld, grind and polish. Reinforce underside of top with #14 gauge stainless steel 4 inches by 1 inch channels plug welded to top and 1 inch by 3 inches inverted hat channels except where indicated differently. Close ends of all channels with neatly welded cap of same material.
- C. Tubular Frame Base: Construct of 1-5/8 inch O.D. #16 gauge stainless steel legs with longitudinal and lateral cross braces of 1 5/8 inch. Weld between legs and bracing shall be ground smooth and polished to a #8 finish. Fit each leg with a stainless steel, fully enclosed circular gusset and stainless steel adjustable bullet foot with modified toe portion to receive 5/16 inch floor pin when specified. Legs shall be provided as indicated in the details.
- D. Cabinet Bases:
 - 1. Constructed with tops as specified except when adjacent to wall, turn edges up 6 inch and back 1/2 inches on two 45 degree angles to wall with ends boxed. Cover corners of raised edge both vertically and horizontally as specified. Front edge turn down 2 inch, 1/2 inch turn back, cap inside 1/2 inch with 1-1/2 inch clearance to

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- cabinet body for cleaning purposes. Secure tops to understructure by welded and concealed studs with stainless steel washers and nuts. Construct understructure entirely of #16 or #18 gauge stainless steel as specified.
2. Completely enclose vertical corner members with #18 gauge stainless steel. Attach all trim so that no bolt, screw or rivet heads are visible from the exterior. Extend the body enclosure sheets around the front to trim the front opening, with all seams knuckle jointed together and silicone seams. Provide with fixed bottom and one intermediate #16 or #18 gauge 304 #4 finish stainless steel fixed or removable shelf as specified.
 3. When indicated or specified provide sliding doors constructed with #18 gauge stainless steel, double walled and sound-deadened. Mount doors on case-hardened ball-bearing type rollers sliding on dust proof channel tracks overhead fastened in such a manner as to eliminate vibration and jarring when doors are operated. Provide door bumpers and a bottom center pin guide. Provide doors with stainless steel recessed handle. In general, cabinet bases are to rest on 6 inch high legs and/or 4 inch or 6 inch high #16 gauge galvanized curb..
 4. Legs shall be the adjustable bullet type. Bottom construction shall be completely enclosed. Open end channels, leg supports with openings and similar openings resulting from the addition of structural shapes for support or mounting will not be accepted unless all joints are closed with metal sheets or weld.
- E. Drawers: Drawers shall be indicated on the Drawings. Drawers shall be constructed of stainless steel. Drawer front shall be 304 #16 gauge #4 finish stainless steel double pan construction having a die stamped stainless steel pull. Drawers shall operate in a pair of double slides equal to Knap and Vogt No. 1500 equipped with metal roller bearing slides and automatic stops, and front recessed pull. Drawers in refrigerated bases to be 304 #14 gauge #4 finish stainless steel extensions slides with 2 inch diameter wheels and bearings grease packed before assembly and corrosion-resistant. Drawers to be self-closing and removable for easy cleaning. Provide one or two full-size stainless steel hotel pans for each drawer.
- F. Overhead Shelves for Tables: Construct of 304 #16 gauge #4 finish stainless steel with all edges turned down and finished in a 1 ½ inch diameter 180 degrees roll, with corners welded, ground and polished. Shelves shall be supported by 1-5/8 inch O.D. #16 gauge 180 grid tubing, dimpled up with #8 finish stainless steel tubular uprights and secured to top with concealed inset tie rods, bolts and nuts. Uprights shall be spaced approximately 42 inches on center.
- G. Wall Shelves: Construct of 304 #18 gauge #4 finish stainless steel with the back and side edges turned up 2 inches and the front turned down in a 2 inch diameter. Shelves shall be supported by #14 gauge stainless steel brackets. Undersides of shelves shall be secured to brackets by means of tack welding brackets to shelves. Brackets shall be spaced no more than 60 inches on center.
- H. Undershelves: Construct of 304 #18 gauge #4 finish stainless steel. Roll shelves in 1 1/8 inch diameter rolled edge or up 2 inches as detailed. Notch shelves and weld to fit legs. Reinforce the underside as required with cross channels constructed of #16 gauge galvanized iron. All signs of welding on shelf surface shall be removed, ground and polished smooth to a uniform finish.
- I. Removable Shelves: Construct removable shelves in cabinet base units, sectional of 304

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#18 gauge #4 finish stainless steel. Turn up edges of shelves 1-1/2 inch against cabinet walls 2 inch turn down with 1 inch return to stiffen them.

- J. Sinks: Construct of 304 #16 gauge #4 finish stainless steel with all interior corners rounded to a 3/4 inch radius both horizontally and vertically, forming a cove in the bottom. All joints shall be butt-edged, electrically welded, ground and polished so no evidence of welding will appear. All sink sizes established in the specifications to be inside measurements. Bottom of each compartment shall be creased to the center and fitted with a 2 inches lever operated waste outlet with a stainless steel strainer and overflow. Overflow shall consist of a 1 1/2 inch stainless steel strainer plate, fitted in back of each compartment at proper level and directly connected to the lever-handled waste outlet. Sinks to be attached to drainboards shall be finished on the front and back edges only and left with a straight edge on the ends so that the drainboards may be continuously electrically welded thereto forming integral units with the top edge of the rolled rim curbing formed on one horizontal plane across the front of the unit through the surfaces of the drainboards. The drainboards shall be pitched to the sinks. Multiple compartment sinks shall be divided with double wall #16 gauge stainless steel partitions, having all corners rounded the same as other corners in sinks, continuously electrically welded in place with welds ground smooth and polished. The back, bottom and front shall be of one continuous piece with no overlapping joints or open spaces between the compartments.
1. Faucets shall be as manufactured by T & S Brass and Bronze Works, Co., Westbury Long Island, New York; Chicago Faucet Company, Des Plaines, Illinois; Fisher Manufacturing Company, Los Angeles, California; or equal.
 2. Waste outlets shall be as manufactured by Atlantic Brass Works, Fisher Manufacturing Co., Los Angeles, California; Kenco Products Corporation, Englewood, New Jersey; or equal.
- K. Inset Sinks: Construct as specified above for sinks and make an integral part of the top. Table top behind sinks shall be punched to receive a deck type combination faucet.
- L. Drain boards: Construct of #14 gauge stainless steel full width of sink having a 3 inch high curbing at front, back and end. All corners shall be continuously electrically welded to sinks and the welds ground smooth and polished to appear as one continuous unit. Drain boards over 24 inches long shall be provided with legs and cross bracing as specified for tubular frame bases.
- M. Trough Drains: Construct of #14 gauge stainless steel integral with top 4 1/2 inches wide by 1 inch deep by length required with coved corners. Box type construction will not be accepted. Trough to be fitted with a grate as manufactured by Chemgrate (206) 485-9735. Grating size to be 6-3/4 inches less than the width and length of the slab depression. Grating to be FRP 1-1/2 inch by 1-1/2 inch by 1-1/2 inch FR gray/CP-84 with flooded grit top. If Grating is not factory cut, finish cut edges as per manufacturer's recommendations. Provide 1 1/2 inch chrome-plated or stainless steel strainer plate and 1 inch O.D. stainless steel tubing drain.
- N. After Fabrication of food service equipment, apply peel-off adhesive type heavy protection Kraft reinforced paper to all stainless steel surfaces. Equipment shall be wrapped, padded and crated when shipped. Dented, scratched or otherwise defaced stainless steel surfaces shall be removed and replaced.

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O. Doors:

1. Cabinet doors to be double cased with #18 gauge No. 4 finish stainless steel exterior and #20 gauge stainless steel interior.
2. Hinged doors to be mounted on stainless steel flag hinges, and to have latches equal to magnetite No. 592. Provide recessed stainless steel pulls.
3. Side sliding doors to be double cased stainless steel, same as hinged doors, but mount on concealed overhead track with large diameter ball bearing rollers.
4. Refrigerated doors, fabricated as above with foam in place insulation and mounted on standard keil "Edgemount" hinges and latches.

P. Ducts: Verify size and position of all exhaust duct connection required for hoods, ventilators, washers and appliances; furnish and install #16 gauge galvanized stainless steel all welded ducts to ceiling connection location. Welds on seams shall be continuous. Include stainless steel duct collar at exposed connection.

Q. Undercounter Refrigerators:

1. Outer casing shall be constructed, of #18 gauge stainless steel, inner liner shall be of #20 gauge stainless steel with #4B finish unless shown otherwise.
2. Refrigerator shall be fully insulated with 2 inch minimum thickness of foam in place urethane or styrofoam between outer casing and inner liner at top, bottom, and sides including doors.
3. Entire perimeter of door opening shall be faced with a 1/8 inch black bakelite thermal breaker strip approximately the width of the mullion. Breaker strip at door sill shall be faced with #18 gauge stainless steel.
4. Door shall be constructed with #18 gauge stainless steel outer casing and #20 gauge stainless steel, #4B finish, inner lining, unless shown otherwise. Moulded grey vinyl latex door gasket shall be attached to perimeter of doors with concealed fasteners.
5. Drawer fronts shall be of same materials as specified for doors. Insulation shall be of same material as used in refrigerator walls and shall be a minimum of 1 inch in thickness.
6. Where cut-outs in refrigerator top are specified or shown on detail drawings, raw edges of cut metal and insulation shall be covered with stainless steel sleeve. Counter top shall be turned down into opening to overlap sleeve with thermal barrier installed between. A stainless steel expanded metal guard shall be furnished for the full length and width of opening with sides to underside of refrigerator interior with closed bottom of guard located 6-1/2 inches below counter top.

R. Ice Bins and Cold Pans:

1. Inner lining shall be constructed of #18 gauge stainless steel and outer casing shall be of #18 gauge galvanized iron, unless shown otherwise.
2. All ice bins and cold pans shall be fully insulated with 2 inch minimum thickness of urethane or styrofoam between outer casing and inner liner, 1/2 inch copper wraps around cold pan.
3. Furnish #18 gauge stainless steel perforated false bottom raised one inch above bin or pan bottom.
4. Furnish 3/4 inch drain and extend to floor sink.

S. Wall Flashing:

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1. Wall flashing shall be of #20 gauge stainless steel affixed to wall with heavy-duty, heat-resistant adhesive.
2. Flashing shall be fabricated from maximum width sheets for minimum amount of vertical joints and shall be sealed with silicone and capped with hem strips without exposed screws or fasteners.
3. When wall flashing includes capping of wall ends, capping shall be fabricated from #18 gauge stainless steel.

2.4. MILLWORK SPECIFICATIONS

- A. General: All wood cabinets, cases, counters and other woodwork items shall be "AWI Quality Standards Illustrated, Eighth Edition Version 2 inches by the American Woodworking Institute, including all amended printed revisions, and N.S.F. Standards.
 1. The type of casework construction shall be flush over-lay type, modified construction.
 2. All exposed surfaces shall be covered with laminated plastic, satin finish in patterns as selected.
 3. Laminated plastic shall be high pressure type such as Formica, Nevamar, Wilsonart, Textolite or equal.
- B. Cabinets: Base Cabinets shall be constructed in modular units or as shown on plans. In either method, each unit shall be constructed as a complete structural unit with a web frame top with cross members at each cabinet partition.
 1. Drawer fronts shall be flush laminated plastic covered wood construction.
 2. Cabinet doors shall be flush laminated plastic covered wood construction unless otherwise noted or specified. All interior surfaces within the cabinets shall be covered with laminated plastic.
 3. Base units shall be fabricated with finished ends except laminated plastic surfacing may be omitted in concealed ends.
 4. Where the space is indicated on the Drawings install topset base to match the existing base or as selected by City's Representative. Extend base into utility compartments and at exposed ends of cabinets.
- C. Counter Tops: Laminated Plastic covered counter tops for base cabinets shall be self-edged with top surface lapping the edging material. Top surface material shall extend to top of splash in one piece. The core material shall be ¾ inch thick of plywood with a backing sheet securely glued to the core with identical adhesive under identical circumstances as the face sheet.
- D. Hardware: Hinges shall be per designer specification and Health Department requirements. Finish to be US10, Satin Chrome or as selected by City's Representative.
 1. Magnetic catches shall be installed on all hinged doors. All drawers shall be fitted with ball-bearing, self-closing drawer slides of 100 lb. load capacity and operate by gravity alone.
 2. Where specified, all drawers and doors shall be furnished with cylinder locks keyed and master keyed in duplicate to City's keying schedule.

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3. Door and drawer handles shall be stainless steel deep recess with beveled edges type on all base cabinets and counters. manufactured by Klein No. 12270 or equal.
 4. Upper cabinet door pulls shall be per designer specification.
- E. Submittals: Submit to Owner's Representative 1 set of reproducible transparencies of shop drawings for millwork items.

2.5. ELECTRICAL SERVICE REQUIREMENTS FOR MANUFACTURED EQUIPMENT

- A. Unless otherwise directed in these specifications, all electrical connections to equipment specified herein will be made under the electrical section of the specifications. This includes furnishing and mounting all disconnected switches and all electrical power wiring. All equipment under this section shall be completely wired ready for final connection.
- B. All equipment having plug-in connections shall be provided with a multi-conductor cable having sufficient number of conductors for equipment operations plus a grounding conductor grounded to frame of equipment. On each such cable provide a grounding type cap to match the receptacle installed to accept the specific item of equipment installed.
- C. Circuit breakers and thermal overload protection devices shall be used on equipment. Fuses, fusestats and fusetrons will not be permitted.
- D. It shall be the responsibility of the Foodservice Specialist as part of the work included under this section to ensure that all equipment furnished under this contract shall be so wired, wound, or constructed as to conform to the characteristics of electrical and other services at the premises.
- E. Appliances shall be new, of manufacturer's current production and furnished complete with motors, driving mechanism, starters and controllers, including master switches, timers, cut-outs, reversing mechanism and other electrical equipment if and as applicable. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment.
- F. Appliances shall be of rigid construction, free from objectionable vibration
- G. Quietness of operation of all food service equipment is a requirement and the Contractor will be required to remove or repair any equipment producing objectionable noise and/or vibration.
- H. All electrical components are to be U.L. approved, and all wiring is to be in accordance with the National Electrical Code or electrical code in effect at job site, whichever is the greater.
- I. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches, etc. furnished by the Foodservice Specialist and shall match the material and finish of the equipment to which they will be fastened.

2.6. MECHANICAL SERVICE REQUIREMENTS FOR MANUFACTURED

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EQUIPMENT

- A. Water inlets shall be located above the positive water level to prevent siphoning of liquids into the water system. Where ever conditions shall require submerged inlet, suitable type of check valve and vacuum breaker shall be placed on the fixture to form a part of same to prevent siphoning.
- B. All necessary faucets shall be furnished by the Foodservice Specialist with his equipment and shall be supplied with non-splash aerator unless specified otherwise on Sheet K-2.
- C. Provide suitable pipe slots and/or do all drillings, punching and cutting of equipment required to provide access for mechanical connections and/or runs. Such work when performed at the job site shall be of the same quality as similar work performed in the shop.

2.7. MECHANICAL REFRIGERATION

- A. Refer to Foodservice Drawings for exact specifications.

2.8. REFRIGERATION SYSTEMS/WALK IN REFRIGERATORS

- A. Furnish and install Mechanical Refrigeration work as indicated and specified, complete and ready for use. Principal items of work include:
 - 1. Mechanical refrigeration systems, including compressor units, condensers, refrigerant piping, evaporator coils, control valves, compressor racks and required miscellaneous items.
 - 2. Furnishing of motor starters and walk-in refrigerator freezer thermostats for installation under Electrical.
 - 3. Sleeves, inserts, hangers, supports and other incidental items necessary to complete work.
 - 4. Testing, charging, adjusting, operational testing and cleaning of equipment.
- B. Examination of Drawings:
 - 1. Codes and Orders: Carefully study Drawings and Specifications. If any work as laid out or indicated in contrary to conflicts with any applicable codes or orders, report same at once to City's Representative.
 - 2. Ventilation: Study drawings and report to City's Representative any compressors and condensing units located without adequate ventilation so as to affect operational efficiency of such units and include with report recommendations for corrective procedures. Install no work until adequate ventilation is arranged.
- C. Compressor and Condensing Unit: Single stage compressors with air-cooled condensers operating at such speed within recommended range of suction and discharge pressures for economical operation and with required BTU rating per hour, sizes, and capacities in accordance with specifications. Provide units of same manufacturer and type throughout, new standard catalogued, factory assembled, to operate with currently approved refrigerant, ambient air, capacities selected on 16-hour running time basis. Freezers to use

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currently approved refrigerant

- D. Walk-in Refrigerator Drain Lines: Plumbing contractor to provide type "L" copper drain lines graded from evaporator drain connection and extended through wall to exterior of refrigerator above drain position. Trap terminal of drain line. Point line with point specified for refrigerant piping.

2.9. WALK-IN COLD STORAGE ROOM

- A. Refrigerated rooms shall be factory pre-assembled to assure proper installation at final location. City's Representative shall have the option for inspection of same at this time. To be constructed per City approved specifications (Refer to schedule at the end of this Section).
- B. Health Department Requirements: Design of equipment and installation of same shall comply with all local Health Department requirements and all required labels pertaining to same must be affixed.

2.10. ITEMS OF EQUIPMENT

- A. See schedule following this Section.
- B. Foodservice Equipment:
 - 1. Supplier shall furnish and coordinate the installation of foodservice equipment complete with all parts and components ready for use by the City.
 - 2. The equipment components shall be fully coordinated and integrated and shall be provided by manufacturers regularly engaged in the manufacture of the products specified hereinafter. The equipment manufacturer shall have full responsibility for system performance and shall provide experienced factory representatives for technical installation, consultation, on-site engineering check-out of system installation, and operation at start-up support as specified herein.
- C. Utilities:
 - 1. All required utilities as specified by manufacturer shop drawings shall be brought to equipment location by Contractor. Foodservice Equipment Specialist shall deliver, uncrate, set in place and coordinate final utility connections to utility supply and component interconnections by Contractor. All materials and supplies for utility connections and installation to be supplied by Contractor and/or Food Service Equipment Specialist except as noted herein. Refer to drawing nos. K2.1 for utility requirements of specified system components.
- D. Materials and Equipment:
 - 1. Material and equipment shall be the standard products of the manufacturer regularly engaged in the manufacture of the products specified. The manufacturer shall demonstrate applications of similar equipment and material in accounts of similar or larger size providing prepared food products where systems essentially duplicate the

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- proposed equipment and have been installed and operational for a period of not less than two 2years prior to bid opening.
 - 2. Equipment provided shall be manufactured to NSF standards.
- E. Manufacturer Engineering and Operational Support:
 - 1. Where necessary, Manufacturer shall provide the services of a factory engineer experienced in the installation, adjustment, and operation of the system to be furnished. The factory engineer shall provide the following services: Production and submittal of detailed system shop drawings for approval to include utility schematics and diagrams for installation; Consultation with supplier and installer during installation. Pre installation on-site visit to job site after equipment is delivered and set in place to review installation requirements with Foodservice Equipment Specialist and installation sub-contractors; Up to five 5 days on-site engineering start-up after installation to test equipment, calibrate if necessary, and train maintenance and authorized service agency in the proper operation and preventative maintenance procedures for system components; Provision of 3 complete sets of maintenance and operator manuals including complete schematics of all parts of the system, wiring diagrams, and complete parts lists.

PART 3 - EXECUTION

3.1. EXAMINATION

- A. Verify at site, conditions affecting work of this section. Obtain accurate dimensions of openings, levels and location and arrangements of walls, etc. Report discrepancies between Drawings, field dimensions and other irregularities or improper conditions to Contractor for correction prior to commencing work. Commencing work indicates acceptance of conditions and surfaces underlaying or adjacent to work of this Section.

3.2. INSTALLATION

- A. Attach all stationary items of equipment to the building structure per requirements of this Section and seal with clear, odorless silicone sealant. Sealant is to be utilized for all items of equipment as required.
- B. Where stationary items of equipment are installed less than 4 inches from walls, provide approved vermin-proof seal between equipment and the structure. Generally, this shall consist of an angle, of the same material as the equipment, fastened to the equipment and the wall with bolts and having silicone sealer between equipment and structure or other pieces of equipment, including partitions, floors, bases, etc. This shall be fully detailed in shop drawings submittals and coordinated with the various trades and contractors involved. Where electric receptacles occur, cut recesses in walls as required to permit the equipment to fit snugly against such walls leaving no gaps or other openings.

3.3. CLEANING AND POLISHING:

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- A. Clean, adjust, and polish all equipment specified in this Section prior to Substantial Completion. Protect equipment from damage during remainder of the construction period.

3.4. FIELD QUALITY CONTROL

- A. The Food Service Specialist shall provide a competent service representative to be present during installation. The representative shall be well informed as to all phases of the work. He shall put into proper operating condition all equipment and provide instruction in the proper use and maintenance schedule to be followed thereafter.
- B. Test and regulate all equipment in the presence of the City's Representative proving it to be operating properly.
- C. All work, all materials, whether incorporated in the work or not, all process of manufacture, and all methods of construction shall be at all times and places subject to the inspection of City's Representative who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture and methods of construction for the purposes for which they are used. Should they fail to meet this approval they shall be forth with reconstructed, made good, replaced and/or corrected, as the case may be, by the Foodservice Equipment Specialist at this own expense. Rejected material shall immediately be removed from the site.

3.5. DEMONSTRATION AND TRAINING

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

ITEM 1 - AIR CURTAIN (1 REQ'D)

Mars Air Systems Model STD236-1UA-OB Dimensions: 12.13(h) x 36(w) x 12.75(d)
Standard Series 2 air curtain for 36"W door, unheated, galvanized steel cabinet with Obsidian Black powder coat finish, (1) 1/2 HP motor, 115v/60/1-ph, 500 watts, 5.1 amps, cETLus

- 1 ea 5 year warranty, standard
- 1 ea 1 year warranty for all parts (except filters), standard
- 1 ea Model ZZMAGSWCTRL Magnetic (NOTE: controller required)
- 1 ea Model ZZNOTD No time delay
- 1 ea Model MCPA-1UA Control Panel, 1 motor, 1/2HP, Unheated, 115V,1Ø,60Hz (Remote Mounted), 120v Ctrl
- 1 ea Model 99-125 Magnetic reed switch, industrial metallic body for surface mounted applications, 120v, NEMA 1 (requires controller or motor control panel)
NOTE: A Controller is required when the unit exceeds 1HP or is a 3phase unit.
Included a control panel per the specs but please note, the INS-CTRL will suffice and will have a shorter lead time.

ITEM 2 - SHELVING UNIT, WIRE (6 kt REQ'D)

Quantum Model WR86-2160GY-5 Dimensions: 86(h) x 60(w) x 21(d)
Wire Shelving Starter Kit, 60"W x 21"D x 86"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
6 kt 15 year limited warranty (limited against rust and corrosion)

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ITEM 3 - SPARE NO. <Spare No.>

ITEM 4 - WALK IN COOLER, MODULAR, REMOTE (1 REQ'D)
Kolpak Model CUSTOM
Walk-In Cooler, Modular Approx. Size OD 8'-2" X 16'-4" , Cooler Size Approx. Size
ID 11'-2-1/2"X 7'-6"

ITEM 5 - SHELVING UNIT, WIRE (2 kt REQ'D)
Quantum Model WR74-2136GY-5 Dimensions: 74(h) x 36(w) x 21(d)
Wire Shelving Starter Kit, 36"W x 21"D x 74"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
2 kt Model WR74-2142GY-5 Wire Shelving Starter Kit, 42"W x 21"D x 74"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
2 kt Model WR74-2148GY-5 Wire Shelving Starter Kit, 48"W x 21"D x 74"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
2 kt 15 year limited warranty (limited against rust and corrosion)

ITEM 6 - BLOWER COIL (COOLER) (1 REQ'D) <INCLUDED >
Kolpak Model CUSTOM
Evaporator Coil (Med Temp) Refer to Shop Drawing.

ITEM 7 - WALK-IN FREEZER, MODULAR, REMOTE (1 REQ'D) <INCLUDED >
Kolpak Model CUSTOM
Walk In Freezer, Modular, Remote

ITEM 8 - SHELVING UNIT, WIRE (4 kt REQ'D)
Quantum Model WR86-2142GY-5 Dimensions: 86(h) x 42(w) x 21(d)
Wire Shelving Starter Kit, 42"W x 21"D x 86"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
4 kt 15 year limited warranty (limited against rust and corrosion)
NOTE: DISCREPANCY - QTY PER SPEC 5 / QTY PER PLANS 4 - QUOTED 4
PER PLAN

ITEM 9 - BLOWER COIL (FREEZER) (1 REQ'D) <INCLUDED >
Kolpak Model CUSTOM
Evaporator Coil (Low Temp) Refer to Shop Drawings

ITEM 10 - REMOTE CONDENSING UNIT (COOLER) (1 REQ'D)
Kolpak Model CUSTOM
Remote Condenser (Med Temp) Refer to Shop Drawings.
1 ea 5 YEAR WARRANTY COMPRESSOR

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ITEM 11 - REMOTE CONDENSING UNIT (FREEZER) (1 REQ'D)

Kolpak Model CUSTOM

Remote Condenser (Low Temp) Refer to Shop Drawing.

1 ea 5 YEAR WARRANTY COMPRESSOR

ITEM 12 - S/S - PREP TABLE W/ SINK (1 REQ'D)

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Prep Table with Sink Approx. Size 30" X 10'-3" Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 13 - DECK MOUNT FAUCET (1 REQ'D)

T&S Brass Model B-1122

Faucet, 10" swing nozzle, deck mounted, quarter-turn Eterna cartridges, lever handles, low lead, ADA Compliant

1 kt Model B-1100-KIT 24" Inlet Supply Hoses (3/8" Compression x 1/2" NPSM Female)
1 ea Model B-3952-01 Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with overflow assembly (replaces B-3917-01)

ITEM 14 - S/S - DOUBLE OVERSHELF (1 REQ'D)

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Double Overshelf Approx. Size 12" X 9"-8-1/2" Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 15 - TRASH RECEPTACLE, INDOOR (5 REQ'D)

CFS Brands Model 34202306 Dimensions: 29.88(h) x 20(w) x 11(d)

Carlisle - Trimline™ Waste Container, 23 gallon, rectangular, integrated corner tabs, bottom helper handles, heavy-duty, polyethylene, beige

ITEM 16 - S/S - UTILITY CHASE (1 REQ'D) <INCLUDED >

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Utility Chase Approx. Size 6" X 12" to include Ceiling Trim. Fabricated per plan and specification ** Approved Shop Drawing **

ITEM 17 - SPARE NO. <Spare No.>

ITEM 18 - WATER FILTRATION SYSTEM, FOR ICE MACHINES (2 REQ'D)

3M Purification Model ICE190-S Dimensions: 23.63(h) x 8(w) x 5.5(d)

(5616403) 3M™ Water Filtration Products Water Filter System, with shut-off valve & gauge, 23-5/8"H x 5"D, standard water, single vessel, max pressure of 125 psi at 100°F, 0.2 micron, 5 gpm flow rate, 54,000 gallons capacity, for cyst, bacteria, sediment, chlorine taste and odor, scale, includes: (1) integral mounting bracket and (1) o-ring seal cartridge filter, 1/2" FNPT connections, NSF certified (for ice machines - cubers up to 2170 lbs, flakers up to 3593 lbs: Manitowoc I 1800, 1802, 1803, 1804, 1805, 1809, 1872, 1874, 1890, 1892, 1894, 2176, Scotsman 1848, 2148, Hoshizaki KM 1601, 1900, 2000, Ice-O-Matic ICE 1506, 1806, 1807, 2106, 2107)

ITEM 19 - ICE MAKER, CUBE-STYLE (1 REQ'D)

Manitowoc Model IYT0900A Dimensions: 26.5(h) x 30(w) x 24.5(d)

Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24-1/2"D x

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26-1/2"H, production capacity up to 865 lb/24 hours at 70°/50° (750 lb AHRI certified at 90°/70°), easyTouch display with 13 different language options, date/time stamp display, automatic reminder/alert icon, one touch asset information, automatic detection of accessories, continuous operating status, programmable production options (time, weight, day or night), one touch cleaning with displayed instructions, Alpha-San anti-microbial protection, acoustical ice sensing probe, self-diagnostic technology, DuraTech™ exterior, half-dice size cubes, R410A refrigerant, NSF, cULus, CE, ENERGY STAR®

1 ea Model WARRANTY-ICE-SC 3 year parts & labor (Machine), 5 year parts & labor (Evaporator), 5 year parts & 3 years labor (Compressor), standard
1 ea (-261) 208-230v/60/1-ph, 9.5 amps

ITEM 20 - ICE BIN FOR ICE MACHINES (1 REQ'D)

Manitowoc Model D570 Dimensions: 50(h) x 30(w) x 34(d)

Ice Bin, 30"W x 34"D x 50"H, with side-hinged front-opening door, side grips, 532 lbs. application capacity, AHRI certified 17.9 cu. ft., for top-mounted ice maker, Duratech exterior, NSF

1 ea Model WARRANTY-BIN/DISP 3 year parts & labor warranty, standard
1 ea Legs, 6" adjustable stainless steel, standard

ITEM 21 - FLOOR TROUGH (1 REQ'D)

Eagle Group Model ASFT-1236-SG Dimensions: 36(w) x 12(d)

Anti-Splash Floor Trough, 36"W x 12"D, stainless steel subway-style grating, 6" deep trough pan with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel removable perforated basket, all-welded 14/304 stainless steel construction, NSF

ITEM 22 - DECK MOUNT FAUCET (1 REQ'D)

T&S Brass Model B-1141-CR

Faucet Workboard, swivel, deck mount, 11-3/8" long, gooseneck, 4" centers, lever handles, cerama cartridges, check valves, includes: lock washer (014200-45), 2.2 GPM aerator, low-lead, polished chrome, 1/2" male NPT, ADA Compliant, ANSI, NSF

1 kt Model B-1100-KIT 24" Inlet Supply Hoses (3/8" Compression x 1/2" NPSM Female)

ITEM 23 - S/S - HAND SINK (1 REQ'D) <INCLUDED >

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Hand Sink Included in or part of Item # 27 Fabricated per plan and specification ** Approved Shop Drawing **

ITEM 24 - NIC BY OWNER - SOAP & TOWEL DISPENSER (3 REQ'D) <NIC>

NIC Model BY OWNER

Soap and Towel Dispenser

ITEM 25 - WALL / SPLASH MOUNT FAUCET (1 REQ'D)

T&S Brass Model B-0231

Sink Mixing Faucet, wall mount, 8" centers, 12" swing nozzle, lever handles, quarter-turn Eterna cartridges, 1/2" NPT female inlets, low lead, ADA Compliant

ITEM 26 - S/S - DOUBLE WALLSHELF (1 REQ'D)

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Double Wall Shelf Approx. Size 12" X 10'-3" Fabricated per plan and specification ** Approved Shop Drawing **

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ITEM 27 - S/S - PREP TABLE W/SINKS (2) (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Prep Table w/Sinks (2) Approx. Size 27" X 12'-3" Fabricated per plan and specification ** Approved Shop Drawing **

ITEM 28 - SPARE NO. <Spare No.>

NOTE: DISCREPANCY - Item is spare per schedule and plans. ITEM IS CALLED OUT IN SPEC AS A PREP SINK. Two sinks have been included for item 27 (hand sink item 23 and prep sink included in item 27)

ITEM 29 - SPARE NO. <Spare No.>

ITEM 30 - FIRE SUPPRESSION SYSTEM (1 REQ'D)
Captive-Aire Model TANK SYSTEM
Fire Suppression System

1 ea ELECTRICAL SYSTEM
1 ea FACTORY SERVICES

ITEM 31 - EXHAUST HOOD CONTROLS (1 REQ'D) <INCLUDED >
Captive-Aire Model CUSTOM
INLCUED IN ITEM 30

ITEM 32 - S/S - WALL FLASHING (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Wall Flashing to Include Joiner Strips and J Channel. Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 33 - EXHAUST HOOD (TYPE 1) W/PSP (1 REQ'D)
Captive-Aire Model CUSTOM
Exhaust Hood with (PSP) Perforated Supply Plenum. Refer to Shop Drawing.

ITEM 33.1 - S/S -HOOD ENCLOSURES (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom S/S Hood Enclosure Panels w/1-LOT Knuckle
Seams Where It Occurs.
(Size: 5'-6" W x 15'-0" L x 1'-0"H)

ITEM 34 - MAKE-UP AIR SYSTEM (1 REQ'D) <INCLUDED >
Captive-Aire Model CUSTOM
Refer to Shop Drawing.

ITEM 35 - SPARE NO. <Spare No.>

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ITEM 36 - CONVECTION OVEN, GAS (1 REQ'D)

Garland Model MCO-GS-20M Dimensions: 57.5(h) x 38(w) x 41.25(d)

Master Series Convection Oven, gas, double-deck, standard depth 41-1/2", (2) speed fan, 4.3" easyTouch digital control with simple Press&Go, Cook 'n' Hold, timers, & recipe functions, dependent 60/40 doors with windows, stainless steel front, sides & top, porcelain cavity, 24" cooking cavity height, with (6) chrome plated oven racks on 13-position rack guides, 6-1/2" legs, EnerLogic Technology, 120,000 BTU (Garland), UL, cUL, NSF

1 ea (2) year limited parts & (1) year labor warranty, Door warranty (5) year limited parts except window, covers products purchased and installed in the USA & Canada only, standard

1 ea Gas type to be specified

1 ea NOTE: Contact factory for other connection options

1 ea (2) 120v/60/1-ph, 9.8 amps, NEMA 5-15P (3/4 HP motor), standard

1 ea Top Oven: Stainless steel enclosed back

1 ea Bottom Oven: Stainless steel enclosed back

1 ea NOTE: Contact factory for other connection options

2 ea Dormont Model 16100BPQ2SR48 Dormont Blue Hose™ Moveable Gas Connector Hose Assembly, 1" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, 1 SnapFast® QD, 2 Swivel MAX®, coiled restraining cable with hardware, 295,000 BTU/hr minimum flow capacity, limited lifetime warranty

NOTE: DISCREPANCY - MODEL QUOTED PER PLANS. MODEL PER SPEC IS MCO-GS-20-S. QUOTED DORMONT IN 1" TO MATCH SCHEDULE

ITEM 37 - HD RANGE, 36", 6 OPEN BURNERS (1 REQ'D)

Garland Model C36-6M Dimensions: 10(h) x 36(w) x 39.38(d)

Garland Cuisine Series Heavy Duty Range, gas, 36", modular, (6) 35,000 BTU open burners, 7"H backguard, stainless steel front, sides, plate rail & burner box, 210,000 BTU (NG), CSA Flame, CSA Star, NSF (Garland)

1 ea Two year limited parts and labor warranty, covers products purchased and installed in the USA only, standard

1 ea Natural gas, specify elevation if over 2,000 ft

1 ea 1-1/4" Rear gas connection, including end cap & cover (Consult spec sheet and specify)

1 ea Stainless steel belly bar, standard

1 ea Model LEG KIT LEG KIT

1 ea Dormont Model 16125BPQ2SR48 Dormont Blue Hose™ Moveable Gas Connector Hose Assembly, 1-1/4" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, 1 SnapFast® QD, 2 Swivel MAX®, coiled restraining cable with hardware, 449,000 BTU/hr minimum flow capacity, limited lifetime warranty

NOTE: SCHEDULE CALLS FOR 1-1/4" CONNECTION. SPECIFIED WAS FRONT MANIFOLD. DRAWING SHOWS REAR CONNECTION. QUOTED REAR CONNECTION WITH CORRECT DISCONNECT.

ITEM 38 - CHEF BASE (1 REQ'D)

True Mfg. - General Foodservice Model TRCB-72-HC Dimensions: 20.38(h) x 72.38(w) x 32.13(d)

Refrigerated Chef Base, 72-3/8"W base, one-piece 300 series 18 gauge stainless steel top with V edge, (4) drawers (accommodates (2) 12" x 20" x 4" pans, NOT included), stainless steel front/sides, aluminum back, aluminum interior with stainless steel floor, 4" castors, view spec sheet for electrical information & certifications, Made in USA

1 ea 7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.

1 ea Self-contained refrigeration standard

BUILDING AND SITE IMPROVEMENTS
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1 ea Standard marine edge top
1 ea 4" Castors, standard
NOTE: DISCREPANCY – MODEL PER SPEC 36" – MODEL PER PLANS 72" – BID
MODEL PER PLANS.

ITEM 39 - GRIDDLE, GAS, COUNTERTOP (1 REQ'D)
Garland Model GTGG36-G36M-SIGNATURE Dimensions: 13(h) x 35.44(w) x 32(d)
Signature Griddle, countertop, gas, heavy-duty, 35-7/8" W x 23" D cooking surface, 1" thick smooth
steel griddle plate, manual hi-lo controls, piezo pilot igniters, 4" deep front grease trough, stainless
steel front, sides and back, 4" adjustable feet, 81,000 BTU (Garland), NSF, CSA Star, CSA Flame
1 ea The Garland Signature Program is applicable to standard equipment features ONLY.
Models with accessories and options not listed under the Signature suffix are not
applicable and standard pricing will apply.
1 ea One year limited parts and labor warranty, covers products purchased and installed
in the USA only, standard
1 ea Natural gas, specify elevation if over 2,000 ft
1 kt Dormont Model 1675KIT2S48 Dormont Blue Hose™ Moveable Gas Connector Kit,
3/4" inside dia., 48" long, covered with stainless steel braid, coated with blue
antimicrobial PVC, (1) SnapFast® QD, (2) Swivel MAX®, (1) full port valve, coiled
restraining cable with hardware, 160,000 BTU/hr minimum flow capacity, limited
lifetime warranty

ITEM 40 - TILTING SKILLET BRAISING PAN, GAS (1 REQ'D)
Cleveland Range Model SGL30T1 Dimensions: 39(h) x 37.88(w) x 41(d)
PowerPan™ Tilting Skillet, gas, 30-gallon capacity, bead blasted cooking surface, 10° tilt cooking
feature, with easy manual hand tilt, spring-assisted cover with vent, gallon & liter markings, stainless
steel construction with open leg frame, 125,000 BTU, CE, NSF
1 ea 1-year parts & labor warranty, standard
1 ea Performance start-up included at customer request after equipment is installed (Free
Water Quality Check included) (contact Cleveland Sales Representative for details)
1 ea Gas type to be specified
1 ea Standard wattage
1 ea 120v/60/1-ph, 1.4 amps, NEMA 5-15P, standard
1 ea Standard controls, temperature control dial, LED ON indicator light, main power
switch with standard and high power setting, standard
1 ea Model DPK29 Double Pantry Faucet, with 3/4" swing spout & mounting bracket, for
T1 skillets, mounts on right side of unit (add 4.5" to width) (for SEL/SGL models)
1 kt Dormont Model 1675KIT2S48 Dormont Blue Hose™ Moveable Gas Connector Kit,
3/4" inside dia., 48" long, covered with stainless steel braid, coated with blue
antimicrobial PVC, (1) SnapFast® QD, (2) Swivel MAX®, (1) full port valve, coiled
restraining cable with hardware, 160,000 BTU/hr minimum flow capacity, limited
lifetime warranty

ITEM 41 - FLOOR TROUGH (1 REQ'D)
Eagle Group Model ASFT-1224-SG Dimensions: 24(w) x 12(d)
Anti-Splash Floor Trough, 24"W x 12"D, stainless steel subway-style grating, 6" deep trough pan
with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel
removable perforated basket, all-welded 14/304 stainless steel construction, NSF
NOTE: DISCREPANCY – MODEL PER SPEC "FG" – MODEL PER PLANS "SG" –
BID MODEL PER PLANS.

ITEM 42 - SPARE NO. <Spare No.>

BUILDING AND SITE IMPROVEMENTS
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ITEM 43 - SPARE NO. <Spare No.>

ITEM 44 - S/S - CHEF'S TABLE (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Chef's Table Approx. Size 3'-0" X 15'-0" Plate Storage Below on Chef's Side. Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 45 - S/S - DOUBLE OVERSHELF (1 REQ'D) <INCLUDED >
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Double Over Shelf. Approx. Size 15" X 15'-0". Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 46 - SPARE NO. <Spare No.>

ITEM 47 - SPARE NO. <Spare No.>

ITEM 48 - SPARE NO. <Spare No.>

ITEM 49 - SPARE NO. <Spare No.>

ITEM 50 - REACH-IN REFRIGERATOR (1 REQ'D)
True Mfg. - General Foodservice Model STA2R-2S-HC Dimensions: 77.75(h) x 52.63(w) x 33.75(d)
SPEC SERIES® Refrigerator, reach-in, two-section, (2) stainless steel doors with locks, cam-lift hinges, digital temperature control, (6) chrome shelves, LED interior lights, stainless steel front & sides, aluminum interior sides & walls, stainless floor & ceiling, 5" castors, view spec sheet for electrical information & certifications, Made in USA
1 ea 7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.
1 ea Left door hinged left, right door hinged right standard
1 ea (3) chrome shelves & shelf supports standard per section
1 st 5" castors (set of 4), standard

ITEM 51 - REACH-IN FREEZER (1 REQ'D)
True Mfg. - General Foodservice Model STA1F-1S-HC Dimensions: 77.75(h) x 27.5(w) x 33.75(d)
SPEC SERIES® Freezer, reach-in, -10°F, one-section, (1) stainless steel door with lock, cam-lift hinges, digital temperature control, (3) chrome shelves, LED interior lights, stainless steel front & sides, aluminum interior, 5" castors, view spec sheet for electrical information & certifications, Made in USA
1 ea 7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.
1 ea Door hinged right standard
1 ea (3) chrome shelves & shelf supports standard per section
1 st 5" castors (set of 4), standard

ITEM 52 - HAND SINK (2 REQ'D)
Eagle Group Model HSA-10 Dimensions: 14.25(h) x 18.88(w) x 14.75(d)

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Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, requires splash mounted faucet, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

2 ea Model 306134 T&S Extra Heavy Duty Gooseneck Faucet, splash-mounted, 4" OC, NSF

ITEM 53 - SPARE NO. <Spare No.>

ITEM 54 - SPARE NO. <Spare No.>

ITEM 55 - REACH-IN REFRIGERATOR (1 REQ'D)

True Mfg. - General Foodservice Model STA1R-1G-HC Dimensions: 77.75(h) x 27.5(w) x 33.75(d)
SPEC SERIES® Refrigerator, reach-in, one-section, (1) glass door with lock, cam-lift hinges, digital temperature control, (3) chrome shelves, LED interior lights, stainless steel front & sides, aluminum interior sides & walls, stainless floor & ceiling, 5" castors, view spec sheet for electrical information & certifications, Made in USA

1 ea 7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.

1 ea Door hinged right standard

1 ea (3) chrome shelves & shelf supports standard per section

1 st 5" castors (set of 4), standard

ITEM 56 - MOBILE HEATED CABINET (1 REQ'D)

Metro Model C569-SDS-U Dimensions: 74.75(h) x 29.13(w) x 32.63(d)

C5™ 6 Series Heated Holding Cabinet, mobile, full height, insulated, solid Dutch doors, top mount controls & analog thermometer, ducted heating system, thermostat 70° to 200°F temp, universal wire (17) 18" x 26" or (32) 12" x 20" x 2-1/2" pan capacity, 1-1/2" adjustable wire slides, 5" casters (2 with brakes), 304 stainless steel, 120v/60/1-ph, 2000 watts, 16 amps, NEMA 5-20P, cULus, NSF, ENERGY STAR®

1 ea Use model number with "L" in the middle (Ex: C589L-SDS-UA) for lower wattage models

1 ea 1 year warranty against manufacturing defects

ITEM 57 - S/S - SERVICE COUNTER (1 REQ'D)

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Approx. Size 3'-0" X 10'-0" To Include provisions for drop in equipment.

Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 57A - S/S - SERVICE COUNTER (1 REQ'D)

Stainless Fabricator Model CUSTOM

Custom Stainless Steel CURB

ITEM 58 - COLD FOOD WELL UNIT, DROP-IN, REFRIGERATED (1 REQ'D)

Delfield Model N8130BP Dimensions: 21.87(h) x 30.75(w) x 26(d)

Drop-In Mechanically Cooled Pan, 30-3/4"W x 26" D, 2-pan size, 1" dia. drain, insulated pan, stainless steel inner liner & top, galvanized steel outer liner, includes adapter bars, self-contained refrigeration, R290 Hydrocarbon refrigerant, 1/6 hp, (29-3/4" x 25" cutout required), cUL, UL, NSF

1 ea Introducing: Freight Made Simple

BUILDING AND SITE IMPROVEMENTS
WESTEND NAVIGATION CENTER

6% on Single purchase orders shipping to one location**.
Liftgate & inside delivery not included.
Nationwide Freight*

*Continental United States only

**6% Must be manually calculated on your purchase order total, \$200 minimum.

If you have any questions, please contact Customer Service at 1-800-733-8948
1 ea Model 0460000N 1 year parts & labor warranty, standard
1 ea Model W00003A 5 year compressor warranty (NET priced – no further discount)
1 ea 115v/60/1-ph, 2.0 amps, NEMA 5-15P, standard

ITEM 59 - HOT FOOD WELL UNIT, DROP-IN, ELECTRIC (1 REQ'D)
Wells (Middleby) Model MOD-200TDM Dimensions: 9.75(h) x 29.5(w) x 23.63(d)
(QUICK SHIP) (MIDDLEBY ESSENTIALS ITEM) Food Warmer, top-mount, built-in, electric, (2) 12" x 20" openings with manifold drains with one valve, wet/dry operation, thermostatic controls, stainless steel interior, insulated aluminum steel housing, cULus
1 ea 1 year parts & labor warranty, standard
1 ea Note: Must specify voltage and phase
1 ea 208/240v/60/1-ph, 1.24/1.65 kW per well, field wired

ITEM 60 - SPARE NO. <Spare No.>

ITEM 61 - SPARE NO. <Spare No.>

ITEM 62 - S/S - THREE(3) COMP SINK (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Three(3) Compartment Sink Approx. Size 34" X 10'-1/2" Fabricated per plan and specification. ** Approved Shop Drawing **
3 ea T&S Brass Model B-3952-01 Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with overflow assembly (replaces B-3917-01)

ITEM 63 - S/S - WALLSHELF DBL (2 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Wall Shelf Approx. Size 12" X 60" Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 64 - WALL / SPLASH MOUNT FAUCET (1 REQ'D)
T&S Brass Model B-0231
Sink Mixing Faucet, wall mount, 8" centers, 12" swing nozzle, lever handles, quarter-turn Eterna cartridges, 1/2" NPT female inlets, low lead, ADA Compliant

ITEM 65 - PRE-RINSE FAUCET ASSEMBLY, WITH ADD ON FAUCET (1 REQ'D)
T&S Brass Model B-0133-ADF08-B
EasyInstall Pre-Rinse Unit, with 6" wall bracket, wall mount base, 8" centers, 44" flexible hose with overhead spring body & B-0107 spray valve, 18" riser, add-on faucet with 8" swing nozzle, lever handles, 1/2" NPT female inlets, quarter-turn Eterna cartridges, low lead

BUILDING AND SITE IMPROVEMENTS
WESTEND NAVIGATION CENTER

ITEM 66 - SPARE NO. <Spare No.>

ITEM 67 - S/S - WALLSHELF (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Wall Shelf Approx. Size 12" X 48" Fabricated per plan and specification. **
Approved Shop Drawing **

ITEM 68 - S/S - CLEAN DISH LANDING (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Clean Dish Table. Fabricated per plan and specification. ** Approved Shop
Drawing **

ITEM 69 - EXHAUST HOOD (TYPE 2) (1 REQ'D)
Captive-Aire Model CUSTOM
Condensation Hood Full Perimeter Gutter.

ITEM 69.1 - S/S -HOOD ENCLOSURES (1 REQ'D)
Stainless Fabricator Model CUSTOM
S/S HOOD ENCLOSURE PANELS 12'-0" X 18" MAX

ITEM 70 - DISHWASHER, DOOR TYPE (1 REQ'D)
Hobart Model CDH-1
Centerline Dishwasher, door type, high temperature sanitizing, 208-240/60/3 (field convertible to single phase), single-point standard, (51) racks/hr, pumped-rinse, 0.73 gal/rack, with booster, standard or extended cycle options, tri-prong combination wash/rinse arms, Delime Notification with Cycle, service diagnostics with error notifications, recirculating design, pumped drain, soft start, 18-inch pillarless vertical door opening, straight-thru or corner installation, door-actuated start. Ships with (1) peg rack and (1) combination rack, cULus, NSF, ENERGY STAR® (Pricing options available, please contact your local rep for more information) (NET price shown)
1 ea Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA
1 ea Model DWT-AM16°C Drain water tempering (single valve) kit with Pumped Drain Air Gap
1 ea Model ACC-INSTALL-HOB Accessory Installation - For installations within 100 miles (accessible by public roadway) of a Hobart Service Office during normal business hours with appropriate notice; Installation beyond 100 miles locations in Alaska, Hawaii or New York City or those not accessible by public roadway will be quoted by Service. Includes installation of this item only, final electrical or plumbing connections by others. Recommendation: coordinate accessory installation with machine assembly/ installation (NET)
1 ea NOTE: For water of 3-grains of hardness or more, Hobart suggests adding a water softener.

ITEM 71 - PRE-RINSE FAUCET ASSEMBLY (1 REQ'D)
T&S Brass Model B-0133
EasyInstall Pre-Rinse Unit, wall mount mixing faucet with 8" adjustable centers, quarter-turn Eterna cartridges with spring checks, lever handles with color-coded indexes, 18" EasyInstall riser, 44" flexible stainless steel hose with heat-resistant gray handle & hold down ring, 1.15 GPM spray valve (B-0107), finger hook, polished chrome-plated brass faucet body, 1/2" NPT female inlets, CSA

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1 ea	Model B-0109-01 Wall Bracket, 6"
1 kt	Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "Ell" 1/2" NPT female x male
1 kt	Model B-0230-KIT Inlet Kit, 1/2" NPT nipple, close elbows, 24" flex supply hoses
1 ea	Model B-3952-01 Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with overflow assembly (replaces B-3917-01)

ITEM 72 - S/S - SCRAP SINK (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Scrap Sink w Rails Included in or part of Item # 73. Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 73 - S/S - SOILED DISH LANDING (1 REQ'D) <INCLUDED >
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Soiled Dish Table Fabricated per plan and specification.
** Approved Shop Drawing **

ITEM 74 - COMMERCIAL WASTE CONTAINER (1 REQ'D)
CFS Brands Model 84103223
Carlisle - Bronco™ Waste Bin Trash Container, 32 gallon, 28"H x 21-2/5" dia., round, stackable, double-reinforced stress ribs, ergonomic handles, integrated bag cinches, drag skids, deep hand holds on base, polyethylene, gray, NSF, Made in USA

ITEM 75 - S/S - SLANTED GLASS RACK (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Slanted Glass Sorting Rack. Approx. Size 20" X 42" Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 76 - SPARE NO. <Spare No.>

ITEM 77 - S/S - PASS SHELF (1 REQ'D) <INCLUDED >
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Pass/Pick-up Shelf. Approx. Size 14" X 10'-0" Fabricated per plan and specification. ** Approved Shop Drawing **

ITEM 78 - S/S - BEVERAGE COUNTER (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel - Beverage Counter Approx. Size 36" X 16'-0" Fabricated per plan and specification. ** Approved Shop Drawing **
NOTE: MILLWORK NIC

ITEM 78A - S/S - SERVICE COUNTER (1 REQ'D)
Stainless Fabricator Model CUSTOM
Custom Stainless Steel CURB

ITEM 79 - COFFEE BREWER (1 REQ'D)
FETCO Model C53016 Dimensions: 39.5(h) x 21(w) x 16(d)

BUILDING AND SITE IMPROVEMENTS
WESTEND NAVIGATION CENTER

Handle Operated Series Coffee Brewer, twin, 2.0 gallon capacity, automatic, on/off switch, two-portion standard, gravity flow dispense tube system, programmable recipes, gourmet coffee brew basket locks during brew cycle, hot water service, tank drain, 2 x 3.0kW heaters, 120/208-240v, 1-ph, 3+G wires, 22.0 - 25.4 max amp draw, 4.6 - 6.1kW, terminal block, 4.0 - 20.0 gallons per hour, UL, cUL, NSF (Use with FETCO D450 or D453 - sold separately)

1 ea NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation
1 ea Circuit board: 3 year parts & 1 year labor warranty, standard
1 ea Electro-mechanical parts: 2 year parts & 1 year labor warranty, standard
1 ea All other parts: 1 year parts & 1 year labor warranty, standard

ITEM 80 - COFFEE TEA BREWER (1 REQ'D)

FETCO Model M1221US-1A117-PM001 Dimensions: 36.63(h) x 9.25(w) x 22(d)

Extractor Plus™ Series Multi Beverage Brewer System, tall, 3 L coffee & 3 gallons of iced tea output, 4.4 gallons per hour, digital touchpad operation, adjustable brew time & volume, streamlined programming & diagnostic, USB, hot water faucet, fits airpots & iced tea dispensers (Not included), 1.7kW heater, 120v/60/1-ph, 14.7 amps, 1.8 kW, NEMA 5-15P, cULus, NSF

1 ea NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation

ITEM 81 - S/S - BEVERAGE COUNTER TROUGH DRAIN (1 REQ'D) <INCLUDED >

Stainless Fabricator Model CUSTOM

Custom Stainless Steel - Beverage Counter Trough Drain. Approx. Size 4-3/4" X 48" Fabricated per plan and specification. ** Approved Shop Drawing **

END OF SECTION



04/17/2026

Project:
Westend Navigation
Center SPECIFICATIONS
11109 Jasmine Street
Fontana, CA 92337

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Submittal Sheet

10/03/2025

ITEM# 1 - AIR CURTAIN (1 EA REQ'D)

Mars Air Systems STD236-1UA-OB

Standard Series 2 air curtain for 36"W door, unheated, galvanized steel cabinet with Obsidian Black powder coat finish, (1) 1/2 HP motor, 115v/60/1-ph, 500 watts, 5.1 amps, cETLus

ACCESSORIES

Mfr	Qty	Model	Spec
Mars Air Systems	1		5 year warranty, standard
Mars Air Systems	1		1 year warranty for all parts (except filters), standard
Mars Air Systems	1	ZZMAGSWCTRL	Magnetic (NOTE: controller required)
Mars Air Systems	1	ZZNOTD	No time delay
Mars Air Systems	1	MCPA-1UA	Control Panel, 1 motor, 1/2HP, Unheated, 115V,1Ø,60Hz (Remote Mounted), 120v Ctrl
Mars Air Systems	1	99-125	Magnetic reed switch, industrial metallic body for surface mounted applications, 120v, NEMA 1 (requires controller or motor control panel)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1				5.1	.5	1/2		
2	120	60	1								

STD2 (Standard 2) Series

Unheated

Model Lengths: 36"–144"

Environmental Separation (up to 12')

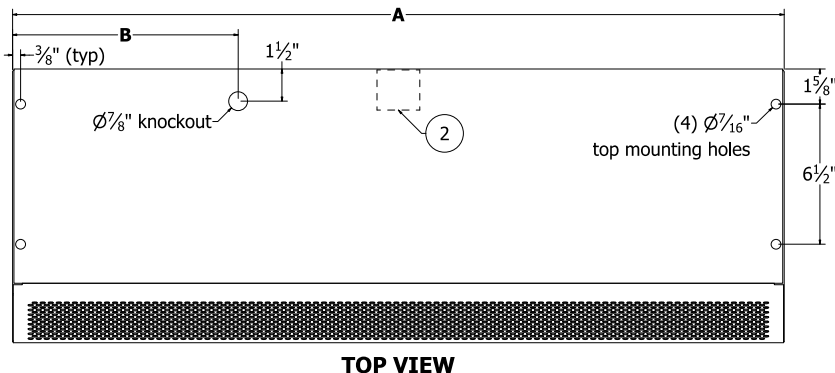
Insect Control (up to 10')



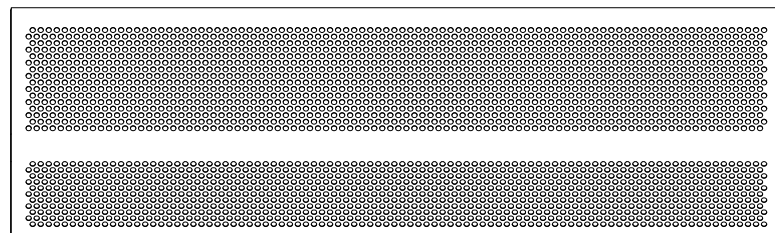
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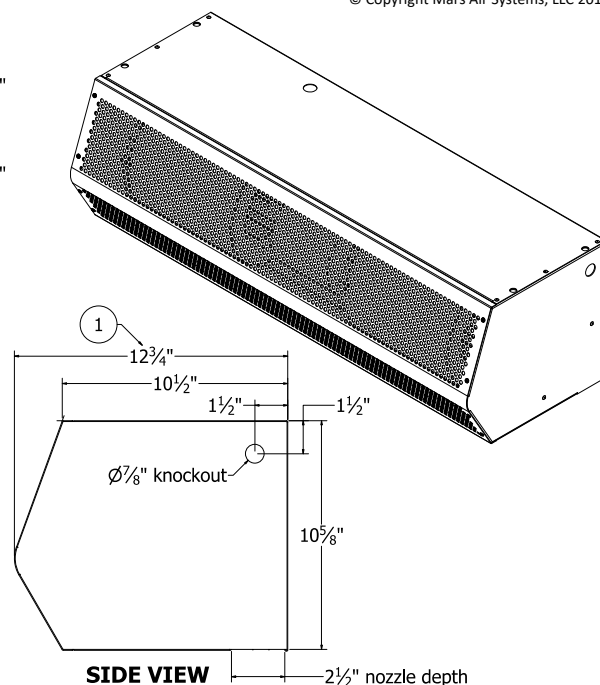
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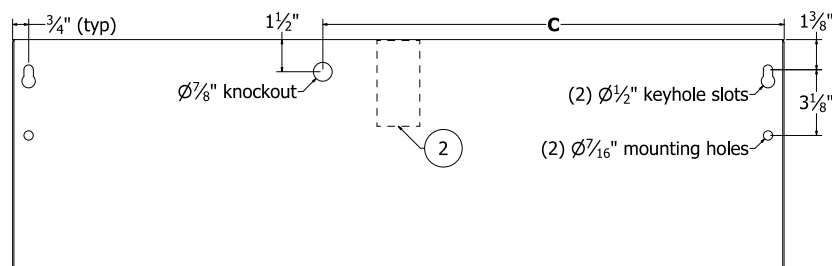
TOP VIEW



FRONT VIEW



SIDE VIEW



REAR VIEW

Notes:

- Overall depth is 17 1/4" for STD2 units with SimpleLink option.
- Internal junction boxes provided for electrical wiring: (1) 2"x4" box for one-motor units, (1) 4"x4" box for two-motor units, (2) 4"x4" box for three-motor units.
- Recommended service clearances are 2" to the left and right sides, 6" on top, and 18" in front of the unit.
- Circuit protection (per NEC) to be installed by others.
- To prevent accidental damage during operation, unit must be installed so that the bottom of the air curtain does not extend below the door header.
- Unit can be fastened to wall on both ends without intermediate support.
- One-motor units up to 48" are shipped with Motor-Fan Assembly (MFA) factory-installed. All other models, MFAs are shipped loose to minimize freight damage.

Model Number	Mechanical Data						AMCA Certified Lab Data				
	Overall Length A (in)	Nozzle Length (in)	Top Knockout Location B (in)	Rear Knockout Location C (in)	Motor (hp)	Weight (lb)	Max Core Velocity at Nozzle (in)	Avg Velocity (fpm)	Volume (cfm)	Uniformity (%)	Power Rating (watt)
<input type="checkbox"/> STD236-1U*-OB	36	36	10 1/2	21 1/2	1/2	60	5960	2206	1379	84	500
<input type="checkbox"/> STD240-1U*-OB	40	40	12 1/2	23 1/2	1/2	65	4660	2084	1447	92	523
<input type="checkbox"/> STD242-1U*-OB	42	42	13 1/2	24 1/2	1/2	65	4865	1945	1418	87	506
<input type="checkbox"/> STD248-1U*-OB	48	48	16 1/2	27 1/2	1/2	70	4247	1730	1442	85	549
<input type="checkbox"/> STD272-2U*-OB	72	72	31 1/2	40 1/2	(2) 1/2	120	5960	2206	2758	84	1000
<input type="checkbox"/> STD284-2U*-OB	84	84	37 1/2	46 1/2	(2) 1/2	125	4865	1945	2836	87	1012
<input type="checkbox"/> STD296-2U*-OB	96	96	43 1/2	52 1/2	(2) 1/2	135	4247	1730	2884	85	1098
<input type="checkbox"/> STD2108-3U*-OB	108	108	31 1/2	40 1/2	(3) 1/2	175	5960	2206	4137	84	1500
<input type="checkbox"/> STD2120-3U*-OB	120	120	35 1/2	44 1/2	(3) 1/2	185	4660	2084	4341	92	1569
<input type="checkbox"/> STD2144-3U*-OB	144	144	43 1/2	52 1/2	(3) 1/2	200	4247	1730	4326	85	1647
The following model is not licensed to bear the AMCA seal											
<input type="checkbox"/> STD260-2U*-OB	60	60	22 1/2	33 1/2	(2) 1/2	90	6000	2633	2743	93	951

* – Use corresponding letters in "Electrical Data" column headers (see page 2) to complete the model numbers.

Note: above data is for 60 Hz at 1725 RPM. For 50 Hz, RPM is 1425 with a 17% reduction in performance.

- The AMCA Certified Ratings Seal applies to airflow rate, average outlet velocity, outlet velocity uniformity, velocity project, and power rating at free delivery only.

NOTE: Mars Air Systems, LLC reserves the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions, or replacements for previously purchased equipment.

MARS AIR SYSTEMS, LLC • GARDENA, CA • USA

STD2 Unheated, 27 February 2024

STD2 (Standard 2) Series

Unheated

Model Lengths: 36"–144"

Environmental Separation (up to 12')

Insect Control (up to 10')



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Standard Features:

- ❖ ETL-certified to conform to UL 507 (US) and CSA 22.2 (Canada) standards, for indoor/outdoor use
- ❖ AMCA-certified to AMCA 211 (includes performance testing per AMCA 220)
 - Certified models are approved for use as alternate to vestibules (per ASHRAE 90.1, IECC, and IgCC)
- ❖ Sleek self-contained one-piece heavy-gauge corrosion-proof paint lock metal design
- ❖ Fire retardant and rust preventative electrostatic polyurethane powder coating
 - Standard color is Obsidian Black (OB)
- ❖ ½ HP continuous duty Totally Enclosed Air Over (TEAO) motors (NEMA 1)
- ❖ Adjustable air directional vanes with 40° sweep front to back
- ❖ 5-year parts warranty
- ❖ Freight included (FOB continental USA)
- ❖ Proudly made in the USA

Mars Recommended Accessories (see [catalog](#) for complete listing):

- ❖ **Door Limit Switches** (\$)
 - ☐ 99-014, Combination mechanical switch, 250V, 1HP Max
 - ☐ 99-125, Industrial surface mounted magnetic switch (controller required)
 - ❖ **Controllers**
 - ☐ MCPA-†U*, [Motor Control Panel](#), 120V control voltage († = # of Motors, * = Voltage Code) (\$)
 - ☐ MCP-TD, Adjustable time delay, 1sec-100hr (panel required)
 - ☐ MCP-24V, Low voltage control option (panel required)
 - ☐ BMS-303, BMS for monitor and control (panel with MCP-24V required)
 - Note:** Dry contact provided in panel for monitoring motor. 24Vac signal provided from panel for controlling motor.
 - ☐ SK-UU, [SimpleLink](#), 115V-230V, 1PH, 2Mtr & 1HP max, Integral Control, NEMA 1, requires protection from direct elements for outdoor use (housing depth will be 17 3/8" deep)
 - ❖ **Brackets** (\$)
 - ☐ B0004, Adjustable mounting bracket set, 3½" clearance
 - ☐ B0005, Adjustable mounting bracket set, 7"–13" clearance
 - ☐ B0041, Transom mounting bracket set for STD2
 - ❖ **Filters**
 - ☐ J21†-†, ¼" aluminum pressed frame bank filters († = Model Length, † = # of Motors)
 - ❖ **Severe Duty and Finish**
 - ☐ HSG-304SS-STD, 304 Stainless steel housing construction
 - ☐ INS-WD-STD2, Washdown motor fan assembly, IP54
 - ☐ INS-XP-STD2, Explosion resistant motor fan assembly, Class 1, Division 1, Group D (TENV)
 - Note:** Washdown and explosion proof units draw higher motor amperage (see electrical data table). Control panels for these units require OL/MP with higher amperage range (use MCP-MWD or MCP-MXP accessory).
- (S) = Shipped loose

Sound Levels (measured at 10' in a free field):

1 Motor Unit = 66 dBA, 2 Motor Unit = 68 dBA, 3 Motor Unit = 71 dBA, 4 Motor Unit = 73 dBA

Electrical Data Full Load Amp (FLA)	Unit Amperage (Voltage Code)			
	Single Phase		Three Phase	
	115V/1Ø <input type="checkbox"/> (A)	208-230V/1Ø <input type="checkbox"/> (D)	208-230V/3Ø <input type="checkbox"/> (G)	460V/3Ø <input type="checkbox"/> (H)
<input type="checkbox"/> STD236-1U*-OB	5.1	2.5	1.8/1.6	0.8
<input type="checkbox"/> STD240-1U*-OB	5.1	2.5	1.8/1.6	0.8
<input type="checkbox"/> STD242-1U*-OB	5.1	2.5	1.8/1.6	0.8
<input type="checkbox"/> STD248-1U*-OB	5.1	2.5	1.8/1.6	0.8
<input type="checkbox"/> STD260-2U*-OB	10.2	5.0	3.6/3.2	1.6
<input type="checkbox"/> STD272-2U*-OB	10.2	5.0	3.6/3.2	1.6
<input type="checkbox"/> STD284-2U*-OB	10.2	5.0	3.6/3.2	1.6
<input type="checkbox"/> STD296-2U*-OB	10.2	5.0	3.6/3.2	1.6
<input type="checkbox"/> STD2108-3U*-OB	15.3	7.5	5.4/4.8	2.4
<input type="checkbox"/> STD2120-3U*-OB	15.3	7.5	5.4/4.8	2.4
<input type="checkbox"/> STD2144-3U*-OB	15.3	7.5	5.4/4.8	2.4

* – Use corresponding letters in "Voltage Code" column headers to complete the model numbers

Ampacity (MCA) = total FLA x 1.25

Alternate voltage codes with FLA data:

·277V/1Ø/60Hz (L) – 2.7A per motor
 ·220V/1Ø/50Hz (U) – 2.5A per motor
 ·380-415V/3Ø/50Hz (W) – 1.1A per motor

Washdown motor FLA data (INS-WD-STD2):

·115V/1Ø/60Hz (A) – 7.4A per motor
 ·208-230V/1Ø/60Hz (D) – 3.9/3.7A per motor
 ·208-230V/3Ø/60Hz (G) – 2.0/2.1A per motor
 ·460V/3Ø/60Hz (H) – 1.0A per motor

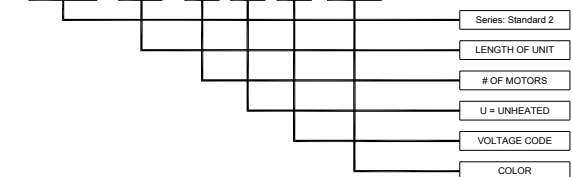
Explosion proof motor FLA data (INS-XP-STD2):

·115V/1Ø/60Hz (A) – 7.4A per motor
 ·208-230V/1Ø/60Hz (D) – 3.7A per motor
 ·208-230V/3Ø/60Hz (G) – 1.8/1.6A per motor
 ·460V/3Ø/60Hz (H) – 0.8A per motor

AMCA Certified Projection Velocity		
Model	Distance from Nozzle (in)	Average Core Velocity (fpm)
STD236-1U*	40	1207
	80	856
	120	710
	160	637
	200	588

EXAMPLE

STD2 72 - 2 U H - OB



MARS Air Systems, LLC certifies that the Air Curtains shown on this data sheet are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

The AMCA Certified Ratings Seal applies to airflow rate, average outlet velocity, outlet velocity uniformity, velocity projection and power rating at free delivery only.

NOTE: Model STD260-2 is not AMCA-certified.

Door Switches



NEMA1 to NEMA9 Models

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Door Switch Number	Description	Max Voltage	Phase	Max HP	Amperage	Poles	NEMA Rating
<i>Mechanical Switches – controller not required for air curtains under switch electrical limits</i>							
99-014	Combination Plunger/Roller	250V	1	1	20 A	1	NEMA 1
99-270	Washdown Roller	250V	1	1	20 A	1	NEMA 4X
99-016	Explosion Resistant Roller	250V	1	¾	15 A	1	NEMA 7 and 9
<i>Magnetic Switches – controller required</i>							
99-018	Commercial, Plastic, Surface Mounted	24V	1	-	½ A	1	NEMA 1
99-125	Industrial, Metal, Surface Mounted	120V	1	-	3 A	1	NEMA 1
99-124	Industrial, Metal, Floor Mounted	120V	1	-	3 A	1	NEMA 1

Note: DO NOT ground the green wire (for 99-124 and 99-125) or COM terminal (for all others). This is the switch common, not ground or neutral. Please refer to the wiring instructions included with the switches.

Mechanical Switch Features:

Combination Roller/Plunger Switch (99-014)

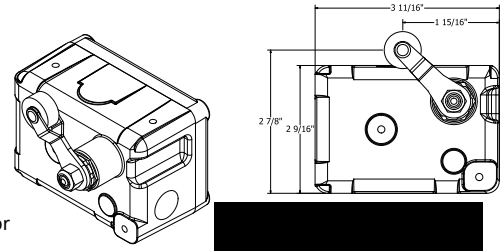
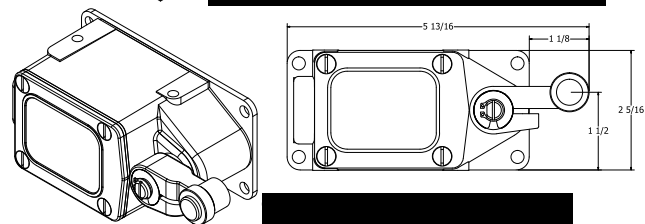
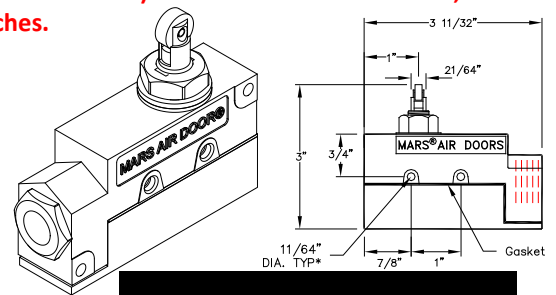
- ❖ UR (UL Recognized) and rated for NEMA 1 applications (field installed by others)
 - ❖ Used to enable automatic control of air curtain(s): turns air curtain on when door opens and off when door closes
 - ❖ Suitable for various applications and installation types
 - ❖ Maximum ratings of 250V, 20A, and 1HP (see individual model specs for details)
 - If the air curtain exceeds any of these ratings, or if it is three phase, a [Motor Control Panel \(MCP\)](#) or [solid state controller](#) is required
 - ❖ Single pole (1P) switch with normally closed (NC) and normally open (NO) contacts
 - Only normally closed and common (COM) terminals are provided with screws for wiring
 - ❖ Requires less than 1/8" of travel and 2 lbs. of force on plunger to activate switch
 - ❖ 1/2" FPT conduit connection (field wired by others)
 - ❖ (2) 11/64" mounting holes*
- *Do not use a fastener larger than a #6 sheet metal screw or a #8 Machine screw to mount this door limit switch. Larger screws may damage the switch and void the warranty.
- ❖ 1 year parts warranty for all switches

Washdown Roller Switch (99-270)

- ❖ UR (UL Recognized) and rated for NEMA4X/IP55

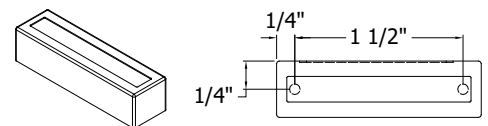
Explosion Resistant Roller Switch (99-016)

- ❖ UR (UL Recognized) and rated for NEMA 7 & 9 (Class 1, Division 1, Group D)

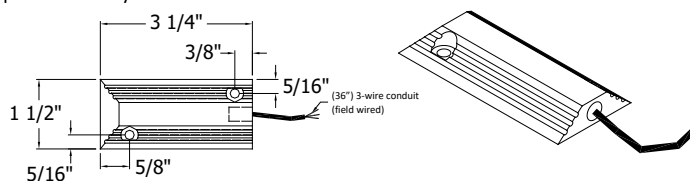


Magnetic Switch Features:

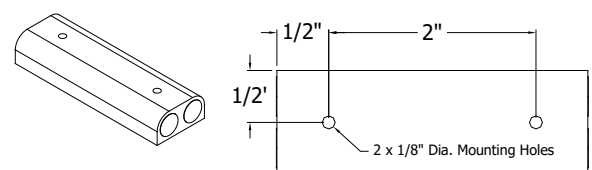
- ❖ UR (UL Recognized) and rated for NEMA 1 applications (field installed by others)
- ❖ Used to enable automatic control of air curtain(s): turns air curtain on when door opens and off when door closes
- ❖ Typical applications for each switch:
 - 99-018: for neat trim and finish in commercial applications
 - 99-125: for heavy duty industrial applications
 - 99-124: for roll-up doors with forklift traffic
- ❖ A [Motor Control Panel \(MCP\)](#) or [solid state controller](#) is required for use with all magnetic door switches (except for electric heated air curtain)
 - For 99-018, MCP-24V adder is required for use with MCP
- ❖ Single pole (1P) switch with normally closed (NC) and normally open (NO) contacts
- ❖ Maximum acceptable gap of 1/8" distance (commercial) or 1/2" (industrial) between magnets to activate switch
- ❖ Lightweight and easy to install
- ❖ 1 year parts warranty for all switches



99-018 – Commercial Surface Mounted Magnetic Switch



99-124 – Industrial Floor Mounted Magnetic



99-125 – Industrial Surface Mounted Magnetic Switch

NOTE: MARS AIR SYSTEMS, LLC reserves the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions, or replacements for previously purchased equipment.

Submittal Sheet

10/03/2025

ITEM# 2 - SHELVING UNIT, WIRE (6 KT REQ'D)

Quantum WR86-2160GY-5

Wire Shelving Starter Kit, 60"W x 21"D x 86"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD

ACCESSORIES

Mfr	Qty	Model	Spec
Quantum	6		15 year limited warranty (limited against rust and corrosion)

WIRE SHELVING

DESIGN: The open wire design of these shelves minimizes dust accumulation and allows free circulation of air, greater visibility of stored items and greater light penetration.

CONSTRUCTION: All welded wire shelves and posts are constructed of heavy-gauge carbon steel or Type 304 stainless steel.

CHOICE OF FINISHES:

- **Chrome** - is a plating process which deposits hard chrome OVER a copper, nickel surface. This process is VERY durable and allows product to be used in any application in a dry storage ENVIRONMENT. 1 year limited warranty to not rust or corrode when used in dry and non-humid ENVIRONMENTS.
- **Stainless Steel** - 304 Stainless with an electro-polish finish represents the highest industry standard in the PREVENTION of corrosion. This finish is highly EFFECTIVE for CORROSIVE, high humidity or clean room ENVIRONMENTS. Lifetime warranty for 304 stainless steel electro-polish finish.
- **Proform Green, Gray and Black Epoxy** - are an ideal solution for high humidity, wet, or walk-in-cooler applications. The carbon steel is treated with an iron phosphate and the powder coated epoxy is electrostatically applied, baked and cured to a hard surface. All three colors are antimicrobial. 15 year limited warranty for antimicrobial finish to not rust or corrode.

ADAPTABLE: Wire shelving can adapt to your changing needs. By using various accessories, hundreds of shelving configurations become possible.

QUICK, EASY ASSEMBLY: Posts have a double groove visual guide feature every 8", circular grooves at 1" increments, and are numbered at 1" intervals. Tapered split sleeve snaps together around each post. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock. Shelf is assembled in minutes without the use of any special tools.

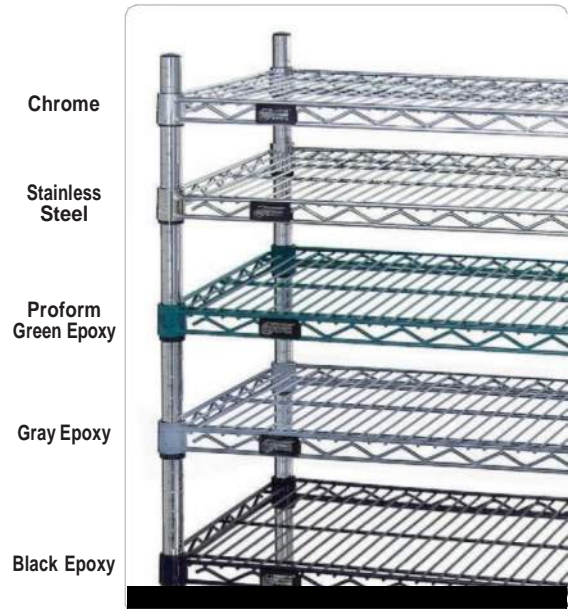
ADJUSTABLE: Shelves can be adjusted at 1" intervals along length of the post.

WIRE TRUSSES: Architectural wire trusses increase shelf capacity.

TOP MAT WIRES: Run front to back to slide items easily off and on the shelf.

SHELF ACCESSIBILITY: Shelves can be loaded/unloaded easily from all sides. This open construction allows maximum use of storage cube.

ADJUSTABLE FOOT: 3/8-16 leveling bolt compensate for irregular floor surfaces.



Note: Stainless stationary posts are equipped with stainless steel LEVELING feet.

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WIRE SHELVING

WIRE SHELVES

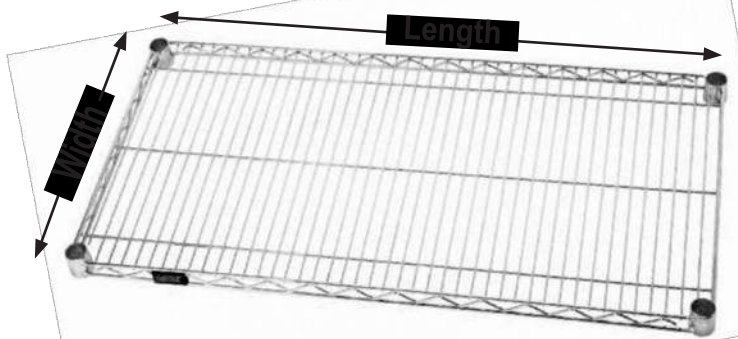
- **Plastic Split SLEEVES** - are included with each shelf
Replacements are available:
Model No: **WR-SS** (4 Pairs)
- **Plastic CONDUCTIVE Split SLEEVES** - are AVAILABLE for CONDUCTIVE applications
Model No: **WR-SSCO** (4 Pairs)
- **Aluminum Split SLEEVES** - are recommended for extreme mobile applications and CONDUCTIVE applications
Model No: **ESD-SS** (4 Pairs)
- **Load capacity (evenly distributed) per shelf**

Widths: 12" to 36"

Lengths: 800 lbs. for 18" to 48"

600 lbs. for 54" or longer except heavy-duty

1,000 lbs. for 60" or 72" on chrome heavy-duty



All welded construction with additional wire trussing for high-strength characteristics

Top mat wires run front to back (except on 12" x 36" size) for ease of loading and unloading

- Numbered GROOVED posts on 1" increments for quick assembly
- Wire allows air to circulate and light to penetrate for increased product VISIBILITY
- Minimal dirt accumulation
- Adjustable foot LEVELERS
- No tools required for assembly
- Durable finishes
- Aesthetically pleasing
- National Sanitation Foundation (NSF) APPROVED
- Shipped KD Class 70



Split Sleeve



Aluminum Split Sleeve

		CHROME	STAINLESS STEEL	EPOXY		
				PROFORM GREEN	GRAY	BLACK
SHELF W" x L"	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.
12" Deep - Wire Shelves						
12" x 24"	6 lbs	1224C	-	1224P	1224GY	1224BK
12" x 30"	6 lbs	1230C	-	1230P	1230GY	1230BK
12" x 36"	7 lbs	1236C	1236S	1236P	1236GY	1236BK
12" x 42"	8 lbs	1242C	-	1242P	1242GY	1242BK
12" x 48"	9 lbs	1248C	1248S	1248P	1248GY	1248BK
12" x 60"	14 lbs	1260C	1260S	1260P	1260GY	1260BK
12" x 72"	17 lbs	1272C	1272S	1272P	1272GY	1272BK
14" Deep - Wire Shelves						
14" x 24"	6 lbs	1424C	-	1424P	1424GY	1424BK
14" x 30"	7 lbs	1430C	1430S	1430P	1430GY	1430BK
14" x 36"	8 lbs	1436C	1436S	1436P	1436GY	1436BK
14" x 42"	10 lbs	1442C	1442S	1442P	1442GY	1442BK
14" x 48"	11 lbs	1448C	1448S	1448P	1448GY	1448BK
14" x 54"	12 lbs	1454C	1454S	1454P	1454GY	1454BK
14" x 60"	14 lbs	1460C	1460S	1460P	1460GY	1460BK
14" x 72"	17 lbs	1472C	1472S	1472P	1472GY	1472BK
18" Deep - Wire Shelves						
18" x 24"	7 lbs	1824C	1824S	1824P	1824GY	1824BK
18" x 30"	8 lbs	1830C	1830S	1830P	1830GY	1830BK
18" x 36"	10 lbs	1836C	1836S	1836P	1836GY	1836BK
18" x 42"	11 lbs	1842C	1842S	1842P	1842GY	1842BK
18" x 48"	14 lbs	1848C	1848S	1848P	1848GY	1848BK
18" x 54"	15 lbs	1854C	1854S	1854P	1854GY	1854BK
18" x 60"	17 lbs	1860C	1860S	1860P	1860GY	1860BK
18" x 72"	20 lbs	1872C	1872S	1872P	1872GY	1872BK
21" Deep - Wire Shelves						
21" x 24"	8 lbs	2124C	2124S	2124P	2124GY	2124BK
21" x 30"	9 lbs	2130C	2130S	2130P	2130GY	2130BK
21" x 36"	11 lbs	2136C	2136S	2136P	2136GY	2136BK
21" x 42"	12 lbs	2142C	2142S	2142P	2142GY	2142BK
21" x 48"	14 lbs	2148C	2148S	2148P	2148GY	2148BK
21" x 54"	16 lbs	2154C	2154S	2154P	2154GY	2154BK
21" x 60"	18 lbs	2160C	2160S	2160P	2160GY	2160BK
21" x 72"	24 lbs	2172C	2172S	2172P	2172GY	2172BK
24" Deep - Wire Shelves						
24" x 24"	9 lbs	2424C	2424S	2424P	2424GY	2424BK
24" x 30"	11 lbs	2430C	2430S	2430P	2430GY	2430BK
24" x 36"	13 lbs	2436C	2436S	2436P	2436GY	2436BK
24" x 42"	15 lbs	2442C	2442S	2442P	2442GY	2442BK
24" x 48"	16 lbs	2448C	2448S	2448P	2448GY	2448BK
24" x 54"	18 lbs	2454C	2454S	2454P	2454GY	2454BK
24" x 60"	21 lbs	2460C	2460S	2460P	2460GY	2460BK
24" x 66"	23 lbs	2466C	-	2466P	2466GY	-
24" x 72"	26 lbs	2472C	2472S	2472P	2472GY	2472BK
24" Deep Heavy-Duty - Wire Shelves (1,000 lb. capacity)						
24" x 60"	25 lbs	2460CHD	-	-	-	-
24" x 72"	30 lbs	2472CHD	-	-	-	-
30" Deep - Wire Shelves						
30" x 36"	15 lbs	3036C	3036S	3036P	3036GY	3036BK
30" x 42"	18 lbs	3042C	3042S	3042P	3042GY	3042BK
30" x 48"	21 lbs	3048C	3048S	3048P	3048GY	3048BK
30" x 60"	27 lbs	3060C	3060S	3060P	3060GY	3060BK
30" x 72"	31 lbs	3072C	3072S	3072P	3072GY	3072BK
36" Deep - Wire Shelves						
36" x 36"	18 lbs	3636C	3636S	3636P	3636GY	3636BK
36" x 48"	23 lbs	3648C	3648S	3648P	3648GY	3648BK
36" x 60"	29 lbs	3660C	3660S	3660P	3660GY	3660BK
36" x 72"	35 lbs	3672C	3672S	3672P	3672GY	3672BK

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POSTS

All posts are fabricated from 16 gauge carbon steel with locating grooves on 1" increments and printed numbers between the grooves. Post also have doubled grooves every 8" for fast identification. Leveling legs are enclosed with all posts. Leveling legs cannot be used in conjunction with stem casters. Custom post heights are available.

STATIONARY POSTS ARE EQUIPPED WITH:

- **Post LEVELER Insert & LEVELING Bolt** - use to account for *UNEVEN* floors, it adjusts up or down allowing height flexibility
Replacements are available:
Insert
Model No: **W-PLI**
Leveling Bolt
Model No: **W-PLB**
- **Foot Plates** - triangular plate allows additional surface to disperse weight. It may be ordered separately and installed in place of LEVELING foot
Model No: **FP**
- **Floor Guides** - Serves as protection to PREVENT marring of floors
Model No: **FG** (Pack of 4)
- **Fully Threaded Stud Connector** - can be utilized to connect two posts enabling any post height to be ACHIEVED
Model No: **W-PC-STUD**
- **Post Cap** - Plastic caps are included with each post
Replacements are available:
Model No: **W-PC** (Pack of 4)
- **Shelf Collar Plug** - Shelf Collar Plug COVERS shelf collar when post is not being used
Model No: **WR-SP** (Pack of 4)
- **S-Hook** - For continuous runs of SHELVING. Two hooks should be placed per shelf where two posts are not utilized.
Model No: **S-HOOK** (Pack of 8)



Post Insert

Post Leveling Bolt



Fully Threaded Stud Connector



Post Cap



S-Hook



Foot Plate

Floor Glides

Shelf Collar Plug

FINISHES:

Chrome, Stainless Steel, Proform and Epoxy Green, Gray, Black

DESCRIPTION	SHIP WGT	Foot Plate		Floor Glides		Shelf Collar Plug	
		CHROME	STAINLESS STEEL	EPOXY			
		MODEL NO.	MODEL NO.	PROFORM GREEN	GRAY	BLACK	
DESCRIPTION	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	
6"H Post	1 lb	P6C	P6S	P6P	P6GY	P6BK	
14"H Post	1 lb	P14C	P14S	P14P	P14GY	P14BK	
34"H Post	2 lbs	P34C	P34S	P34P	P34GY	P34BK	
36"H Post	2 lbs	P36C	-	-	-	-	
39"H Post	2 lbs	P39C	-	-	-	P39BK	
42"H Post	2 lbs	-	P42S	-	-	-	
54"H Post	3 lbs	P54C	P54S	P54P	P54GY	P54BK	
63"H Post	4 lbs	P63C*	P63S	P63P*	P63GY*	P63BK*	
74"H Post	4 lbs	P74C*	P74S	P74P*	P74GY*	P74BK*	
86"H Post	5 lbs	P86C*	P86S	P86P*	P86GY*	P86BK*	
96"H Post	6 lbs	P96C	P96S	P96P	P96GY	P96BK	

*For easy installation, 63", 74" and 86" posts are available with pre-inserted leveler and bolt by adding an X to the Model No. P74CX

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SHELVING UNITS

Heavy-duty shelving units allows up to 800 lb. shelf capacity. Starter kits come complete with 4 posts and 4 shelves. Additional shelves may be purchased separately.

Additional Add-On kits allows you to expand your starter kit by sharing a set of posts. Configuration options include side to side, back to back and right angles (L-Shape). Add-On kits come complete with 2 posts, 4 shelves and 8 S-Hooks. Additional shelves and posts may be purchased separately. Units with Add-on kits cannot be made mobile.

ADD SUFFIX TO THE END OF EACH MODEL NO. WHEN REFERENCING TO PART FINISHES

• CHROME C
• STAINLESS S
• ENAMEL E
• GREEN G
• GRAY Y
• BLACK B



DB

Donut Bumper

Non-marking donut bumper used to protect walls and help cushion impact. Sold individually. Measures 3" diameter



WR-00HS

Polyurethane Stainless Steel Casters w/ Zerk Grease Fittings

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"



WR-00H

Polyurethane Casters

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"

63"H STARTER KIT UNITS			63"H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 63"	44	WR63-1236	12" x 36" x 63"	37	AD63-1236C
12" x 42" x 63"	48	WR63-1242	12" x 42" x 63"	41	AD63-1242C
12" x 48" x 63"	52	WR63-1248	12" x 48" x 63"	45	AD63-1248C
12" x 60" x 63"	60	WR63-1260	12" x 60" x 63"	53	AD63-1260C
12" x 72" x 63"	68	WR63-1272	12" x 72" x 63"	61	AD63-1272C
14" x 24" x 63"	40	WR63-1424	14" x 24" x 63"	33	AD63-1424C
14" x 30" x 63"	44	WR63-1430	14" x 30" x 63"	37	AD63-1430C
14" x 36" x 63"	48	WR63-1436	14" x 36" x 63"	41	AD63-1436C
14" x 42" x 63"	56	WR63-1442	14" x 42" x 63"	49	AD63-1442C
14" x 48" x 63"	60	WR63-1448	14" x 48" x 63"	53	AD63-1448C
14" x 54" x 63"	64	WR63-1454	14" x 54" x 63"	57	AD63-1454C
14" x 60" x 63"	72	WR63-1460	14" x 60" x 63"	65	AD63-1460C
14" x 72" x 63"	84	WR63-1472	14" x 72" x 63"	77	AD63-1472C
18" x 24" x 63"	44	WR63-1824	18" x 24" x 63"	37	AD63-1824C
18" x 30" x 63"	48	WR63-1830	18" x 30" x 63"	41	AD63-1830C
18" x 36" x 63"	54	WR63-1836	18" x 36" x 63"	49	AD63-1836C
18" x 42" x 63"	58	WR63-1842	18" x 42" x 63"	53	AD63-1842C
18" x 48" x 63"	62	WR63-1848	18" x 48" x 63"	57	AD63-1848C
18" x 54" x 63"	74	WR63-1854	18" x 54" x 63"	69	AD63-1854C
18" x 60" x 63"	82	WR63-1860	18" x 60" x 63"	77	AD63-1860C
18" x 72" x 63"	94	WR63-1872	18" x 72" x 63"	89	AD63-1872C
21" x 24" x 63"	46	WR63-2124	21" x 24" x 63"	41	AD63-2124C
21" x 30" x 63"	50	WR63-2130	21" x 30" x 63"	45	AD63-2130C
21" x 36" x 63"	58	WR63-2136	21" x 36" x 63"	53	AD63-2136C
21" x 42" x 63"	62	WR63-2142	21" x 42" x 63"	57	AD63-2142C
21" x 48" x 63"	70	WR63-2148	21" x 48" x 63"	65	AD63-2148C
21" x 54" x 63"	78	WR63-2154	21" x 54" x 63"	73	AD63-2154C
21" x 60" x 63"	86	WR63-2160	21" x 60" x 63"	81	AD63-2160C
21" x 72" x 63"	110	WR63-2172	21" x 72" x 63"	105	AD63-2172C
24" x 24" x 63"	50	WR63-2424	24" x 24" x 63"	45	AD63-2424C
24" x 30" x 63"	58	WR63-2430	24" x 30" x 63"	53	AD63-2430C
24" x 36" x 63"	66	WR63-2436	24" x 36" x 63"	61	AD63-2436C
24" x 42" x 63"	74	WR63-2442	24" x 42" x 63"	69	AD63-2442C
24" x 48" x 63"	78	WR63-2448	24" x 48" x 63"	73	AD63-2448C
24" x 54" x 63"	86	WR63-2454	24" x 54" x 63"	81	AD63-2454C
24" x 60" x 63"	98	WR63-2460	24" x 60" x 63"	93	AD63-2460C
24" x 72" x 63"	118	WR63-2472	24" x 72" x 63"	113	AD63-2472C
30" x 36" x 63"	74	WR63-3036	30" x 36" x 63"	69	AD63-3036C
30" x 42" x 63"	86	WR63-3042	30" x 42" x 63"	81	AD63-3042C
30" x 48" x 63"	98	WR63-3048	30" x 48" x 63"	93	AD63-3048C
30" x 60" x 63"	122	WR63-3060	30" x 60" x 63"	117	AD63-3060C
30" x 72" x 63"	138	WR63-3072	30" x 72" x 63"	133	AD63-3072C
36" x 36" x 63"	86	WR63-3636	36" x 36" x 63"	81	AD63-3636C
36" x 48" x 63"	106	WR63-3648	36" x 48" x 63"	101	AD63-3648C
36" x 60" x 63"	130	WR63-3660	36" x 60" x 63"	125	AD63-3660C
36" x 72" x 63"	138	WR63-3672	36" x 72" x 63"	133	AD63-3672C

74" H STARTER KIT UNITS			74" H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 74"	44	WR74-1236	12" x 36" x 74"	38	AD74-1236
12" x 42" x 74"	48	WR74-1242	12" x 42" x 74"	42	AD74-1242
12" x 48" x 74"	52	WR74-1248	12" x 48" x 74"	46	AD74-1248
12" x 60" x 74"	60	WR74-1260	12" x 60" x 74"	54	AD74-1260
12" x 72" x 74"	68	WR74-1272	12" x 72" x 74"	62	AD74-1272
14" x 24" x 74"	40	WR74-1424	14" x 24" x 74"	34	AD74-1424
14" x 30" x 74"	44	WR74-1430	14" x 30" x 74"	38	AD74-1430
14" x 36" x 74"	48	WR74-1436	14" x 36" x 74"	42	AD74-1436
14" x 42" x 74"	56	WR74-1442	14" x 42" x 74"	50	AD74-1442
14" x 48" x 74"	60	WR74-1448	14" x 48" x 74"	54	AD74-1448
14" x 54" x 74"	64	WR74-1454	14" x 54" x 74"	58	AD74-1454
14" x 60" x 74"	72	WR74-1460	14" x 60" x 74"	66	AD74-1460
14" x 72" x 74"	84	WR74-1472	14" x 72" x 74"	78	AD74-1472
18" x 24" x 74"	44	WR74-1824	18" x 24" x 74"	38	AD74-1824
18" x 30" x 74"	48	WR74-1830	18" x 30" x 74"	42	AD74-1830
18" x 36" x 74"	56	WR74-1836	18" x 36" x 74"	50	AD74-1836
18" x 42" x 74"	60	WR74-1842	18" x 42" x 74"	54	AD74-1842
18" x 48" x 74"	64	WR74-1848	18" x 48" x 74"	58	AD74-1848
18" x 54" x 74"	76	WR74-1854	18" x 54" x 74"	70	AD74-1854
18" x 60" x 74"	84	WR74-1860	18" x 60" x 74"	78	AD74-1860
18" x 72" x 74"	96	WR74-1872	18" x 72" x 74"	90	AD74-1872
21" x 24" x 74"	48	WR74-2124	21" x 24" x 74"	42	AD74-2124
21" x 30" x 74"	52	WR74-2130	21" x 30" x 74"	46	AD74-2130
21" x 36" x 74"	60	WR74-2136	21" x 36" x 74"	54	AD74-2136
21" x 42" x 74"	64	WR74-2142	21" x 42" x 74"	58	AD74-2142
21" x 48" x 74"	72	WR74-2148	21" x 48" x 74"	66	AD74-2148
21" x 54" x 74"	80	WR74-2154	21" x 54" x 74"	74	AD74-2154
21" x 60" x 74"	88	WR74-2160	21" x 60" x 74"	82	AD74-2160
21" x 72" x 74"	112	WR74-2172	21" x 72" x 74"	106	AD74-2172
24" x 24" x 74"	52	WR74-2424	24" x 24" x 74"	46	AD74-2424
24" x 30" x 74"	60	WR74-2430	24" x 30" x 74"	54	AD74-2430
24" x 36" x 74"	68	WR74-2436	24" x 36" x 74"	62	AD74-2436
24" x 42" x 74"	76	WR74-2442	24" x 42" x 74"	70	AD74-2442
24" x 48" x 74"	80	WR74-2448	24" x 48" x 74"	74	AD74-2448
24" x 54" x 74"	88	WR74-2454	24" x 54" x 74"	82	AD74-2454
24" x 60" x 74"	100	WR74-2460	24" x 60" x 74"	94	AD74-2460
24" x 72" x 74"	120	WR74-2472	24" x 72" x 74"	114	AD74-2472
30" x 36" x 74"	76	WR74-3036	30" x 36" x 74"	70	AD74-3036
30" x 42" x 74"	88	WR74-3042	30" x 42" x 74"	82	AD74-3042
30" x 48" x 74"	100	WR74-3048	30" x 48" x 74"	94	AD74-3048
30" x 60" x 74"	124	WR74-3060	30" x 60" x 74"	118	AD74-3060
30" x 72" x 74"	140	WR74-3072	30" x 72" x 74"	134	AD74-3072
36" x 36" x 74"	88	WR74-3636	36" x 36" x 74"	82	AD74-3636
36" x 48" x 74"	108	WR74-3648	36" x 48" x 74"	102	AD74-3648
36" x 60" x 74"	132	WR74-3660	36" x 60" x 74"	126	AD74-3660
36" x 72" x 74"	140	WR74-3672	36" x 72" x 74"	134	AD74-3672

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Submittal Sheet

10/03/2025

ITEM# 3 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 4 - WALK IN COOLER, MODULAR, REMOTE (1 EA REQ'D)

Kolpak CUSTOM

Walk-In Cooler, Modular Approx. Size OD 8'-2" X 16'-4" , Cooler Size Approx. Size
ID 11'-2-1/2" X 7'-6"

Submittal Sheet

10/03/2025

ITEM# 5 - SHELVING UNIT, WIRE (2 KT REQ'D)

Quantum WR74-2136GY-5

Wire Shelving Starter Kit, 36"W x 21"D x 74"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD

ACCESSORIES

Mfr	Qty	Model	Spec
Quantum	2	WR74-2142GY-5	Wire Shelving Starter Kit, 42"W x 21"D x 74"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
Quantum	2	WR74-2148GY-5	Wire Shelving Starter Kit, 48"W x 21"D x 74"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD
Quantum	2		15 year limited warranty (limited against rust and corrosion)

WIRE SHELVING

DESIGN: The open wire design of these shelves minimizes dust accumulation and allows free circulation of air, greater visibility of stored items and greater light penetration.

CONSTRUCTION: All welded wire shelves and posts are constructed of heavy-gauge carbon steel or Type 304 stainless steel.

CHOICE OF FINISHES:

- **Chrome** - is a plating process which deposits hard chrome OVER a copper, nickel surface. This process is VERY durable and allows product to be used in any application in a dry storage ENVIRONMENT. 1 year limited warranty to not rust or corrode when used in dry and non-humid ENVIRONMENTS.
- **Stainless Steel** - 304 Stainless with an electro-polish finish represents the highest industry standard in the PREVENTION of corrosion. This finish is highly EFFECTIVE for CORROSIVE, high humidity or clean room ENVIRONMENTS. Lifetime warranty for 304 stainless steel electro-polish finish.
- **Proform Green, Gray and Black Epoxy** - are an ideal solution for high humidity, wet, or walk-in-cooler applications. The carbon steel is treated with an iron phosphate and the powder coated epoxy is electrostatically applied, baked and cured to a hard surface. All three colors are antimicrobial. 15 year limited warranty for antimicrobial finish to not rust or corrode.

ADAPTABLE: Wire shelving can adapt to your changing needs. By using various accessories, hundreds of shelving configurations become possible.

QUICK, EASY ASSEMBLY: Posts have a double groove visual guide feature every 8", circular grooves at 1" increments, and are numbered at 1" intervals. Tapered split sleeve snaps together around each post. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock. Shelf is assembled in minutes without the use of any special tools.

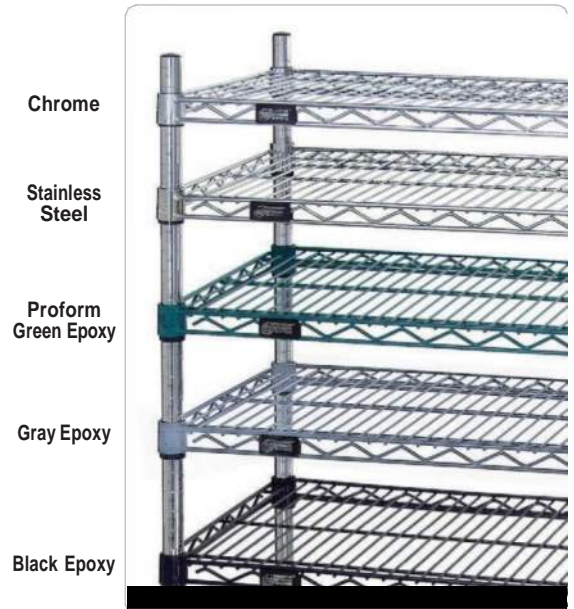
ADJUSTABLE: Shelves can be adjusted at 1" intervals along length of the post.

WIRE TRUSSES: Architectural wire trusses increase shelf capacity.

TOP MAT WIRES: Run front to back to slide items easily off and on the shelf.

SHELF ACCESSIBILITY: Shelves can be loaded/unloaded easily from all sides. This open construction allows maximum use of storage cube.

ADJUSTABLE FOOT: 3/8-16 leveling bolt compensate for irregular floor surfaces.



Note: Stainless stationary posts are equipped with stainless steel LEVELING feet.

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WIRE SHELVING

WIRE SHELVES

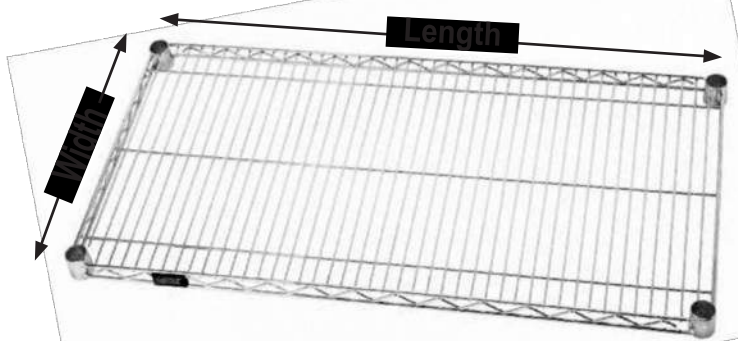
- **Plastic Split SLEEVES** - are included with each shelf
Replacements are available:
Model No: **WR-SS** (4 Pairs)
- **Plastic CONDUCTIVE Split SLEEVES** - are AVAILABLE for CONDUCTIVE applications
Model No: **WR-SSCO** (4 Pairs)
- **Aluminum Split SLEEVES** - are recommended for extreme mobile applications and CONDUCTIVE applications
Model No: **ESD-SS** (4 Pairs)
- **Load capacity (evenly distributed) per shelf**

Widths: 12" to 36"

Lengths: 800 lbs. for 18" to 48"

600 lbs. for 54" or longer except heavy-duty

1,000 lbs. for 60" or 72" on chrome heavy-duty



All welded construction with additional wire trussing for high-strength characteristics

Top mat wires run front to back (except on 12" x 36" size) for ease of loading and unloading

- Numbered GROOVED posts on 1" increments for quick assembly
- Wire allows air to circulate and light to penetrate for increased product VISIBILITY
- Minimal dirt accumulation
- Adjustable foot LEVELERS
- No tools required for assembly
- Durable finishes
- Aesthetically pleasing
- National Sanitation Foundation (NSF) APPROVED
- Shipped KD Class 70



Split Sleeve



Aluminum Split Sleeve

		CHROME	STAINLESS STEEL	EPOXY		
				PROFORM GREEN	GRAY	BLACK
SHELF W" x L"	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.
12" Deep - Wire Shelves						
12" x 24"	6 lbs	1224C	-	1224P	1224GY	1224BK
12" x 30"	6 lbs	1230C	-	1230P	1230GY	1230BK
12" x 36"	7 lbs	1236C	1236S	1236P	1236GY	1236BK
12" x 42"	8 lbs	1242C	-	1242P	1242GY	1242BK
12" x 48"	9 lbs	1248C	1248S	1248P	1248GY	1248BK
12" x 60"	14 lbs	1260C	1260S	1260P	1260GY	1260BK
12" x 72"	17 lbs	1272C	1272S	1272P	1272GY	1272BK
14" Deep - Wire Shelves						
14" x 24"	6 lbs	1424C	-	1424P	1424GY	1424BK
14" x 30"	7 lbs	1430C	1430S	1430P	1430GY	1430BK
14" x 36"	8 lbs	1436C	1436S	1436P	1436GY	1436BK
14" x 42"	10 lbs	1442C	1442S	1442P	1442GY	1442BK
14" x 48"	11 lbs	1448C	1448S	1448P	1448GY	1448BK
14" x 54"	12 lbs	1454C	1454S	1454P	1454GY	1454BK
14" x 60"	14 lbs	1460C	1460S	1460P	1460GY	1460BK
14" x 72"	17 lbs	1472C	1472S	1472P	1472GY	1472BK
18" Deep - Wire Shelves						
18" x 24"	7 lbs	1824C	1824S	1824P	1824GY	1824BK
18" x 30"	8 lbs	1830C	1830S	1830P	1830GY	1830BK
18" x 36"	10 lbs	1836C	1836S	1836P	1836GY	1836BK
18" x 42"	11 lbs	1842C	1842S	1842P	1842GY	1842BK
18" x 48"	14 lbs	1848C	1848S	1848P	1848GY	1848BK
18" x 54"	15 lbs	1854C	1854S	1854P	1854GY	1854BK
18" x 60"	17 lbs	1860C	1860S	1860P	1860GY	1860BK
18" x 72"	20 lbs	1872C	1872S	1872P	1872GY	1872BK
21" Deep - Wire Shelves						
21" x 24"	8 lbs	2124C	2124S	2124P	2124GY	2124BK
21" x 30"	9 lbs	2130C	2130S	2130P	2130GY	2130BK
21" x 36"	11 lbs	2136C	2136S	2136P	2136GY	2136BK
21" x 42"	12 lbs	2142C	2142S	2142P	2142GY	2142BK
21" x 48"	14 lbs	2148C	2148S	2148P	2148GY	2148BK
21" x 54"	16 lbs	2154C	2154S	2154P	2154GY	2154BK
21" x 60"	18 lbs	2160C	2160S	2160P	2160GY	2160BK
21" x 72"	24 lbs	2172C	2172S	2172P	2172GY	2172BK
24" Deep - Wire Shelves						
24" x 24"	9 lbs	2424C	2424S	2424P	2424GY	2424BK
24" x 30"	11 lbs	2430C	2430S	2430P	2430GY	2430BK
24" x 36"	13 lbs	2436C	2436S	2436P	2436GY	2436BK
24" x 42"	15 lbs	2442C	2442S	2442P	2442GY	2442BK
24" x 48"	16 lbs	2448C	2448S	2448P	2448GY	2448BK
24" x 54"	18 lbs	2454C	2454S	2454P	2454GY	2454BK
24" x 60"	21 lbs	2460C	2460S	2460P	2460GY	2460BK
24" x 66"	23 lbs	2466C	-	2466P	2466GY	-
24" x 72"	26 lbs	2472C	2472S	2472P	2472GY	2472BK
24" Deep Heavy-Duty - Wire Shelves (1,000 lb. capacity)						
24" x 60"	25 lbs	2460CHD	-	-	-	-
24" x 72"	30 lbs	2472CHD	-	-	-	-
30" Deep - Wire Shelves						
30" x 36"	15 lbs	3036C	3036S	3036P	3036GY	3036BK
30" x 42"	18 lbs	3042C	3042S	3042P	3042GY	3042BK
30" x 48"	21 lbs	3048C	3048S	3048P	3048GY	3048BK
30" x 60"	27 lbs	3060C	3060S	3060P	3060GY	3060BK
30" x 72"	31 lbs	3072C	3072S	3072P	3072GY	3072BK
36" Deep - Wire Shelves						
36" x 36"	18 lbs	3636C	3636S	3636P	3636GY	3636BK
36" x 48"	23 lbs	3648C	3648S	3648P	3648GY	3648BK
36" x 60"	29 lbs	3660C	3660S	3660P	3660GY	3660BK
36" x 72"	35 lbs	3672C	3672S	3672P	3672GY	3672BK

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WIRE SHELVING

POSTS

All posts are fabricated from 16 gauge carbon steel with locating grooves on 1" increments and printed numbers between the grooves. Post also have doubled grooves every 8" for fast identification. Leveling legs are enclosed with all posts. Leveling legs cannot be used in conjunction with stem casters. Custom post heights are available.

STATIONARY POSTS ARE EQUIPPED WITH:

- **Post LEVELER Insert & LEVELING Bolt** - use to account for *UNEVEN* floors, it adjusts up or down allowing height flexibility
Replacements are available:
Insert
Model No: **W-PLI**
Leveling Bolt
Model No: **W-PLB**
- **Foot Plates** - triangular plate allows additional surface to disperse weight. It may be ordered separately and installed in place of LEVELING foot
Model No: **FP**
- **Floor Guides** - Serves as protection to PREVENT marring of floors
Model No: **FG** (Pack of 4)
- **Fully Threaded Stud Connector** - can be utilized to connect two posts enabling any post height to be ACHIEVED
Model No: **W-PC-STUD**
- **Post Cap** - Plastic caps are included with each post
Replacements are available:
Model No: **W-PC** (Pack of 4)
- **Shelf Collar Plug** - Shelf Collar Plug COVERS shelf collar when post is not being used
Model No: **WR-SP** (Pack of 4)
- **S-Hook** - For continuous runs of SHELVING. Two hooks should be placed per shelf where two posts are not utilized.
Model No: **S-HOOK** (Pack of 8)



Post Insert

Post Leveling Bolt



Fully Threaded Stud Connector



Post Cap



S-Hook



FINISHES:

Chrome, Stainless Steel, Proform and Epoxy Green, Gray, Black

		Foot Plate		Floor Glides		Shelf Collar Plug	
		CHROME	STAINLESS STEEL	EPOXY			
				PROFORM GREEN	GRAY	BLACK	
DESCRIPTION	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	
6"H Post	1 lb	P6C	P6S	P6P	P6GY	P6BK	
14"H Post	1 lb	P14C	P14S	P14P	P14GY	P14BK	
34"H Post	2 lbs	P34C	P34S	P34P	P34GY	P34BK	
36"H Post	2 lbs	P36C	-	-	-	-	
39"H Post	2 lbs	P39C	-	-	-	P39BK	
42"H Post	2 lbs	-	P42S	-	-	-	
54"H Post	3 lbs	P54C	P54S	P54P	P54GY	P54BK	
63"H Post	4 lbs	P63C*	P63S	P63P*	P63GY*	P63BK*	
74"H Post	4 lbs	P74C*	P74S	P74P*	P74GY*	P74BK*	
86"H Post	5 lbs	P86C*	P86S	P86P*	P86GY*	P86BK*	
96"H Post	6 lbs	P96C	P96S	P96P	P96GY	P96BK	

*For easy installation, 63", 74" and 86" posts are available with pre-inserted leveler and bolt by adding an X to the Model No. P74CX

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WIRE SHELVING

SHELVING UNITS

Heavy-duty shelving units allows up to 800 lb. shelf capacity. Starter kits come complete with 4 posts and 4 shelves. Additional shelves may be purchased separately.

Additional Add-On kits allows you to expand your starter kit by sharing a set of posts. Configuration options include side to side, back to back and right angles (L-Shape). Add-On kits come complete with 2 posts, 4 shelves and 8 S-Hooks. Additional shelves and posts may be purchased separately. Units with Add-on kits cannot be made mobile.

ADD SUFFIX TO THE END OF EACH MODEL NO. WHEN REFERENCING TO PART FINISHES

• CHROME C
• STAINLESS S
• ENAMEL E
• GREEN G
• GRAY Y
• BLACK B



DB

Donut Bumper

Non-marking donut bumper used to protect walls and help cushion impact. Sold individually. Measures 3" diameter



WR-00HS

Polyurethane Stainless Steel Casters w/ Zerk Grease Fittings

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"



WR-00H

Polyurethane Casters

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"

63"H STARTER KIT UNITS			63"H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 63"	44	WR63-1236	12" x 36" x 63"	37	AD63-1236C
12" x 42" x 63"	48	WR63-1242	12" x 42" x 63"	41	AD63-1242C
12" x 48" x 63"	52	WR63-1248	12" x 48" x 63"	45	AD63-1248C
12" x 60" x 63"	60	WR63-1260	12" x 60" x 63"	53	AD63-1260C
12" x 72" x 63"	68	WR63-1272	12" x 72" x 63"	61	AD63-1272C
14" x 24" x 63"	40	WR63-1424	14" x 24" x 63"	33	AD63-1424C
14" x 30" x 63"	44	WR63-1430	14" x 30" x 63"	37	AD63-1430C
14" x 36" x 63"	48	WR63-1436	14" x 36" x 63"	41	AD63-1436C
14" x 42" x 63"	56	WR63-1442	14" x 42" x 63"	49	AD63-1442C
14" x 48" x 63"	60	WR63-1448	14" x 48" x 63"	53	AD63-1448C
14" x 54" x 63"	64	WR63-1454	14" x 54" x 63"	57	AD63-1454C
14" x 60" x 63"	72	WR63-1460	14" x 60" x 63"	65	AD63-1460C
14" x 72" x 63"	84	WR63-1472	14" x 72" x 63"	77	AD63-1472C
18" x 24" x 63"	44	WR63-1824	18" x 24" x 63"	37	AD63-1824C
18" x 30" x 63"	48	WR63-1830	18" x 30" x 63"	41	AD63-1830C
18" x 36" x 63"	54	WR63-1836	18" x 36" x 63"	49	AD63-1836C
18" x 42" x 63"	58	WR63-1842	18" x 42" x 63"	53	AD63-1842C
18" x 48" x 63"	62	WR63-1848	18" x 48" x 63"	57	AD63-1848C
18" x 54" x 63"	74	WR63-1854	18" x 54" x 63"	69	AD63-1854C
18" x 60" x 63"	82	WR63-1860	18" x 60" x 63"	77	AD63-1860C
18" x 72" x 63"	94	WR63-1872	18" x 72" x 63"	89	AD63-1872C
21" x 24" x 63"	46	WR63-2124	21" x 24" x 63"	41	AD63-2124C
21" x 30" x 63"	50	WR63-2130	21" x 30" x 63"	45	AD63-2130C
21" x 36" x 63"	58	WR63-2136	21" x 36" x 63"	53	AD63-2136C
21" x 42" x 63"	62	WR63-2142	21" x 42" x 63"	57	AD63-2142C
21" x 48" x 63"	70	WR63-2148	21" x 48" x 63"	65	AD63-2148C
21" x 54" x 63"	78	WR63-2154	21" x 54" x 63"	73	AD63-2154C
21" x 60" x 63"	86	WR63-2160	21" x 60" x 63"	81	AD63-2160C
21" x 72" x 63"	110	WR63-2172	21" x 72" x 63"	105	AD63-2172C
24" x 24" x 63"	50	WR63-2424	24" x 24" x 63"	45	AD63-2424C
24" x 30" x 63"	58	WR63-2430	24" x 30" x 63"	53	AD63-2430C
24" x 36" x 63"	66	WR63-2436	24" x 36" x 63"	61	AD63-2436C
24" x 42" x 63"	74	WR63-2442	24" x 42" x 63"	69	AD63-2442C
24" x 48" x 63"	78	WR63-2448	24" x 48" x 63"	73	AD63-2448C
24" x 54" x 63"	86	WR63-2454	24" x 54" x 63"	81	AD63-2454C
24" x 60" x 63"	98	WR63-2460	24" x 60" x 63"	93	AD63-2460C
24" x 72" x 63"	118	WR63-2472	24" x 72" x 63"	113	AD63-2472C
30" x 36" x 63"	74	WR63-3036	30" x 36" x 63"	69	AD63-3036C
30" x 42" x 63"	86	WR63-3042	30" x 42" x 63"	81	AD63-3042C
30" x 48" x 63"	98	WR63-3048	30" x 48" x 63"	93	AD63-3048C
30" x 60" x 63"	122	WR63-3060	30" x 60" x 63"	117	AD63-3060C
30" x 72" x 63"	138	WR63-3072	30" x 72" x 63"	133	AD63-3072C
36" x 36" x 63"	86	WR63-3636	36" x 36" x 63"	81	AD63-3636C
36" x 48" x 63"	106	WR63-3648	36" x 48" x 63"	101	AD63-3648C
36" x 60" x 63"	130	WR63-3660	36" x 60" x 63"	125	AD63-3660C
36" x 72" x 63"	138	WR63-3672	36" x 72" x 63"	133	AD63-3672C

74" H STARTER KIT UNITS			74" H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 74"	44	WR74-1236	12" x 36" x 74"	38	AD74-1236
12" x 42" x 74"	48	WR74-1242	12" x 42" x 74"	42	AD74-1242
12" x 48" x 74"	52	WR74-1248	12" x 48" x 74"	46	AD74-1248
12" x 60" x 74"	60	WR74-1260	12" x 60" x 74"	54	AD74-1260
12" x 72" x 74"	68	WR74-1272	12" x 72" x 74"	62	AD74-1272
14" x 24" x 74"	40	WR74-1424	14" x 24" x 74"	34	AD74-1424
14" x 30" x 74"	44	WR74-1430	14" x 30" x 74"	38	AD74-1430
14" x 36" x 74"	48	WR74-1436	14" x 36" x 74"	42	AD74-1436
14" x 42" x 74"	56	WR74-1442	14" x 42" x 74"	50	AD74-1442
14" x 48" x 74"	60	WR74-1448	14" x 48" x 74"	54	AD74-1448
14" x 54" x 74"	64	WR74-1454	14" x 54" x 74"	58	AD74-1454
14" x 60" x 74"	72	WR74-1460	14" x 60" x 74"	66	AD74-1460
14" x 72" x 74"	84	WR74-1472	14" x 72" x 74"	78	AD74-1472
18" x 24" x 74"	44	WR74-1824	18" x 24" x 74"	38	AD74-1824
18" x 30" x 74"	48	WR74-1830	18" x 30" x 74"	42	AD74-1830
18" x 36" x 74"	56	WR74-1836	18" x 36" x 74"	50	AD74-1836
18" x 42" x 74"	60	WR74-1842	18" x 42" x 74"	54	AD74-1842
18" x 48" x 74"	64	WR74-1848	18" x 48" x 74"	58	AD74-1848
18" x 54" x 74"	76	WR74-1854	18" x 54" x 74"	70	AD74-1854
18" x 60" x 74"	84	WR74-1860	18" x 60" x 74"	78	AD74-1860
18" x 72" x 74"	96	WR74-1872	18" x 72" x 74"	90	AD74-1872
21" x 24" x 74"	48	WR74-2124	21" x 24" x 74"	42	AD74-2124
21" x 30" x 74"	52	WR74-2130	21" x 30" x 74"	46	AD74-2130
21" x 36" x 74"	60	WR74-2136	21" x 36" x 74"	54	AD74-2136
21" x 42" x 74"	64	WR74-2142	21" x 42" x 74"	58	AD74-2142
21" x 48" x 74"	72	WR74-2148	21" x 48" x 74"	66	AD74-2148
21" x 54" x 74"	80	WR74-2154	21" x 54" x 74"	74	AD74-2154
21" x 60" x 74"	88	WR74-2160	21" x 60" x 74"	82	AD74-2160
21" x 72" x 74"	112	WR74-2172	21" x 72" x 74"	106	AD74-2172
24" x 24" x 74"	52	WR74-2424	24" x 24" x 74"	46	AD74-2424
24" x 30" x 74"	60	WR74-2430	24" x 30" x 74"	54	AD74-2430
24" x 36" x 74"	68	WR74-2436	24" x 36" x 74"	62	AD74-2436
24" x 42" x 74"	76	WR74-2442	24" x 42" x 74"	70	AD74-2442
24" x 48" x 74"	80	WR74-2448	24" x 48" x 74"	74	AD74-2448
24" x 54" x 74"	88	WR74-2454	24" x 54" x 74"	82	AD74-2454
24" x 60" x 74"	100	WR74-2460	24" x 60" x 74"	94	AD74-2460
24" x 72" x 74"	120	WR74-2472	24" x 72" x 74"	114	AD74-2472
30" x 36" x 74"	76	WR74-3036	30" x 36" x 74"	70	AD74-3036
30" x 42" x 74"	88	WR74-3042	30" x 42" x 74"	82	AD74-3042
30" x 48" x 74"	100	WR74-3048	30" x 48" x 74"	94	AD74-3048
30" x 60" x 74"	124	WR74-3060	30" x 60" x 74"	118	AD74-3060
30" x 72" x 74"	140	WR74-3072	30" x 72" x 74"	134	AD74-3072
36" x 36" x 74"	88	WR74-3636	36" x 36" x 74"	82	AD74-3636
36" x 48" x 74"	108	WR74-3648	36" x 48" x 74"	102	AD74-3648
36" x 60" x 74"	132	WR74-3660	36" x 60" x 74"	126	AD74-3660
36" x 72" x 74"	140	WR74-3672	36" x 72" x 74"	134	AD74-3672

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WIRE SHELVING

DESIGN: The open wire design of these shelves minimizes dust accumulation and allows free circulation of air, greater visibility of stored items and greater light penetration.

CONSTRUCTION: All welded wire shelves and posts are constructed of heavy-gauge carbon steel or Type 304 stainless steel.

CHOICE OF FINISHES:

- **Chrome** - is a plating process which deposits hard chrome OVER a copper, nickel surface. This process is VERY durable and allows product to be used in any application in a dry storage ENVIRONMENT. 1 year limited warranty to not rust or corrode when used in dry and non-humid ENVIRONMENTS.
- **Stainless Steel** - 304 Stainless with an electro-polish finish represents the highest industry standard in the PREVENTION of corrosion. This finish is highly EFFECTIVE for CORROSIVE, high humidity or clean room ENVIRONMENTS. Lifetime warranty for 304 stainless steel electro-polish finish.
- **Proform Green, Gray and Black Epoxy** - are an ideal solution for high humidity, wet, or walk-in-cooler applications. The carbon steel is treated with an iron phosphate and the powder coated epoxy is electrostatically applied, baked and cured to a hard surface. All three colors are antimicrobial. 15 year limited warranty for antimicrobial finish to not rust or corrode.

ADAPTABLE: Wire shelving can adapt to your changing needs. By using various accessories, hundreds of shelving configurations become possible.

QUICK, EASY ASSEMBLY: Posts have a double groove visual guide feature every 8", circular grooves at 1" increments, and are numbered at 1" intervals. Tapered split sleeve snaps together around each post. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock. Shelf is assembled in minutes without the use of any special tools.

ADJUSTABLE: Shelves can be adjusted at 1" intervals along length of the post.

WIRE TRUSSES: Architectural wire trusses increase shelf capacity.

TOP MAT WIRES: Run front to back to slide items easily off and on the shelf.

SHELF ACCESSIBILITY: Shelves can be loaded/unloaded easily from all sides. This open construction allows maximum use of storage cube.

ADJUSTABLE FOOT: 3/8-16 leveling bolt compensate for irregular floor surfaces.

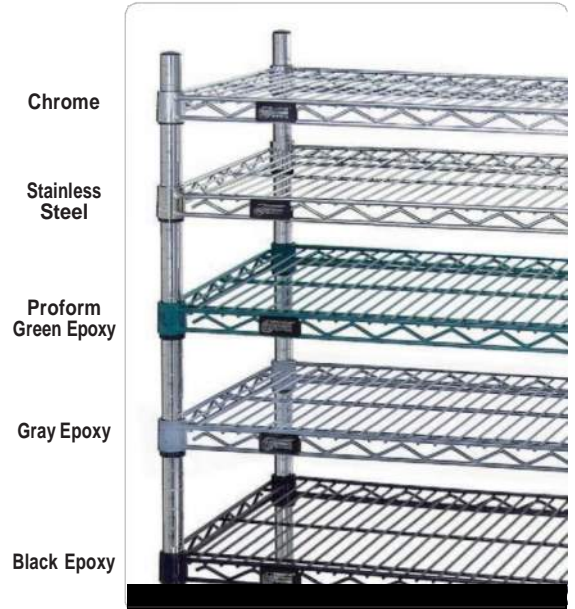
Note: Stainless stationary posts are equipped with stainless steel LEVELING feet.

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WIRE SHELVING

WIRE SHELVES

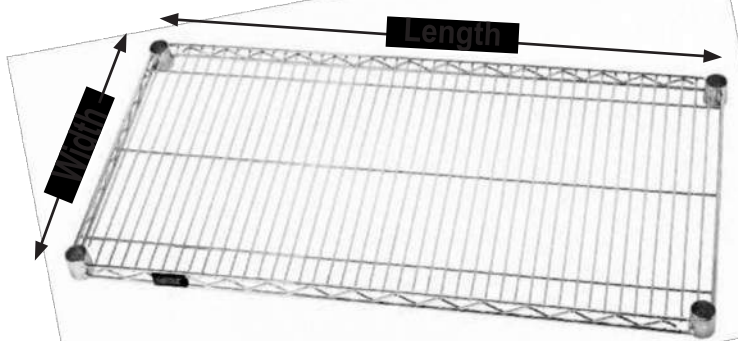
- **Plastic Split SLEEVES** - are included with each shelf
Replacements are available:
Model No: **WR-SS** (4 Pairs)
- **Plastic CONDUCTIVE Split SLEEVES** - are AVAILABLE for CONDUCTIVE applications
Model No: **WR-SSCO** (4 Pairs)
- **Aluminum Split SLEEVES** - are recommended for extreme mobile applications and CONDUCTIVE applications
Model No: **ESD-SS** (4 Pairs)
- **Load capacity (evenly distributed) per shelf**

Widths: 12" to 36"

Lengths: 800 lbs. for 18" to 48"

600 lbs. for 54" or longer except heavy-duty

1,000 lbs. for 60" or 72" on chrome heavy-duty



All welded construction with additional wire trussing for high-strength characteristics

Top mat wires run front to back (except on 12" x 36" size) for ease of loading and unloading

- Numbered GROOVED posts on 1" increments for quick assembly
- Wire allows air to circulate and light to penetrate for increased product VISIBILITY
- Minimal dirt accumulation
- Adjustable foot LEVELERS
- No tools required for assembly
- Durable finishes
- Aesthetically pleasing
- National Sanitation Foundation (NSF) APPROVED
- Shipped KD Class 70



Split Sleeve



Aluminum Split Sleeve

		CHROME	STAINLESS STEEL	EPOXY		
				PROFORM GREEN	GRAY	BLACK
SHELF W" x L"	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.
12" Deep - Wire Shelves						
12" x 24"	6 lbs	1224C	-	1224P	1224GY	1224BK
12" x 30"	6 lbs	1230C	-	1230P	1230GY	1230BK
12" x 36"	7 lbs	1236C	1236S	1236P	1236GY	1236BK
12" x 42"	8 lbs	1242C	-	1242P	1242GY	1242BK
12" x 48"	9 lbs	1248C	1248S	1248P	1248GY	1248BK
12" x 60"	14 lbs	1260C	1260S	1260P	1260GY	1260BK
12" x 72"	17 lbs	1272C	1272S	1272P	1272GY	1272BK
14" Deep - Wire Shelves						
14" x 24"	6 lbs	1424C	-	1424P	1424GY	1424BK
14" x 30"	7 lbs	1430C	1430S	1430P	1430GY	1430BK
14" x 36"	8 lbs	1436C	1436S	1436P	1436GY	1436BK
14" x 42"	10 lbs	1442C	1442S	1442P	1442GY	1442BK
14" x 48"	11 lbs	1448C	1448S	1448P	1448GY	1448BK
14" x 54"	12 lbs	1454C	1454S	1454P	1454GY	1454BK
14" x 60"	14 lbs	1460C	1460S	1460P	1460GY	1460BK
14" x 72"	17 lbs	1472C	1472S	1472P	1472GY	1472BK
18" Deep - Wire Shelves						
18" x 24"	7 lbs	1824C	1824S	1824P	1824GY	1824BK
18" x 30"	8 lbs	1830C	1830S	1830P	1830GY	1830BK
18" x 36"	10 lbs	1836C	1836S	1836P	1836GY	1836BK
18" x 42"	11 lbs	1842C	1842S	1842P	1842GY	1842BK
18" x 48"	14 lbs	1848C	1848S	1848P	1848GY	1848BK
18" x 54"	15 lbs	1854C	1854S	1854P	1854GY	1854BK
18" x 60"	17 lbs	1860C	1860S	1860P	1860GY	1860BK
18" x 72"	20 lbs	1872C	1872S	1872P	1872GY	1872BK
21" Deep - Wire Shelves						
21" x 24"	8 lbs	2124C	2124S	2124P	2124GY	2124BK
21" x 30"	9 lbs	2130C	2130S	2130P	2130GY	2130BK
21" x 36"	11 lbs	2136C	2136S	2136P	2136GY	2136BK
21" x 42"	12 lbs	2142C	2142S	2142P	2142GY	2142BK
21" x 48"	14 lbs	2148C	2148S	2148P	2148GY	2148BK
21" x 54"	16 lbs	2154C	2154S	2154P	2154GY	2154BK
21" x 60"	18 lbs	2160C	2160S	2160P	2160GY	2160BK
21" x 72"	24 lbs	2172C	2172S	2172P	2172GY	2172BK
24" Deep - Wire Shelves						
24" x 24"	9 lbs	2424C	2424S	2424P	2424GY	2424BK
24" x 30"	11 lbs	2430C	2430S	2430P	2430GY	2430BK
24" x 36"	13 lbs	2436C	2436S	2436P	2436GY	2436BK
24" x 42"	15 lbs	2442C	2442S	2442P	2442GY	2442BK
24" x 48"	16 lbs	2448C	2448S	2448P	2448GY	2448BK
24" x 54"	18 lbs	2454C	2454S	2454P	2454GY	2454BK
24" x 60"	21 lbs	2460C	2460S	2460P	2460GY	2460BK
24" x 66"	23 lbs	2466C	-	2466P	2466GY	-
24" x 72"	26 lbs	2472C	2472S	2472P	2472GY	2472BK
24" Deep Heavy-Duty - Wire Shelves (1,000 lb. capacity)						
24" x 60"	25 lbs	2460CHD	-	-	-	-
24" x 72"	30 lbs	2472CHD	-	-	-	-
30" Deep - Wire Shelves						
30" x 36"	15 lbs	3036C	3036S	3036P	3036GY	3036BK
30" x 42"	18 lbs	3042C	3042S	3042P	3042GY	3042BK
30" x 48"	21 lbs	3048C	3048S	3048P	3048GY	3048BK
30" x 60"	27 lbs	3060C	3060S	3060P	3060GY	3060BK
30" x 72"	31 lbs	3072C	3072S	3072P	3072GY	3072BK
36" Deep - Wire Shelves						
36" x 36"	18 lbs	3636C	3636S	3636P	3636GY	3636BK
36" x 48"	23 lbs	3648C	3648S	3648P	3648GY	3648BK
36" x 60"	29 lbs	3660C	3660S	3660P	3660GY	3660BK
36" x 72"	35 lbs	3672C	3672S	3672P	3672GY	3672BK

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WIRE SHELVING

POSTS

All posts are fabricated from 16 gauge carbon steel with locating grooves on 1" increments and printed numbers between the grooves. Post also have doubled grooves every 8" for fast identification. Leveling legs are enclosed with all posts. Leveling legs cannot be used in conjunction with stem casters. Custom post heights are available.

STATIONARY POSTS ARE EQUIPPED WITH:

- **Post LEVELER Insert & LEVELING Bolt** - use to account for *UNEVEN* floors, it adjusts up or down allowing height flexibility
Replacements are available:
Insert
Model No: **W-PLI**
Leveling Bolt
Model No: **W-PLB**
- **Foot Plates** - triangular plate allows additional surface to disperse weight. It may be ordered separately and installed in place of LEVELING foot
Model No: **FP**
- **Floor Guides** - Serves as protection to PREVENT marring of floors
Model No: **FG** (Pack of 4)
- **Fully Threaded Stud Connector** - can be utilized to connect two posts enabling any post height to be ACHIEVED
Model No: **W-PC-STUD**
- **Post Cap** - Plastic caps are included with each post
Replacements are available:
Model No: **W-PC** (Pack of 4)
- **Shelf Collar Plug** - Shelf Collar Plug COVERS shelf collar when post is not being used
Model No: **WR-SP** (Pack of 4)
- **S-Hook** - For continuous runs of SHELVING. Two hooks should be placed per shelf where two posts are not utilized.
Model No: **S-HOOK** (Pack of 8)



Post Insert

Post Leveling Bolt



Fully Threaded Stud Connector



Post Cap



S-Hook



Foot Plate

Floor Glides

Shelf Collar Plug

FINISHES:

Chrome, Stainless Steel, Proform and Epoxy Green, Gray, Black

DESCRIPTION	SHIP WGT	Foot Plate		Floor Glides		Shelf Collar Plug	
		CHROME	STAINLESS STEEL	EPOXY			
		MODEL NO.	MODEL NO.	PROFORM GREEN	GRAY	BLACK	
DESCRIPTION	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	
6"H Post	1 lb	P6C	P6S	P6P	P6GY	P6BK	
14"H Post	1 lb	P14C	P14S	P14P	P14GY	P14BK	
34"H Post	2 lbs	P34C	P34S	P34P	P34GY	P34BK	
36"H Post	2 lbs	P36C	-	-	-	-	
39"H Post	2 lbs	P39C	-	-	-	P39BK	
42"H Post	2 lbs	-	P42S	-	-	-	
54"H Post	3 lbs	P54C	P54S	P54P	P54GY	P54BK	
63"H Post	4 lbs	P63C*	P63S	P63P*	P63GY*	P63BK*	
74"H Post	4 lbs	P74C*	P74S	P74P*	P74GY*	P74BK*	
86"H Post	5 lbs	P86C*	P86S	P86P*	P86GY*	P86BK*	
96"H Post	6 lbs	P96C	P96S	P96P	P96GY	P96BK	

*For easy installation, 63", 74" and 86" posts are available with pre-inserted leveler and bolt by adding an X to the Model No. P74CX

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SHELVING UNITS

Heavy-duty shelving units allows up to 800 lb. shelf capacity. Starter kits come complete with 4 posts and 4 shelves. Additional shelves may be purchased separately.

Additional Add-On kits allows you to expand your starter kit by sharing a set of posts. Configuration options include side to side, back to back and right angles (L-Shape). Add-On kits come complete with 2 posts, 4 shelves and 8 S-Hooks. Additional shelves and posts may be purchased separately. Units with Add-on kits cannot be made mobile.

ADD SUFFIX TO THE END OF EACH MODEL NO. WHEN REFERENCING TO PART FINISHES

• CHROME C
• STAINLESS S
• ENAMEL E
• GREEN G
• GRAY Y
• BLACK B



DB

Donut Bumper

Non-marking donut bumper used to protect walls and help cushion impact. Sold individually. Measures 3" diameter



WR-00HS

Polyurethane Stainless Steel Casters w/ Zerk Grease Fittings

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"



WR-00H

Polyurethane Casters

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"

63"H STARTER KIT UNITS			63"H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 63"	44	WR63-1236	12" x 36" x 63"	37	AD63-1236C
12" x 42" x 63"	48	WR63-1242	12" x 42" x 63"	41	AD63-1242C
12" x 48" x 63"	52	WR63-1248	12" x 48" x 63"	45	AD63-1248C
12" x 60" x 63"	60	WR63-1260	12" x 60" x 63"	53	AD63-1260C
12" x 72" x 63"	68	WR63-1272	12" x 72" x 63"	61	AD63-1272C
14" x 24" x 63"	40	WR63-1424	14" x 24" x 63"	33	AD63-1424C
14" x 30" x 63"	44	WR63-1430	14" x 30" x 63"	37	AD63-1430C
14" x 36" x 63"	48	WR63-1436	14" x 36" x 63"	41	AD63-1436C
14" x 42" x 63"	56	WR63-1442	14" x 42" x 63"	49	AD63-1442C
14" x 48" x 63"	60	WR63-1448	14" x 48" x 63"	53	AD63-1448C
14" x 54" x 63"	64	WR63-1454	14" x 54" x 63"	57	AD63-1454C
14" x 60" x 63"	72	WR63-1460	14" x 60" x 63"	65	AD63-1460C
14" x 72" x 63"	84	WR63-1472	14" x 72" x 63"	77	AD63-1472C
18" x 24" x 63"	44	WR63-1824	18" x 24" x 63"	37	AD63-1824C
18" x 30" x 63"	48	WR63-1830	18" x 30" x 63"	41	AD63-1830C
18" x 36" x 63"	54	WR63-1836	18" x 36" x 63"	49	AD63-1836C
18" x 42" x 63"	58	WR63-1842	18" x 42" x 63"	53	AD63-1842C
18" x 48" x 63"	62	WR63-1848	18" x 48" x 63"	57	AD63-1848C
18" x 54" x 63"	74	WR63-1854	18" x 54" x 63"	69	AD63-1854C
18" x 60" x 63"	82	WR63-1860	18" x 60" x 63"	77	AD63-1860C
18" x 72" x 63"	94	WR63-1872	18" x 72" x 63"	89	AD63-1872C
21" x 24" x 63"	46	WR63-2124	21" x 24" x 63"	41	AD63-2124C
21" x 30" x 63"	50	WR63-2130	21" x 30" x 63"	45	AD63-2130C
21" x 36" x 63"	58	WR63-2136	21" x 36" x 63"	53	AD63-2136C
21" x 42" x 63"	62	WR63-2142	21" x 42" x 63"	57	AD63-2142C
21" x 48" x 63"	70	WR63-2148	21" x 48" x 63"	65	AD63-2148C
21" x 54" x 63"	78	WR63-2154	21" x 54" x 63"	73	AD63-2154C
21" x 60" x 63"	86	WR63-2160	21" x 60" x 63"	81	AD63-2160C
21" x 72" x 63"	110	WR63-2172	21" x 72" x 63"	105	AD63-2172C
24" x 24" x 63"	50	WR63-2424	24" x 24" x 63"	45	AD63-2424C
24" x 30" x 63"	58	WR63-2430	24" x 30" x 63"	53	AD63-2430C
24" x 36" x 63"	66	WR63-2436	24" x 36" x 63"	61	AD63-2436C
24" x 42" x 63"	74	WR63-2442	24" x 42" x 63"	69	AD63-2442C
24" x 48" x 63"	78	WR63-2448	24" x 48" x 63"	73	AD63-2448C
24" x 54" x 63"	86	WR63-2454	24" x 54" x 63"	81	AD63-2454C
24" x 60" x 63"	98	WR63-2460	24" x 60" x 63"	93	AD63-2460C
24" x 72" x 63"	118	WR63-2472	24" x 72" x 63"	113	AD63-2472C
30" x 36" x 63"	74	WR63-3036	30" x 36" x 63"	69	AD63-3036C
30" x 42" x 63"	86	WR63-3042	30" x 42" x 63"	81	AD63-3042C
30" x 48" x 63"	98	WR63-3048	30" x 48" x 63"	93	AD63-3048C
30" x 60" x 63"	122	WR63-3060	30" x 60" x 63"	117	AD63-3060C
30" x 72" x 63"	138	WR63-3072	30" x 72" x 63"	133	AD63-3072C
36" x 36" x 63"	86	WR63-3636	36" x 36" x 63"	81	AD63-3636C
36" x 48" x 63"	106	WR63-3648	36" x 48" x 63"	101	AD63-3648C
36" x 60" x 63"	130	WR63-3660	36" x 60" x 63"	125	AD63-3660C
36" x 72" x 63"	138	WR63-3672	36" x 72" x 63"	133	AD63-3672C

74" H STARTER KIT UNITS			74" H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 74"	44	WR74-1236	12" x 36" x 74"	38	AD74-1236
12" x 42" x 74"	48	WR74-1242	12" x 42" x 74"	42	AD74-1242
12" x 48" x 74"	52	WR74-1248	12" x 48" x 74"	46	AD74-1248
12" x 60" x 74"	60	WR74-1260	12" x 60" x 74"	54	AD74-1260
12" x 72" x 74"	68	WR74-1272	12" x 72" x 74"	62	AD74-1272
14" x 24" x 74"	40	WR74-1424	14" x 24" x 74"	34	AD74-1424
14" x 30" x 74"	44	WR74-1430	14" x 30" x 74"	38	AD74-1430
14" x 36" x 74"	48	WR74-1436	14" x 36" x 74"	42	AD74-1436
14" x 42" x 74"	56	WR74-1442	14" x 42" x 74"	50	AD74-1442
14" x 48" x 74"	60	WR74-1448	14" x 48" x 74"	54	AD74-1448
14" x 54" x 74"	64	WR74-1454	14" x 54" x 74"	58	AD74-1454
14" x 60" x 74"	72	WR74-1460	14" x 60" x 74"	66	AD74-1460
14" x 72" x 74"	84	WR74-1472	14" x 72" x 74"	78	AD74-1472
18" x 24" x 74"	44	WR74-1824	18" x 24" x 74"	38	AD74-1824
18" x 30" x 74"	48	WR74-1830	18" x 30" x 74"	42	AD74-1830
18" x 36" x 74"	56	WR74-1836	18" x 36" x 74"	50	AD74-1836
18" x 42" x 74"	60	WR74-1842	18" x 42" x 74"	54	AD74-1842
18" x 48" x 74"	64	WR74-1848	18" x 48" x 74"	58	AD74-1848
18" x 54" x 74"	76	WR74-1854	18" x 54" x 74"	70	AD74-1854
18" x 60" x 74"	84	WR74-1860	18" x 60" x 74"	78	AD74-1860
18" x 72" x 74"	96	WR74-1872	18" x 72" x 74"	90	AD74-1872
21" x 24" x 74"	48	WR74-2124	21" x 24" x 74"	42	AD74-2124
21" x 30" x 74"	52	WR74-2130	21" x 30" x 74"	46	AD74-2130
21" x 36" x 74"	60	WR74-2136	21" x 36" x 74"	54	AD74-2136
21" x 42" x 74"	64	WR74-2142	21" x 42" x 74"	58	AD74-2142
21" x 48" x 74"	72	WR74-2148	21" x 48" x 74"	66	AD74-2148
21" x 54" x 74"	80	WR74-2154	21" x 54" x 74"	74	AD74-2154
21" x 60" x 74"	88	WR74-2160	21" x 60" x 74"	82	AD74-2160
21" x 72" x 74"	112	WR74-2172	21" x 72" x 74"	106	AD74-2172
24" x 24" x 74"	52	WR74-2424	24" x 24" x 74"	46	AD74-2424
24" x 30" x 74"	60	WR74-2430	24" x 30" x 74"	54	AD74-2430
24" x 36" x 74"	68	WR74-2436	24" x 36" x 74"	62	AD74-2436
24" x 42" x 74"	76	WR74-2442	24" x 42" x 74"	70	AD74-2442
24" x 48" x 74"	80	WR74-2448	24" x 48" x 74"	74	AD74-2448
24" x 54" x 74"	88	WR74-2454	24" x 54" x 74"	82	AD74-2454
24" x 60" x 74"	100	WR74-2460	24" x 60" x 74"	94	AD74-2460
24" x 72" x 74"	120	WR74-2472	24" x 72" x 74"	114	AD74-2472
30" x 36" x 74"	76	WR74-3036	30" x 36" x 74"	70	AD74-3036
30" x 42" x 74"	88	WR74-3042	30" x 42" x 74"	82	AD74-3042
30" x 48" x 74"	100	WR74-3048	30" x 48" x 74"	94	AD74-3048
30" x 60" x 74"	124	WR74-3060	30" x 60" x 74"	118	AD74-3060
30" x 72" x 74"	140	WR74-3072	30" x 72" x 74"	134	AD74-3072
36" x 36" x 74"	88	WR74-3636	36" x 36" x 74"	82	AD74-3636
36" x 48" x 74"	108	WR74-3648	36" x 48" x 74"	102	AD74-3648
36" x 60" x 74"	132	WR74-3660	36" x 60" x 74"	126	AD74-3660
36" x 72" x 74"	140	WR74-3672	36" x 72" x 74"	134	AD74-3672

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WIRE SHELVING

DESIGN: The open wire design of these shelves minimizes dust accumulation and allows free circulation of air, greater visibility of stored items and greater light penetration.

CONSTRUCTION: All welded wire shelves and posts are constructed of heavy-gauge carbon steel or Type 304 stainless steel.

CHOICE OF FINISHES:

- **Chrome** - is a plating process which deposits hard chrome OVER a copper, nickel surface. This process is VERY durable and allows product to be used in any application in a dry storage ENVIRONMENT. 1 year limited warranty to not rust or corrode when used in dry and non-humid ENVIRONMENTS.
- **Stainless Steel** - 304 Stainless with an electro-polish finish represents the highest industry standard in the PREVENTION of corrosion. This finish is highly EFFECTIVE for CORROSIVE, high humidity or clean room ENVIRONMENTS. Lifetime warranty for 304 stainless steel electro-polish finish.
- **Proform Green, Gray and Black Epoxy** - are an ideal solution for high humidity, wet, or walk-in-cooler applications. The carbon steel is treated with an iron phosphate and the powder coated epoxy is electrostatically applied, baked and cured to a hard surface. All three colors are antimicrobial. 15 year limited warranty for antimicrobial finish to not rust or corrode.

ADAPTABLE: Wire shelving can adapt to your changing needs. By using various accessories, hundreds of shelving configurations become possible.

QUICK, EASY ASSEMBLY: Posts have a double groove visual guide feature every 8", circular grooves at 1" increments, and are numbered at 1" intervals. Tapered split sleeve snaps together around each post. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock. Shelf is assembled in minutes without the use of any special tools.

ADJUSTABLE: Shelves can be adjusted at 1" intervals along length of the post.

WIRE TRUSSES: Architectural wire trusses increase shelf capacity.

TOP MAT WIRES: Run front to back to slide items easily off and on the shelf.

SHELF ACCESSIBILITY: Shelves can be loaded/unloaded easily from all sides. This open construction allows maximum use of storage cube.

ADJUSTABLE FOOT: 3/8-16 leveling bolt compensate for irregular floor surfaces.

Note: Stainless stationary posts are equipped with stainless steel LEVELING feet.

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WIRE SHELVING

WIRE SHELVES

- **Plastic Split SLEEVES** - are included with each shelf
Replacements are available:

Model No: **WR-SS** (4 Pairs)

- **Plastic CONDUCTIVE Split SLEEVES** - are AVAILABLE for CONDUCTIVE applications

Model No: **WR-SSCO** (4 Pairs)

- **Aluminum Split SLEEVES** - are recommended for extreme mobile applications and CONDUCTIVE applications

Model No: **ESD-SS** (4 Pairs)

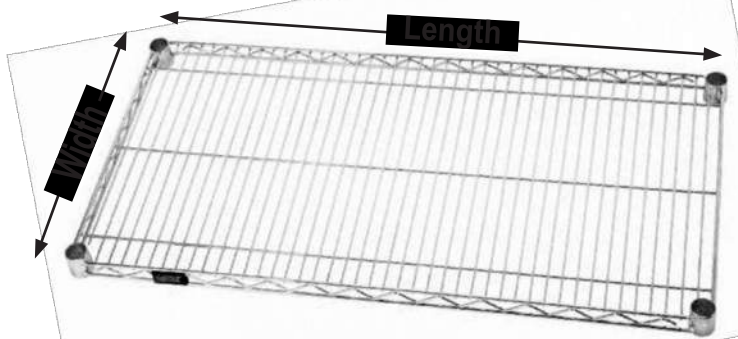
- **Load capacity (evenly distributed) per shelf**

Widths: 12" to 36"

Lengths: 800 lbs. for 18" to 48"

600 lbs. for 54" or longer except heavy-duty

1,000 lbs. for 60" or 72" on chrome heavy-duty



All welded construction with additional wire trussing for high-strength characteristics

Top mat wires run front to back (except on 12" x 36" size) for ease of loading and unloading

- Numbered GROOVED posts on 1" increments for quick assembly

- Wire allows air to circulate and light to penetrate for increased product VISIBILITY

- Minimal dirt accumulation

- Adjustable foot LEVELERS

- No tools required for assembly

- Durable finishes

- Aesthetically pleasing

- National Sanitation Foundation (NSF) APPROVED

- Shipped KD Class 70



Split Sleeve



Aluminum Split Sleeve

		CHROME	STAINLESS STEEL	EPOXY		
				PROFORM GREEN	GRAY	BLACK
SHELF W" x L"	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.
12" Deep - Wire Shelves						
12" x 24"	6 lbs	1224C	-	1224P	1224GY	1224BK
12" x 30"	6 lbs	1230C	-	1230P	1230GY	1230BK
12" x 36"	7 lbs	1236C	1236S	1236P	1236GY	1236BK
12" x 42"	8 lbs	1242C	-	1242P	1242GY	1242BK
12" x 48"	9 lbs	1248C	1248S	1248P	1248GY	1248BK
12" x 60"	14 lbs	1260C	1260S	1260P	1260GY	1260BK
12" x 72"	17 lbs	1272C	1272S	1272P	1272GY	1272BK
14" Deep - Wire Shelves						
14" x 24"	6 lbs	1424C	-	1424P	1424GY	1424BK
14" x 30"	7 lbs	1430C	1430S	1430P	1430GY	1430BK
14" x 36"	8 lbs	1436C	1436S	1436P	1436GY	1436BK
14" x 42"	10 lbs	1442C	1442S	1442P	1442GY	1442BK
14" x 48"	11 lbs	1448C	1448S	1448P	1448GY	1448BK
14" x 54"	12 lbs	1454C	1454S	1454P	1454GY	1454BK
14" x 60"	14 lbs	1460C	1460S	1460P	1460GY	1460BK
14" x 72"	17 lbs	1472C	1472S	1472P	1472GY	1472BK
18" Deep - Wire Shelves						
18" x 24"	7 lbs	1824C	1824S	1824P	1824GY	1824BK
18" x 30"	8 lbs	1830C	1830S	1830P	1830GY	1830BK
18" x 36"	10 lbs	1836C	1836S	1836P	1836GY	1836BK
18" x 42"	11 lbs	1842C	1842S	1842P	1842GY	1842BK
18" x 48"	14 lbs	1848C	1848S	1848P	1848GY	1848BK
18" x 54"	15 lbs	1854C	1854S	1854P	1854GY	1854BK
18" x 60"	17 lbs	1860C	1860S	1860P	1860GY	1860BK
18" x 72"	20 lbs	1872C	1872S	1872P	1872GY	1872BK
21" Deep - Wire Shelves						
21" x 24"	8 lbs	2124C	2124S	2124P	2124GY	2124BK
21" x 30"	9 lbs	2130C	2130S	2130P	2130GY	2130BK
21" x 36"	11 lbs	2136C	2136S	2136P	2136GY	2136BK
21" x 42"	12 lbs	2142C	2142S	2142P	2142GY	2142BK
21" x 48"	14 lbs	2148C	2148S	2148P	2148GY	2148BK
21" x 54"	16 lbs	2154C	2154S	2154P	2154GY	2154BK
21" x 60"	18 lbs	2160C	2160S	2160P	2160GY	2160BK
21" x 72"	24 lbs	2172C	2172S	2172P	2172GY	2172BK
24" Deep - Wire Shelves						
24" x 24"	9 lbs	2424C	2424S	2424P	2424GY	2424BK
24" x 30"	11 lbs	2430C	2430S	2430P	2430GY	2430BK
24" x 36"	13 lbs	2436C	2436S	2436P	2436GY	2436BK
24" x 42"	15 lbs	2442C	2442S	2442P	2442GY	2442BK
24" x 48"	16 lbs	2448C	2448S	2448P	2448GY	2448BK
24" x 54"	18 lbs	2454C	2454S	2454P	2454GY	2454BK
24" x 60"	21 lbs	2460C	2460S	2460P	2460GY	2460BK
24" x 66"	23 lbs	2466C	-	2466P	2466GY	-
24" x 72"	26 lbs	2472C	2472S	2472P	2472GY	2472BK
24" Deep Heavy-Duty - Wire Shelves (1,000 lb. capacity)						
24" x 60"	25 lbs	2460CHD	-	-	-	-
24" x 72"	30 lbs	2472CHD	-	-	-	-
30" Deep - Wire Shelves						
30" x 36"	15 lbs	3036C	3036S	3036P	3036GY	3036BK
30" x 42"	18 lbs	3042C	3042S	3042P	3042GY	3042BK
30" x 48"	21 lbs	3048C	3048S	3048P	3048GY	3048BK
30" x 60"	27 lbs	3060C	3060S	3060P	3060GY	3060BK
30" x 72"	31 lbs	3072C	3072S	3072P	3072GY	3072BK
36" Deep - Wire Shelves						
36" x 36"	18 lbs	3636C	3636S	3636P	3636GY	3636BK
36" x 48"	23 lbs	3648C	3648S	3648P	3648GY	3648BK
36" x 60"	29 lbs	3660C	3660S	3660P	3660GY	3660BK
36" x 72"	35 lbs	3672C	3672S	3672P	3672GY	3672BK

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WIRE SHELVING

POSTS

All posts are fabricated from 16 gauge carbon steel with locating grooves on 1" increments and printed numbers between the grooves. Post also have doubled grooves every 8" for fast identification. Leveling legs are enclosed with all posts. Leveling legs cannot be used in conjunction with stem casters. Custom post heights are available.

STATIONARY POSTS ARE EQUIPPED WITH:

- **Post LEVELER Insert & LEVELING Bolt** - use to account for *UNEVEN* floors, it adjusts up or down allowing height flexibility
Replacements are available:
Insert
Model No: **W-PLI**
Leveling Bolt
Model No: **W-PLB**
- **Foot Plates** - triangular plate allows additional surface to disperse weight. It may be ordered separately and installed in place of LEVELING foot
Model No: **FP**
- **Floor Guides** - Serves as protection to PREVENT marring of floors
Model No: **FG** (Pack of 4)
- **Fully Threaded Stud Connector** - can be utilized to connect two posts enabling any post height to be ACHIEVED
Model No: **W-PC-STUD**
- **Post Cap** - Plastic caps are included with each post
Replacements are available:
Model No: **W-PC** (Pack of 4)
- **Shelf Collar Plug** - Shelf Collar Plug COVERS shelf collar when post is not being used
Model No: **WR-SP** (Pack of 4)
- **S-Hook** - For continuous runs of SHELVEING. Two hooks should be placed per shelf where two posts are not utilized.
Model No: **S-HOOK** (Pack of 8)



Post Insert

Post Leveling Bolt



Fully Threaded Stud Connector



Post Cap



S-Hook



FINISHES:

Chrome, Stainless Steel, Proform and Epoxy Green, Gray, Black

		Foot Plate		Floor Glides		Shelf Collar Plug	
		CHROME	STAINLESS STEEL	EPOXY			
				PROFORM GREEN	GRAY	BLACK	
DESCRIPTION	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	
6"H Post	1 lb	P6C	P6S	P6P	P6GY	P6BK	
14"H Post	1 lb	P14C	P14S	P14P	P14GY	P14BK	
34"H Post	2 lbs	P34C	P34S	P34P	P34GY	P34BK	
36"H Post	2 lbs	P36C	-	-	-	-	
39"H Post	2 lbs	P39C	-	-	-	P39BK	
42"H Post	2 lbs	-	P42S	-	-	-	
54"H Post	3 lbs	P54C	P54S	P54P	P54GY	P54BK	
63"H Post	4 lbs	P63C*	P63S	P63P*	P63GY*	P63BK*	
74"H Post	4 lbs	P74C*	P74S	P74P*	P74GY*	P74BK*	
86"H Post	5 lbs	P86C*	P86S	P86P*	P86GY*	P86BK*	
96"H Post	6 lbs	P96C	P96S	P96P	P96GY	P96BK	

*For easy installation, 63", 74" and 86" posts are available with pre-inserted leveler and bolt by adding an X to the Model No. P74CX

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SHELVING UNITS

Heavy-duty shelving units allows up to 800 lb. shelf capacity. Starter kits come complete with 4 posts and 4 shelves. Additional shelves may be purchased separately.

Additional Add-On kits allows you to expand your starter kit by sharing a set of posts. Configuration options include side to side, back to back and right angles (L-Shape). Add-On kits come complete with 2 posts, 4 shelves and 8 S-Hooks. Additional shelves and posts may be purchased separately. Units with Add-on kits cannot be made mobile.

ADD SUFFIX TO THE END OF EACH MODEL NO. WHEN REFERENCING TO PART FINISHES

• CHROME C
• STAINLESS S
• ENAMEL E
• GREEN G
• GRAY Y
• BLACK BK



DB

Donut Bumper

Non-marking donut bumper used to protect walls and help cushion impact. Sold individually. Measures 3" diameter



WR-00HS

Polyurethane Stainless Steel Casters w/ Zerk Grease Fittings

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"



WR-00H

Polyurethane Casters

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"

63"H STARTER KIT UNITS			63"H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 63"	44	WR63-1236	12" x 36" x 63"	37	AD63-1236C
12" x 42" x 63"	48	WR63-1242	12" x 42" x 63"	41	AD63-1242C
12" x 48" x 63"	52	WR63-1248	12" x 48" x 63"	45	AD63-1248C
12" x 60" x 63"	60	WR63-1260	12" x 60" x 63"	53	AD63-1260C
12" x 72" x 63"	68	WR63-1272	12" x 72" x 63"	61	AD63-1272C
14" x 24" x 63"	40	WR63-1424	14" x 24" x 63"	33	AD63-1424C
14" x 30" x 63"	44	WR63-1430	14" x 30" x 63"	37	AD63-1430C
14" x 36" x 63"	48	WR63-1436	14" x 36" x 63"	41	AD63-1436C
14" x 42" x 63"	56	WR63-1442	14" x 42" x 63"	49	AD63-1442C
14" x 48" x 63"	60	WR63-1448	14" x 48" x 63"	53	AD63-1448C
14" x 54" x 63"	64	WR63-1454	14" x 54" x 63"	57	AD63-1454C
14" x 60" x 63"	72	WR63-1460	14" x 60" x 63"	65	AD63-1460C
14" x 72" x 63"	84	WR63-1472	14" x 72" x 63"	77	AD63-1472C
18" x 24" x 63"	44	WR63-1824	18" x 24" x 63"	37	AD63-1824C
18" x 30" x 63"	48	WR63-1830	18" x 30" x 63"	41	AD63-1830C
18" x 36" x 63"	54	WR63-1836	18" x 36" x 63"	49	AD63-1836C
18" x 42" x 63"	58	WR63-1842	18" x 42" x 63"	53	AD63-1842C
18" x 48" x 63"	62	WR63-1848	18" x 48" x 63"	57	AD63-1848C
18" x 54" x 63"	74	WR63-1854	18" x 54" x 63"	69	AD63-1854C
18" x 60" x 63"	82	WR63-1860	18" x 60" x 63"	77	AD63-1860C
18" x 72" x 63"	94	WR63-1872	18" x 72" x 63"	89	AD63-1872C
21" x 24" x 63"	46	WR63-2124	21" x 24" x 63"	41	AD63-2124C
21" x 30" x 63"	50	WR63-2130	21" x 30" x 63"	45	AD63-2130C
21" x 36" x 63"	58	WR63-2136	21" x 36" x 63"	53	AD63-2136C
21" x 42" x 63"	62	WR63-2142	21" x 42" x 63"	57	AD63-2142C
21" x 48" x 63"	70	WR63-2148	21" x 48" x 63"	65	AD63-2148C
21" x 54" x 63"	78	WR63-2154	21" x 54" x 63"	73	AD63-2154C
21" x 60" x 63"	86	WR63-2160	21" x 60" x 63"	81	AD63-2160C
21" x 72" x 63"	110	WR63-2172	21" x 72" x 63"	105	AD63-2172C
24" x 24" x 63"	50	WR63-2424	24" x 24" x 63"	45	AD63-2424C
24" x 30" x 63"	58	WR63-2430	24" x 30" x 63"	53	AD63-2430C
24" x 36" x 63"	66	WR63-2436	24" x 36" x 63"	61	AD63-2436C
24" x 42" x 63"	74	WR63-2442	24" x 42" x 63"	69	AD63-2442C
24" x 48" x 63"	78	WR63-2448	24" x 48" x 63"	73	AD63-2448C
24" x 54" x 63"	86	WR63-2454	24" x 54" x 63"	81	AD63-2454C
24" x 60" x 63"	98	WR63-2460	24" x 60" x 63"	93	AD63-2460C
24" x 72" x 63"	118	WR63-2472	24" x 72" x 63"	113	AD63-2472C
30" x 36" x 63"	74	WR63-3036	30" x 36" x 63"	69	AD63-3036C
30" x 42" x 63"	86	WR63-3042	30" x 42" x 63"	81	AD63-3042C
30" x 48" x 63"	98	WR63-3048	30" x 48" x 63"	93	AD63-3048C
30" x 60" x 63"	122	WR63-3060	30" x 60" x 63"	117	AD63-3060C
30" x 72" x 63"	138	WR63-3072	30" x 72" x 63"	133	AD63-3072C
36" x 36" x 63"	86	WR63-3636	36" x 36" x 63"	81	AD63-3636C
36" x 48" x 63"	106	WR63-3648	36" x 48" x 63"	101	AD63-3648C
36" x 60" x 63"	130	WR63-3660	36" x 60" x 63"	125	AD63-3660C
36" x 72" x 63"	138	WR63-3672	36" x 72" x 63"	133	AD63-3672C

74" H STARTER KIT UNITS			74" H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 74"	44	WR74-1236	12" x 36" x 74"	38	AD74-1236
12" x 42" x 74"	48	WR74-1242	12" x 42" x 74"	42	AD74-1242
12" x 48" x 74"	52	WR74-1248	12" x 48" x 74"	46	AD74-1248
12" x 60" x 74"	60	WR74-1260	12" x 60" x 74"	54	AD74-1260
12" x 72" x 74"	68	WR74-1272	12" x 72" x 74"	62	AD74-1272
14" x 24" x 74"	40	WR74-1424	14" x 24" x 74"	34	AD74-1424
14" x 30" x 74"	44	WR74-1430	14" x 30" x 74"	38	AD74-1430
14" x 36" x 74"	48	WR74-1436	14" x 36" x 74"	42	AD74-1436
14" x 42" x 74"	56	WR74-1442	14" x 42" x 74"	50	AD74-1442
14" x 48" x 74"	60	WR74-1448	14" x 48" x 74"	54	AD74-1448
14" x 54" x 74"	64	WR74-1454	14" x 54" x 74"	58	AD74-1454
14" x 60" x 74"	72	WR74-1460	14" x 60" x 74"	66	AD74-1460
14" x 72" x 74"	84	WR74-1472	14" x 72" x 74"	78	AD74-1472
18" x 24" x 74"	44	WR74-1824	18" x 24" x 74"	38	AD74-1824
18" x 30" x 74"	48	WR74-1830	18" x 30" x 74"	42	AD74-1830
18" x 36" x 74"	56	WR74-1836	18" x 36" x 74"	50	AD74-1836
18" x 42" x 74"	60	WR74-1842	18" x 42" x 74"	54	AD74-1842
18" x 48" x 74"	64	WR74-1848	18" x 48" x 74"	58	AD74-1848
18" x 54" x 74"	76	WR74-1854	18" x 54" x 74"	70	AD74-1854
18" x 60" x 74"	84	WR74-1860	18" x 60" x 74"	78	AD74-1860
18" x 72" x 74"	96	WR74-1872	18" x 72" x 74"	90	AD74-1872
21" x 24" x 74"	48	WR74-2124	21" x 24" x 74"	42	AD74-2124
21" x 30" x 74"	52	WR74-2130	21" x 30" x 74"	46	AD74-2130
21" x 36" x 74"	60	WR74-2136	21" x 36" x 74"	54	AD74-2136
21" x 42" x 74"	64	WR74-2142	21" x 42" x 74"	58	AD74-2142
21" x 48" x 74"	72	WR74-2148	21" x 48" x 74"	66	AD74-2148
21" x 54" x 74"	80	WR74-2154	21" x 54" x 74"	74	AD74-2154
21" x 60" x 74"	88	WR74-2160	21" x 60" x 74"	82	AD74-2160
21" x 72" x 74"	112	WR74-2172	21" x 72" x 74"	106	AD74-2172
24" x 24" x 74"	52	WR74-2424	24" x 24" x 74"	46	AD74-2424
24" x 30" x 74"	60	WR74-2430	24" x 30" x 74"	54	AD74-2430
24" x 36" x 74"	68	WR74-2436	24" x 36" x 74"	62	AD74-2436
24" x 42" x 74"	76	WR74-2442	24" x 42" x 74"	70	AD74-2442
24" x 48" x 74"	80	WR74-2448	24" x 48" x 74"	74	AD74-2448
24" x 54" x 74"	88	WR74-2454	24" x 54" x 74"	82	AD74-2454
24" x 60" x 74"	100	WR74-2460	24" x 60" x 74"	94	AD74-2460
24" x 72" x 74"	120	WR74-2472	24" x 72" x 74"	114	AD74-2472
30" x 36" x 74"	76	WR74-3036	30" x 36" x 74"	70	AD74-3036
30" x 42" x 74"	88	WR74-3042	30" x 42" x 74"	82	AD74-3042
30" x 48" x 74"	100	WR74-3048	30" x 48" x 74"	94	AD74-3048
30" x 60" x 74"	124	WR74-3060	30" x 60" x 74"	118	AD74-3060
30" x 72" x 74"	140	WR74-3072	30" x 72" x 74"	134	AD74-3072
36" x 36" x 74"	88	WR74-3636	36" x 36" x 74"	82	AD74-3636
36" x 48" x 74"	108	WR74-3648	36" x 48" x 74"	102	AD74-3648
36" x 60" x 74"	132	WR74-3660	36" x 60" x 74"	126	AD74-3660
36" x 72" x 74"	140	WR74-3672	36" x 72" x 74"	134	AD74-3672

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Submittal Sheet

10/03/2025

ITEM# 6 - BLOWER COIL (COOLER) (1 EA REQ'D)

Kolpak CUSTOM

Evaporator Coil (Med Temp) Refer to Shop Drawing.

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 7 - WALK-IN FREEZER, MODULAR, REMOTE (1 EA REQ'D)

Kolpak CUSTOM

Walk In Freezer, Modular, Remote

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 8 - SHELVING UNIT, WIRE (4 KT REQ'D)

Quantum WR86-2142GY-5

Wire Shelving Starter Kit, 42"W x 21"D x 86"H, 600 - 800 lb. capacity, includes (5) wire shelves & (4) posts, gray epoxy antimicrobial finish, NSF, shipped KD

ACCESSORIES

Mfr	Qty	Model	Spec
Quantum	4		15 year limited warranty (limited against rust and corrosion)

WIRE SHELVING

DESIGN: The open wire design of these shelves minimizes dust accumulation and allows free circulation of air, greater visibility of stored items and greater light penetration.

CONSTRUCTION: All welded wire shelves and posts are constructed of heavy-gauge carbon steel or Type 304 stainless steel.

CHOICE OF FINISHES:

- **Chrome** - is a plating process which deposits hard chrome OVER a copper, nickel surface. This process is VERY durable and allows product to be used in any application in a dry storage ENVIRONMENT. 1 year limited warranty to not rust or corrode when used in dry and non-humid ENVIRONMENTS.
- **Stainless Steel** - 304 Stainless with an electro-polish finish represents the highest industry standard in the PREVENTION of corrosion. This finish is highly EFFECTIVE for CORROSIVE, high humidity or clean room ENVIRONMENTS. Lifetime warranty for 304 stainless steel electro-polish finish.
- **Proform Green, Gray and Black Epoxy** - are an ideal solution for high humidity, wet, or walk-in-cooler applications. The carbon steel is treated with an iron phosphate and the powder coated epoxy is electrostatically applied, baked and cured to a hard surface. All three colors are antimicrobial. 15 year limited warranty for antimicrobial finish to not rust or corrode.

ADAPTABLE: Wire shelving can adapt to your changing needs. By using various accessories, hundreds of shelving configurations become possible.

QUICK, EASY ASSEMBLY: Posts have a double groove visual guide feature every 8", circular grooves at 1" increments, and are numbered at 1" intervals. Tapered split sleeve snaps together around each post. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock. Shelf is assembled in minutes without the use of any special tools.

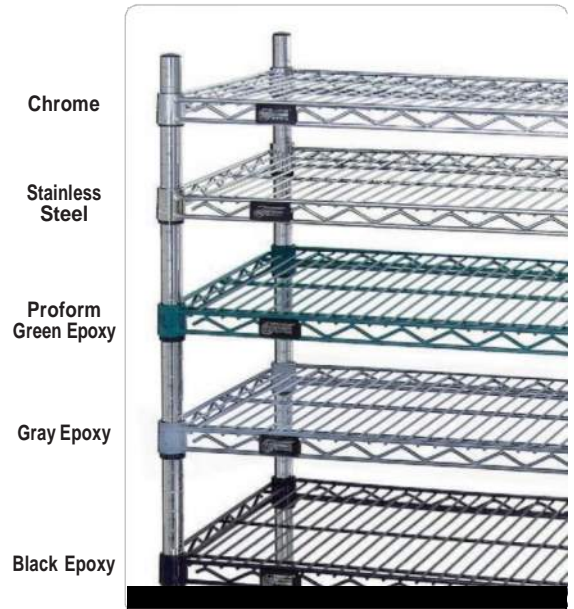
ADJUSTABLE: Shelves can be adjusted at 1" intervals along length of the post.

WIRE TRUSSES: Architectural wire trusses increase shelf capacity.

TOP MAT WIRES: Run front to back to slide items easily off and on the shelf.

SHELF ACCESSIBILITY: Shelves can be loaded/unloaded easily from all sides. This open construction allows maximum use of storage cube.

ADJUSTABLE FOOT: 3/8-16 leveling bolt compensate for irregular floor surfaces.



Note: Stainless stationary posts are equipped with stainless steel LEVELING feet.

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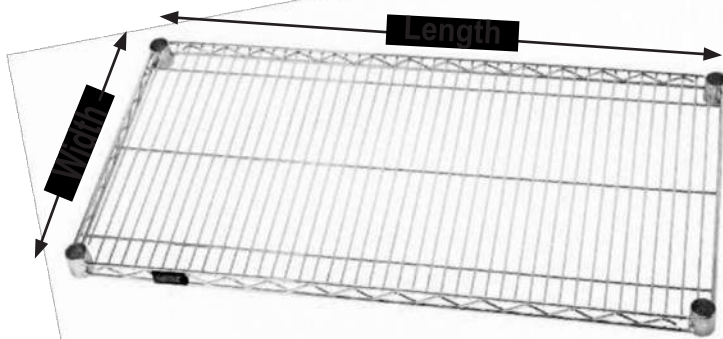


WIRE SHELVING

WIRE SHELVES

- **Plastic Split SLEEVES** - are included with each shelf
Replacements are available:
Model No: **WR-SS** (4 Pairs)
- **Plastic CONDUCTIVE Split SLEEVES** - are AVAILABLE for CONDUCTIVE applications
Model No: **WR-SSCO** (4 Pairs)
- **Aluminum Split SLEEVES** - are recommended for extreme mobile applications and CONDUCTIVE applications
Model No: **ESD-SS** (4 Pairs)
- **Load capacity (evenly distributed) per shelf**

Widths: 12" to 36"
Lengths: 800 lbs. for 18" to 48"
 600 lbs. for 54" or longer except heavy-duty
 1,000 lbs. for 60" or 72" on chrome heavy-duty



All welded construction with additional wire trussing for high-strength characteristics

Top mat wires run front to back (except on 12" x 36" size) for ease of loading and unloading

- Numbered GROOVED posts on 1" increments for quick assembly
- Wire allows air to circulate and light to penetrate for increased product VISIBILITY
- Minimal dirt accumulation
- Adjustable foot LEVELERS
- No tools required for assembly
- Durable finishes
- Aesthetically pleasing
- National Sanitation Foundation (NSF) APPROVED
- Shipped KD Class 70



Split Sleeve



Aluminum Split Sleeve

		CHROME	STAINLESS STEEL	EPOXY		
				PROFORM GREEN	GRAY	BLACK
SHELF W" x L"	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.
12" Deep - Wire Shelves						
12" x 24"	6 lbs	1224C	-	1224P	1224GY	1224BK
12" x 30"	6 lbs	1230C	-	1230P	1230GY	1230BK
12" x 36"	7 lbs	1236C	1236S	1236P	1236GY	1236BK
12" x 42"	8 lbs	1242C	-	1242P	1242GY	1242BK
12" x 48"	9 lbs	1248C	1248S	1248P	1248GY	1248BK
12" x 60"	14 lbs	1260C	1260S	1260P	1260GY	1260BK
12" x 72"	17 lbs	1272C	1272S	1272P	1272GY	1272BK
14" Deep - Wire Shelves						
14" x 24"	6 lbs	1424C	-	1424P	1424GY	1424BK
14" x 30"	7 lbs	1430C	1430S	1430P	1430GY	1430BK
14" x 36"	8 lbs	1436C	1436S	1436P	1436GY	1436BK
14" x 42"	10 lbs	1442C	1442S	1442P	1442GY	1442BK
14" x 48"	11 lbs	1448C	1448S	1448P	1448GY	1448BK
14" x 54"	12 lbs	1454C	1454S	1454P	1454GY	1454BK
14" x 60"	14 lbs	1460C	1460S	1460P	1460GY	1460BK
14" x 72"	17 lbs	1472C	1472S	1472P	1472GY	1472BK
18" Deep - Wire Shelves						
18" x 24"	7 lbs	1824C	1824S	1824P	1824GY	1824BK
18" x 30"	8 lbs	1830C	1830S	1830P	1830GY	1830BK
18" x 36"	10 lbs	1836C	1836S	1836P	1836GY	1836BK
18" x 42"	11 lbs	1842C	1842S	1842P	1842GY	1842BK
18" x 48"	14 lbs	1848C	1848S	1848P	1848GY	1848BK
18" x 54"	15 lbs	1854C	1854S	1854P	1854GY	1854BK
18" x 60"	17 lbs	1860C	1860S	1860P	1860GY	1860BK
18" x 72"	20 lbs	1872C	1872S	1872P	1872GY	1872BK
21" Deep - Wire Shelves						
21" x 24"	8 lbs	2124C	2124S	2124P	2124GY	2124BK
21" x 30"	9 lbs	2130C	2130S	2130P	2130GY	2130BK
21" x 36"	11 lbs	2136C	2136S	2136P	2136GY	2136BK
21" x 42"	12 lbs	2142C	2142S	2142P	2142GY	2142BK
21" x 48"	14 lbs	2148C	2148S	2148P	2148GY	2148BK
21" x 54"	16 lbs	2154C	2154S	2154P	2154GY	2154BK
21" x 60"	18 lbs	2160C	2160S	2160P	2160GY	2160BK
21" x 72"	24 lbs	2172C	2172S	2172P	2172GY	2172BK
24" Deep - Wire Shelves						
24" x 24"	9 lbs	2424C	2424S	2424P	2424GY	2424BK
24" x 30"	11 lbs	2430C	2430S	2430P	2430GY	2430BK
24" x 36"	13 lbs	2436C	2436S	2436P	2436GY	2436BK
24" x 42"	15 lbs	2442C	2442S	2442P	2442GY	2442BK
24" x 48"	16 lbs	2448C	2448S	2448P	2448GY	2448BK
24" x 54"	18 lbs	2454C	2454S	2454P	2454GY	2454BK
24" x 60"	21 lbs	2460C	2460S	2460P	2460GY	2460BK
24" x 66"	23 lbs	2466C	-	2466P	2466GY	-
24" x 72"	26 lbs	2472C	2472S	2472P	2472GY	2472BK
24" Deep Heavy-Duty - Wire Shelves (1,000 lb. capacity)						
24" x 60"	25 lbs	2460CHD	-	-	-	-
24" x 72"	30 lbs	2472CHD	-	-	-	-
30" Deep - Wire Shelves						
30" x 36"	15 lbs	3036C	3036S	3036P	3036GY	3036BK
30" x 42"	18 lbs	3042C	3042S	3042P	3042GY	3042BK
30" x 48"	21 lbs	3048C	3048S	3048P	3048GY	3048BK
30" x 60"	27 lbs	3060C	3060S	3060P	3060GY	3060BK
30" x 72"	31 lbs	3072C	3072S	3072P	3072GY	3072BK
36" Deep - Wire Shelves						
36" x 36"	18 lbs	3636C	3636S	3636P	3636GY	3636BK
36" x 48"	23 lbs	3648C	3648S	3648P	3648GY	3648BK
36" x 60"	29 lbs	3660C	3660S	3660P	3660GY	3660BK
36" x 72"	35 lbs	3672C	3672S	3672P	3672GY	3672BK

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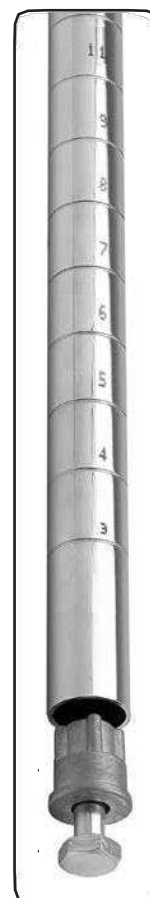
WIRE SHELVING

POSTS

All posts are fabricated from 16 gauge carbon steel with locating grooves on 1" increments and printed numbers between the grooves. Post also have doubled grooves every 8" for fast identification. Leveling legs are enclosed with all posts. Leveling legs cannot be used in conjunction with stem casters. Custom post heights are available.

STATIONARY POSTS ARE EQUIPPED WITH:

- **Post LEVELER Insert & LEVELING Bolt** - use to account for *UNEVEN* floors, it adjusts up or down allowing height flexibility
Replacements are available:
Insert
Model No: **W-PLI**
Leveling Bolt
Model No: **W-PLB**
- **Foot Plates** - triangular plate allows additional surface to disperse weight. It may be ordered separately and installed in place of LEVELING foot
Model No: **FP**
- **Floor Guides** - Serves as protection to PREVENT marring of floors
Model No: **FG** (Pack of 4)
- **Fully Threaded Stud Connector** - can be utilized to connect two posts enabling any post height to be ACHIEVED
Model No: **W-PC-STUD**
- **Post Cap** - Plastic caps are included with each post
Replacements are available:
Model No: **W-PC** (Pack of 4)
- **Shelf Collar Plug** - Shelf Collar Plug COVERS shelf collar when post is not being used
Model No: **WR-SP** (Pack of 4)
- **S-Hook** - For continuous runs of SHELVING. Two hooks should be placed per shelf where two posts are not utilized.
Model No: **S-HOOK** (Pack of 8)



Post Insert

Post Leveling Bolt



Fully Threaded Stud Connector



Post Cap



S-Hook



FINISHES:

Chrome, Stainless Steel, Proform and Epoxy Green, Gray, Black

		Foot Plate		Floor Glides		Shelf Collar Plug	
		CHROME	STAINLESS STEEL	EPOXY			
				PROFORM GREEN	GRAY	BLACK	
DESCRIPTION	SHIP WGT	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	
6"H Post	1 lb	P6C	P6S	P6P	P6GY	P6BK	
14"H Post	1 lb	P14C	P14S	P14P	P14GY	P14BK	
34"H Post	2 lbs	P34C	P34S	P34P	P34GY	P34BK	
36"H Post	2 lbs	P36C	-	-	-	-	
39"H Post	2 lbs	P39C	-	-	-	P39BK	
42"H Post	2 lbs	-	P42S	-	-	-	
54"H Post	3 lbs	P54C	P54S	P54P	P54GY	P54BK	
63"H Post	4 lbs	P63C*	P63S	P63P*	P63GY*	P63BK*	
74"H Post	4 lbs	P74C*	P74S	P74P*	P74GY*	P74BK*	
86"H Post	5 lbs	P86C*	P86S	P86P*	P86GY*	P86BK*	
96"H Post	6 lbs	P96C	P96S	P96P	P96GY	P96BK	

*For easy installation, 63", 74" and 86" posts are available with pre-inserted leveler and bolt by adding an X to the Model No. P74CX

Highest Quality, Lowest Price Guaranteed!

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E-MAIL: SALES@QUANTUMFOODSERVICE.COM WWW.QUANTUMFOODSERVICE.COM



SHELVING UNITS

Heavy-duty shelving units allows up to 800 lb. shelf capacity. Starter kits come complete with 4 posts and 4 shelves. Additional shelves may be purchased separately.

Additional Add-On kits allows you to expand your starter kit by sharing a set of posts. Configuration options include side to side, back to back and right angles (L-Shape). Add-On kits come complete with 2 posts, 4 shelves and 8 S-Hooks. Additional shelves and posts may be purchased separately. Units with Add-on kits cannot be made mobile.

ADD SUFFIX TO THE END OF EACH MODEL NO. WHEN REFERENCING TO PART FINISHES

• CHROME C
• STAINLESS S
• ENAMEL E
• GREEN G
• GRAY Y
• BLACK BK



DB

Donut Bumper

Non-marking donut bumper used to protect walls and help cushion impact. Sold individually. Measures 3" diameter



WR-00HS

Polyurethane Stainless Steel Casters w/ Zerk Grease Fittings

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"



WR-00H

Polyurethane Casters

Sold as a set of 4 casters, 2 with brake. Measures 5" x 1-1/4"

63"H STARTER KIT UNITS			63"H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 63"	44	WR63-1236	12" x 36" x 63"	37	AD63-1236C
12" x 42" x 63"	48	WR63-1242	12" x 42" x 63"	41	AD63-1242C
12" x 48" x 63"	52	WR63-1248	12" x 48" x 63"	45	AD63-1248C
12" x 60" x 63"	60	WR63-1260	12" x 60" x 63"	53	AD63-1260C
12" x 72" x 63"	68	WR63-1272	12" x 72" x 63"	61	AD63-1272C
14" x 24" x 63"	40	WR63-1424	14" x 24" x 63"	33	AD63-1424C
14" x 30" x 63"	44	WR63-1430	14" x 30" x 63"	37	AD63-1430C
14" x 36" x 63"	48	WR63-1436	14" x 36" x 63"	41	AD63-1436C
14" x 42" x 63"	56	WR63-1442	14" x 42" x 63"	49	AD63-1442C
14" x 48" x 63"	60	WR63-1448	14" x 48" x 63"	53	AD63-1448C
14" x 54" x 63"	64	WR63-1454	14" x 54" x 63"	57	AD63-1454C
14" x 60" x 63"	72	WR63-1460	14" x 60" x 63"	65	AD63-1460C
14" x 72" x 63"	84	WR63-1472	14" x 72" x 63"	77	AD63-1472C
18" x 24" x 63"	44	WR63-1824	18" x 24" x 63"	37	AD63-1824C
18" x 30" x 63"	48	WR63-1830	18" x 30" x 63"	41	AD63-1830C
18" x 36" x 63"	54	WR63-1836	18" x 36" x 63"	49	AD63-1836C
18" x 42" x 63"	58	WR63-1842	18" x 42" x 63"	53	AD63-1842C
18" x 48" x 63"	62	WR63-1848	18" x 48" x 63"	57	AD63-1848C
18" x 54" x 63"	74	WR63-1854	18" x 54" x 63"	69	AD63-1854C
18" x 60" x 63"	82	WR63-1860	18" x 60" x 63"	77	AD63-1860C
18" x 72" x 63"	94	WR63-1872	18" x 72" x 63"	89	AD63-1872C
21" x 24" x 63"	46	WR63-2124	21" x 24" x 63"	41	AD63-2124C
21" x 30" x 63"	50	WR63-2130	21" x 30" x 63"	45	AD63-2130C
21" x 36" x 63"	58	WR63-2136	21" x 36" x 63"	53	AD63-2136C
21" x 42" x 63"	62	WR63-2142	21" x 42" x 63"	57	AD63-2142C
21" x 48" x 63"	70	WR63-2148	21" x 48" x 63"	65	AD63-2148C
21" x 54" x 63"	78	WR63-2154	21" x 54" x 63"	73	AD63-2154C
21" x 60" x 63"	86	WR63-2160	21" x 60" x 63"	81	AD63-2160C
21" x 72" x 63"	110	WR63-2172	21" x 72" x 63"	105	AD63-2172C
24" x 24" x 63"	50	WR63-2424	24" x 24" x 63"	45	AD63-2424C
24" x 30" x 63"	58	WR63-2430	24" x 30" x 63"	53	AD63-2430C
24" x 36" x 63"	66	WR63-2436	24" x 36" x 63"	61	AD63-2436C
24" x 42" x 63"	74	WR63-2442	24" x 42" x 63"	69	AD63-2442C
24" x 48" x 63"	78	WR63-2448	24" x 48" x 63"	73	AD63-2448C
24" x 54" x 63"	86	WR63-2454	24" x 54" x 63"	81	AD63-2454C
24" x 60" x 63"	98	WR63-2460	24" x 60" x 63"	93	AD63-2460C
24" x 72" x 63"	118	WR63-2472	24" x 72" x 63"	113	AD63-2472C
30" x 36" x 63"	74	WR63-3036	30" x 36" x 63"	69	AD63-3036C
30" x 42" x 63"	86	WR63-3042	30" x 42" x 63"	81	AD63-3042C
30" x 48" x 63"	98	WR63-3048	30" x 48" x 63"	93	AD63-3048C
30" x 60" x 63"	122	WR63-3060	30" x 60" x 63"	117	AD63-3060C
30" x 72" x 63"	138	WR63-3072	30" x 72" x 63"	133	AD63-3072C
36" x 36" x 63"	86	WR63-3636	36" x 36" x 63"	81	AD63-3636C
36" x 48" x 63"	106	WR63-3648	36" x 48" x 63"	101	AD63-3648C
36" x 60" x 63"	130	WR63-3660	36" x 60" x 63"	125	AD63-3660C
36" x 72" x 63"	138	WR63-3672	36" x 72" x 63"	133	AD63-3672C

74" H STARTER KIT UNITS			74" H ADD-ON KIT UNITS		
DIMENSIONS	SHIP WGT	MODEL NO.	DIMENSIONS	SHIP WGT	MODEL NO.
12" x 36" x 74"	44	WR74-1236	12" x 36" x 74"	38	AD74-1236
12" x 42" x 74"	48	WR74-1242	12" x 42" x 74"	42	AD74-1242
12" x 48" x 74"	52	WR74-1248	12" x 48" x 74"	46	AD74-1248
12" x 60" x 74"	60	WR74-1260	12" x 60" x 74"	54	AD74-1260
12" x 72" x 74"	68	WR74-1272	12" x 72" x 74"	62	AD74-1272
14" x 24" x 74"	40	WR74-1424	14" x 24" x 74"	34	AD74-1424
14" x 30" x 74"	44	WR74-1430	14" x 30" x 74"	38	AD74-1430
14" x 36" x 74"	48	WR74-1436	14" x 36" x 74"	42	AD74-1436
14" x 42" x 74"	56	WR74-1442	14" x 42" x 74"	50	AD74-1442
14" x 48" x 74"	60	WR74-1448	14" x 48" x 74"	54	AD74-1448
14" x 54" x 74"	64	WR74-1454	14" x 54" x 74"	58	AD74-1454
14" x 60" x 74"	72	WR74-1460	14" x 60" x 74"	66	AD74-1460
14" x 72" x 74"	84	WR74-1472	14" x 72" x 74"	78	AD74-1472
18" x 24" x 74"	44	WR74-1824	18" x 24" x 74"	38	AD74-1824
18" x 30" x 74"	48	WR74-1830	18" x 30" x 74"	42	AD74-1830
18" x 36" x 74"	56	WR74-1836	18" x 36" x 74"	50	AD74-1836
18" x 42" x 74"	60	WR74-1842	18" x 42" x 74"	54	AD74-1842
18" x 48" x 74"	64	WR74-1848	18" x 48" x 74"	58	AD74-1848
18" x 54" x 74"	76	WR74-1854	18" x 54" x 74"	70	AD74-1854
18" x 60" x 74"	84	WR74-1860	18" x 60" x 74"	78	AD74-1860
18" x 72" x 74"	96	WR74-1872	18" x 72" x 74"	90	AD74-1872
21" x 24" x 74"	48	WR74-2124	21" x 24" x 74"	42	AD74-2124
21" x 30" x 74"	52	WR74-2130	21" x 30" x 74"	46	AD74-2130
21" x 36" x 74"	60	WR74-2136	21" x 36" x 74"	54	AD74-2136
21" x 42" x 74"	64	WR74-2142	21" x 42" x 74"	58	AD74-2142
21" x 48" x 74"	72	WR74-2148	21" x 48" x 74"	66	AD74-2148
21" x 54" x 74"	80	WR74-2154	21" x 54" x 74"	74	AD74-2154
21" x 60" x 74"	88	WR74-2160	21" x 60" x 74"	82	AD74-2160
21" x 72" x 74"	112	WR74-2172	21" x 72" x 74"	106	AD74-2172
24" x 24" x 74"	52	WR74-2424	24" x 24" x 74"	46	AD74-2424
24" x 30" x 74"	60	WR74-2430	24" x 30" x 74"	54	AD74-2430
24" x 36" x 74"	68	WR74-2436	24" x 36" x 74"	62	AD74-2436
24" x 42" x 74"	76	WR74-2442	24" x 42" x 74"	70	AD74-2442
24" x 48" x 74"	80	WR74-2448	24" x 48" x 74"	74	AD74-2448
24" x 54" x 74"	88	WR74-2454	24" x 54" x 74"	82	AD74-2454
24" x 60" x 74"	100	WR74-2460	24" x 60" x 74"	94	AD74-2460
24" x 72" x 74"	120	WR74-2472	24" x 72" x 74"	114	AD74-2472
30" x 36" x 74"	76	WR74-3036	30" x 36" x 74"	70	AD74-3036
30" x 42" x 74"	88	WR74-3042	30" x 42" x 74"	82	AD74-3042
30" x 48" x 74"	100	WR74-3048	30" x 48" x 74"	94	AD74-3048
30" x 60" x 74"	124	WR74-3060	30" x 60" x 74"	118	AD74-3060
30" x 72" x 74"	140	WR74-3072	30" x 72" x 74"	134	AD74-3072
36" x 36" x 74"	88	WR74-3636	36" x 36" x 74"	82	AD74-3636
36" x 48" x 74"	108	WR74-3648	36" x 48" x 74"	102	AD74-3648
36" x 60" x 74"	132	WR74-3660	36" x 60" x 74"	126	AD74-3660
36" x 72" x 74"	140	WR74-3672	36" x 72" x 74"	134	AD74-3672

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Submittal Sheet

10/03/2025

ITEM# 9 - BLOWER COIL (FREEZER) (1 EA REQ'D)

Kolpak CUSTOM

Evaporator Coil (Low Temp) Refer to Shop Drawings

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 10 - REMOTE CONDENSING UNIT (COOLER) (1 EA REQ'D)

Kolpak CUSTOM

Remote Condenser (Med Temp) Refer to Shop Drawings.

ACCESSORIES

Mfr	Qty	Model	Spec
Kolpak	1		5 YEAR WARRANTY COMPRESSOR

Submittal Sheet

10/03/2025

ITEM# 11 - REMOTE CONDENSING UNIT (FREEZER) (1 EA REQ'D)

Kolpak CUSTOM

Remote Condenser (Low Temp) Refer to Shop Drawing.

ACCESSORIES

Mfr	Qty	Model	Spec
Kolpak	1		5 YEAR WARRANTY COMPRESSOR

Submittal Sheet

10/03/2025

ITEM# 12 - S/S - PREP TABLE W/ SINK (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Prep Table with Sink Approx. Size 30" X 10'-3" Fabricated per plan and specification. **

Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 13 - DECK MOUNT FAUCET (1 EA REQ'D)

T&S Brass B-1122

Faucet, 10" swing nozzle, deck mounted, quarter-turn Eterna cartridges, lever handles, low lead, ADA Compliant
ACCESSORIES

Mfr	Qty	Model	Spec
T&S Brass	1	B-1100-KIT	24" Inlet Supply Hoses (3/8" Compression x 1/2" NPSM Female)
T&S Brass	1	B-3952-01	Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with overflow assembly (replaces B-3917-01)

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		
2	1-1/2" to 2"	

PLUMBING 2 REMARKS

2" NPT Male Thread, 1-1/2 NPT Female Thread Outlet



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-1122

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

**ADA Compliant**

This Space for Architect/Engineer Approval

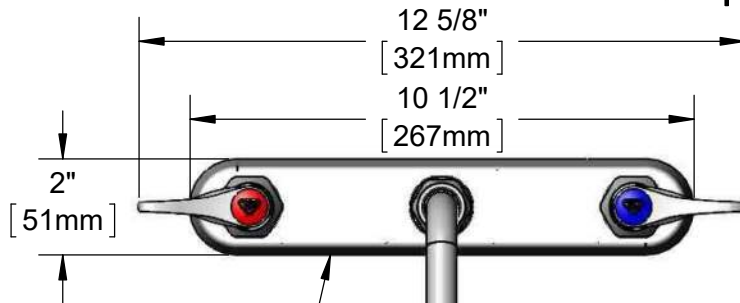
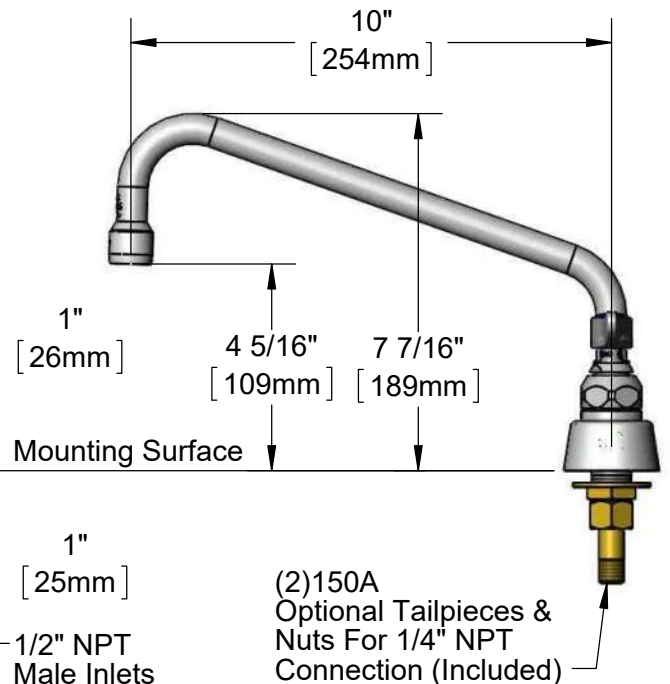
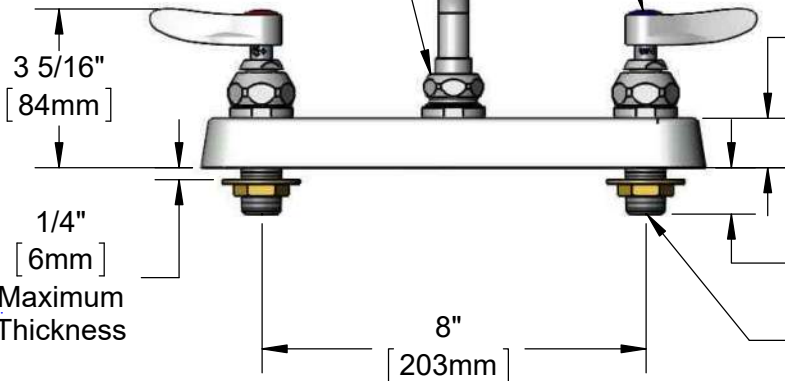
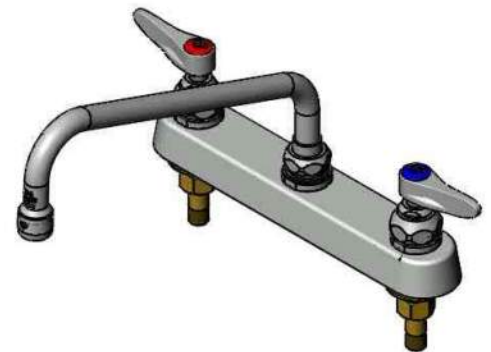
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____

Polished Chrome
Plated Escutcheon061X-A22
10" Swing Nozzle w/
2.2 GPM AeratorQuarter-Turn Eterna
Cartridges w/ Spring
Checks & Lever Handles
w/ Color Coded IndexesSwivel Joint
Converts to Rigid
w/ 014200-45
Lock Washer
(Included)

Mounting Surface

1"
[25mm]1/2" NPT
Male Inlets(2) 150A
Optional Tailpieces &
Nuts For 1/4" NPT
Connection (Included)

Rough-In Requirement:
(2) \varnothing 1" [25mm] Mounting Holes

Product Specifications:

8" Deck Mount Workboard Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 10" Swing Nozzle, 2.2 GPM Aerator & 1/2" NPT Male Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: DHL Checked: JRM Approved: JHB Date: 06/01/16

Scale: 1:4 Sheet: 1 of 2



T&S BRASS AND BRONZE WORKS, INC.

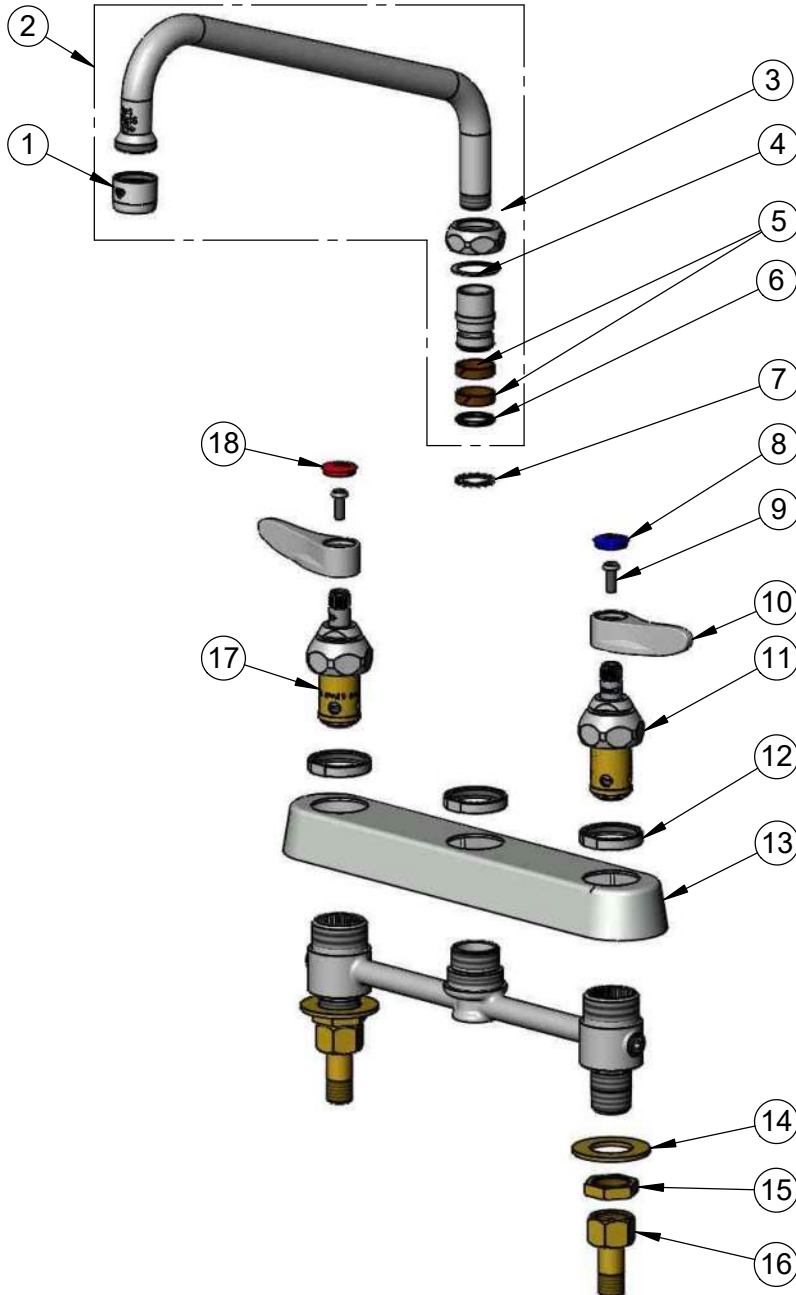
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-1122

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0199-01	2.2 GPM Aerator, 55/64"-27 UN Female
2	061X-A22	10" Swing Nozzle w/ 2.2 GPM Aerator
3	019360-40	Swivel Nut (New Style)
4	009538-45	Swivel Washer
5	011429-45	Swivel Sleeves (2)
6	001074-45	O-Ring
7	014200-45	Star Washer, Anti-Rotation
8	019363-45	Blue Button Index, Press-in
9	000925-45	Lab Handle Screw
10	019361-45	Lever Handle (New Style)
11	019382-40	Quarter-Turn New Style Eterna Cartridge w/ Spring Check, LTC
12	019376-40	Escutcheon Lock Nut
13	019375-40	B-1120 Eterna Workboard Escutcheon
14	000999-45	Brass Lock Washer
15	002954-45	Shank Lock Nut
16	150A	1/4" NPT Tailpiece & Nut
17	019383-40	Quarter-Turn New Style Eterna Cartridge w/ Spring Check, RTC
18	019364-45	Red Button Index, Press-in

Product Specifications:

8" Deck Mount Workboard Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 10" Swing Nozzle, 2.2 GPM Aerator & 1/2" NPT Male Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: DHL

Checked: JRM

Approved: JHB

Date: 06/01/16

Scale: NTS

Sheet: 2 of 2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-1100-KIT

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



1/2" NPSM
Female



9/16-24 UN Female
(3/8" Compression)


Product Specifications:

24" Flexible Stainless Steel Supply Hoses w/ Swivel Fittings & Integral Washers

Product Compliance:

NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: KJG

Checked: LSA

Approved: JHB

Date: 07/26/21

Scale: 1:2

Sheet: 1 of 1


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-3952-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

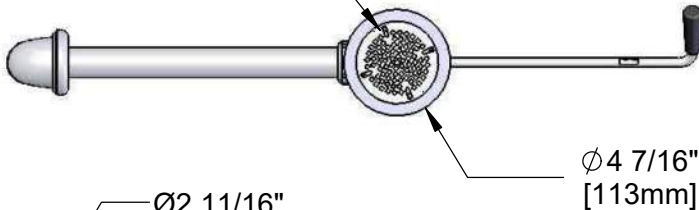
Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____

Twist Handle w/
Heat Resistant
Plastic Grip (Shown
in Open Position)

Removable
Snap-in Strainer



Ø2 11/16"
[68mm]

Ø4 7/16"
[113mm]

Ø1 1/4" [32mm] O.D.
Overflow Tube

19 1/2"
[495mm]

4 1/2"
[114mm]

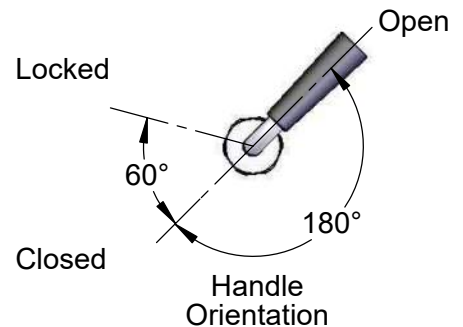
12 1/4" ± 1/4"
[312mm]

2 5/8"
[67mm]

15 3/8"
[391mm]

2" NPT Male Thread,
1-1/2" NPT Female Thread

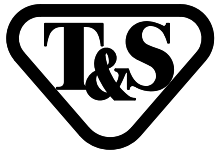
Ø2" [51mm]
Opening Required


Product Specifications:

Rotary Waste Drain Valve w/ Twist Handle, 3 1/2" Sink Opening, 2" Male NPT / 1-1/2" Female NPT Outlet & Overflow Tube & Head

Product Compliance:

ASME A112.18.2 / CSA B125.2



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

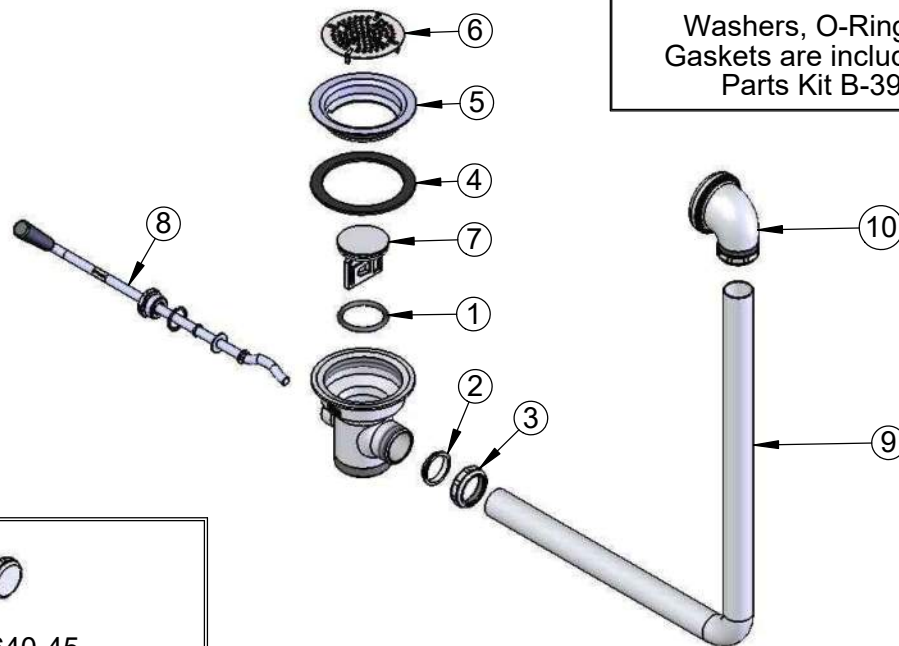
Model No.

B-3952-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

ITEM	SALE NO.	DESCRIPTION
1	010389-45	O-Ring, Plunger
2	010390-45	Ferrule, Coupling Nut
3	010391-45	Nut, Coupling for Twist Drain
4	010382-45	Gasket, 3 1/2" Face Flange
5	010384-45	Flange, 3 1/2" Face
6	010386-45	Strainer, 3 1/2" Snap-in Removable
7	010388-45	Plunger, Lever and Twist Drain
8	010393-45	Handle, Rotary Waste Valve Twist
9	011355-45	Tube, Overflow Elbow
10	011356-45	Head, Overflow Tube



Washers, O-Rings &
Gaskets are included in
Parts Kit B-39K



012640-45
Waste Drain Overflow Cap
w/ Sealing Washer
(Included)

Product Specifications:

Rotary Waste Drain Valve w/ Twist Handle, 3 1/2" Sink Opening, 2" Male NPT / 1-1/2" Female NPT Outlet & Overflow Tube & Head

Product Compliance:

ASME A112.18.2 / CSA B125.2

Submittal Sheet

10/03/2025

ITEM# 14 - S/S - DOUBLE OVERSHELF (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Double Overshelf Approx. Size 12" X 9"-8-1/2" Fabricated per plan and specification. **

Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 15 - TRASH RECEPTACLE, INDOOR (5 EA REQ'D)

CFS Brands 34202306

Carlisle - Trimline™ Waste Container, 23 gallon, rectangular, integrated corner tabs, bottom helper handles, heavy-duty, polyethylene, beige

WASTE CONTAINERS

TRIMLINE™ RECTANGLE WASTE CONTAINERS

- Slim shape saves space by fitting into narrow spaces along walls and near work benches
- Corner tabs keep trash bags securely in place for spill-free, even filling
- Base helper handles stabilize container while being lifted and emptied
- Swing top, handled, or cut-out recycling lid styles available



					
Black (03)	Beige (06)	Green (09)	Blue (14)	Gray (23)	Dark Brown (69)

Prod No	Description	Color	UOM	Case Qty	List Price
TrimLine™ Containers					
342023 Δ	Rectangle Waste Container - 23 Gallon	03, 06, 09, 14, 23, 69	CS	4	\$288.08
342015 Δ	Rectangle Waste Container - 15 Gallon	23	CS	4	\$243.28
TrimLine™ Waste Containers Lids					
342024 Δ	Rectangle Swing-Top Waste Container Lid - 15 & 23 Gallon	03, 23, 69	CS	4	\$203.20
342027REC Δ	Rectangle Waste Container Recycle Lid with Bottle and Can Receptacles - 15 & 23 Gallon	14	CS	4	\$224.44

Submittal Sheet

10/03/2025

ITEM# 16 - S/S - UTILITY CHASE (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Utility Chase Approx. Size 6" X 12" to include Ceiling Trim. Fabricated per plan and specification ** Approved Shop Drawing **

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 17 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 18 - WATER FILTRATION SYSTEM, FOR ICE MACHINES (2 EA REQ'D)

3M Purification ICE190-S

(5616403) 3M™ Water Filtration Products Water Filter System, with shut-off valve & gauge, 23-5/8"H x 5"D, standard water, single vessel, max pressure of 125 psi at 100°F, 0.2 micron, 5 gpm flow rate, 54,000 gallons capacity, for cyst, bacteria, sediment, chlorine taste and odor, scale, includes: (1) integral mounting bracket and (1) o-ring seal cartridge filter, 1/2" FNPT connections, NSF certified (for ice machines - cubers up to 2170 lbs, flakers up to 3593 lbs: Manitowoc I 1800, 1802, 1803, 1804, 1805, 1809, 1872, 1874, 1890, 1892, 1894, 2176, Scotsman 1848, 2148, Hoshizaki KM 1601, 1900, 2000, Ice-O-Matic ICE 1506, 1806, 1807, 2106, 2107)

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/8"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

3M™ Water Filtration Products

SPEC# _____

application: **ICE**

QUANTITY _____

models:

ICE190-S/ICE195-S

3M Models ICE190-S and ICE195-S single cartridge water filtration systems help provide consistent high quality water for commercial ice by reducing the effects of particulate, chlorine taste and odor and scale at flow rates up to 5 gpm (18.9 lpm). Built-in scale inhibition reduces the ability of calcium and magnesium to precipitate on the evaporator plates as hard scale.

- **ICE190-S** combines chlorine taste and odor reduction with cyst, bacteria¹ and particulate reduction, while reducing the effects of chlorine corrosion and scale for up to 54,000 gallons (204,412 liters).
- **ICE195-S** combines chlorine taste and odor reduction with particulate reduction from higher turbidity water, while reducing the effects of chlorine corrosion and scale for up to 54,000 gallons (204,412 liters).

PRODUCT BENEFITS

- Effectively reduces particulate and chlorine taste and odor for better equipment protection and clearer, great tasting ice.
- Revolutionary **Integrated Membrane Pre-Activated Carbon Technology ("IMPACT")** dual-zone media cartridge construction combines a membrane in series with premium activated carbon to provide superior throughput and cartridge life.
- Built-in bacteria inhibitor intended to reduce fouling of media (HF90-S replacement cartridge).
- Certified by NSF to Standard 53 for cyst reduction (HF90-S replacement cartridge).
- NSF Standard 42 and/or FDA CFR-21 compliant materials.
- Reduction of up to 99.99% of common water-borne heterotrophic bacteria by membrane filtration as tested by 3M Purification Inc. (HF90-S replacement cartridge).
- Built-in scale inhibitor reduces lime scale build-up on evaporator plates as tested by 3M Purification Inc.
- Sanitary Quick Change (SQC) encapsulated cartridge design allows for fast and easy cartridge change-outs with a 1/4 turn.
- 1/2" FNPT horizontal inlet and outlet ports allow direct or easily adaptable connections to existing plumbing lines.

PRODUCT SPECIFICATIONS

Model Number	Part Number	Reduction Claims	Nominal Micron Rating	Capacity	Service Flow Rate	Application	Replacement Cartridge	Sizing
ICE190-S	56164-03	Cyst, Bacteria ¹ , Particulate, Chlorine Taste and Odor, Scale ²	0.2 ³	54,000 gallons (204,412 liters)	5 gpm (18.9 lpm)	Most Standard Water	HF90-S: 56135-05	Low Flow Cubers to 1,450 lbs. (658 kg) High Flow Cubers to 1,000 lbs. (454 kg) Flakers to 2,400 lbs. (1,089 kg)
ICE195-S	56164-04	Particulate, Chlorine Taste and Odor, Scale ²	3.0	54,000 gallons (204,412 liters)	5 gpm (18.9 lpm)	Higher Turbidity Water	HF95-S: 56135-09	Low Flow Cubers to 1,450 lbs. (658 kg) High Flow Cubers to 1,000 lbs. (454 kg) Flakers to 2,400 lbs. (1,089 kg)

¹As tested with either E.Coli ATCC (11229) or Pseudomonas (B) diminuta ATCC (19146)

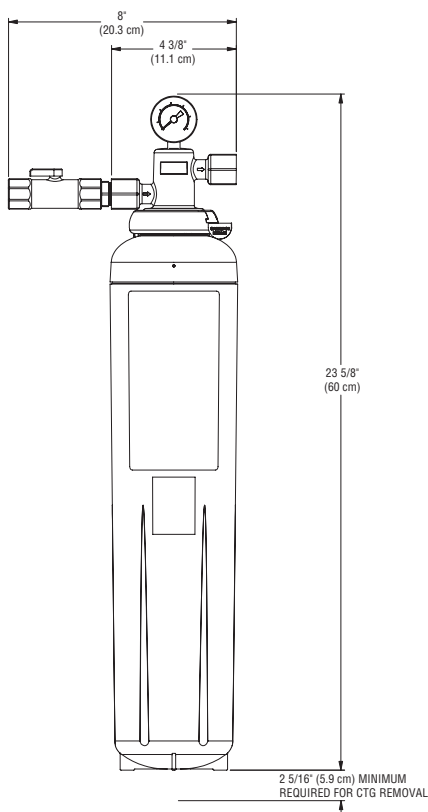
²Tested and verified by manufacturer's laboratory

³NSF Certified for Particulate, Class I



ICE190-S/ICE195-S

SPEC# _____
 QUANTITY _____
 MODEL NUMBER _____
 PART NUMBER _____



⚠ WARNING: To reduce the risk associated with the ingestion of contaminants:

- Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems certified for cyst reduction may be used on disinfected water that may contain filterable cysts. EPA Establishment #070595-CT-001

3M Purification Inc. Incorporated recommends regularly scheduled maintenance and replacement of the filter cartridge(s) in order for the product to perform as advertised/sold. 3M Purification Inc. shall not be liable for system failures due to improper maintenance.

LIMITED WARRANTY

3M Purification Inc. warrants ICE190-S/ICE195-S only to be free from defects in material and workmanship for five (5) years from the date of purchase. The disposable filter cartridge is warranted from defects in material and workmanship for a period of one (1) year from the date of purchase. This warranty does not cover failures resulting from abuse, misuse, alterations or damage not caused by 3M Purification Inc. or failure to follow installation and use instructions. No warranty is given as to the service life of any filter cartridge or membrane as it will vary with local water conditions and consumption. **3M PURIFICATION INC. MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOMER OR USAGE OF TRADE.** If the Product fails to satisfy this Limited Warranty during the warranty period, 3M Purification Inc., at its option, will replace the Product or refund your Product purchase price. This warranty does not cover labor. **The remedy stated in this paragraph is Customer's sole remedy and 3M Purification Inc.'s exclusive obligation.** For additional information, see the entire Limited Warranty located in the product Installation and Operation Instruction Manual.

Limitation of Liability: 3M Purification Inc. will not be liable for any loss or damage arising from this 3M Purification Inc. product, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability. Some states and countries do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

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 NSF is a trademark of NSF International.
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 70020194182 REV 0812B
 Please recycle. Printed in U.S.A.

PHYSICAL SPECIFICATIONS

- System includes a head assembly with pressure gauge, inlet water shut-off valve assembly, mounting bracket and a single cartridge filter.
- Inlet and outlet plumbing connections are 1/2" FNPT.
- Filter cartridges are o-ring seal type.
- System maximum operating pressure of 125 psi (862 kPa) and operating temperature of 100°F (37.8°C).
- Recommended service flow rate is up to 5 gpm (18.9 lpm).
- Filter cartridges incorporate a bacteriostatic carbon block filtration medium (HF90-S replacement cartridge) and scale inhibitor.
- System materials are NSF Standard 42 and/or FDA CFR-21 compliant.
- Cartridges are sanitary in design, requiring no contact with the filter media during cartridge change-out.
- Filter cartridges require no pre-activation.
- NSF Performance Data Sheet (PDS) is included.
- Shipping weight: 5.8 lbs. (2.6 kg) per case.
- Operating weight: 11 lbs. (5 kg) per case.
- Case quantity: 1.

IMPORTANT: INSTALLATION TIPS

These installation tips are for informational purposes only and are not intended to be used as actual installation instructions. **CAUTION: To reduce the risk associated with property damage due to water leakage:**

- **Read and follow** Use Instructions before installation and use of this system.
- Installation and use **MUST** comply with all state and local plumbing codes.
- **Protect from freezing**, remove filter cartridge when temperatures are expected to drop below 40°F (4.4°C).
- **Do not install on hot water supply lines.** The maximum operating water temperature of this filter system is 100°F (37.8°C).
- **Do not install** if water pressure exceeds 125 psi (862 kPa). If your water pressure exceeds 80 psi (552 kPa), you must install a pressure limiting valve. Contact a plumbing professional if you are uncertain how to check your water pressure.
- **Do not install** where water hammer conditions may occur. If water hammer conditions exist you must install a water hammer arrester. Contact a plumbing professional if you are uncertain how to check for this condition.
- The disposable filter cartridge **MUST** be replaced every 12 months, at the rated capacity or if a noticeable reduction in flow rate occurs.



Visit www.nsf.org for the claims associated with products that are NSF listed.



3M Purification Inc.
 400 Research Parkway
 Meriden, CT 06450 U.S.A.
 Toll Free: 866.990.9785
 Worldwide: 203.237.5541
 Fax: 203.238.8701
www.3Mfoodservice.com
www.3mpurification.com

Submittal Sheet

10/03/2025

ITEM# 19 - ICE MAKER, CUBE-STYLE (1 EA REQ'D)

Manitowoc IYT0900A

Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24-1/2"D x 26-1/2"H, production capacity up to 865 lb/24 hours at 70°/50° (750 lb AHRI certified at 90°/70°), easyTouch display with 13 different language options, date/time stamp display, automatic reminder/alert icon, one touch asset information, automatic detection of accessories, continuous operating status, programmable production options (time, weight, day or night), one touch cleaning with displayed instructions, Alpha-San anti-microbial protection, acoustical ice sensing probe, self-diagnostic technology, DuraTech™ exterior, half-dice size cubes, R410A refrigerant, NSF, cULus, CE, ENERGY STAR®

ACCESSORIES

Mfr	Qty	Model	Spec
Manitowoc	1	WARRANTY-ICE-SC	3 year parts & labor (Machine), 5 year parts & labor (Evaporator), 5 year parts & 3 years labor (Compressor), standard (nc)
Manitowoc	1		(-261) 208-230v/60/1-ph, 9.5 amps

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208-230	60	1				9.5				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/8"					
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1/2"	
2	1/2"	

PLUMBING 1 REMARKS

Ice Maker Drain

PLUMBING 2 REMARKS

Auxiliary Drain


INDIGO[®] NXT

iT0900 Ice Cube Machine

Model:

☐ IRT0900A
☐ IRT0900W

☐ IDT0900A
☐ IDT0900W

☐ IYT0900A
☐ IYT0900W


Indigo NXT Series iT0900
Ice Machine on a D570 Bin
*Ice machine and bin sold separately

Designed for operators who know that ice is critical to their business, the Indigo[®]NXT Series ice machine's preventative diagnostics continually monitor itself for reliable ice production. Improvements in cleanability and programmability make your ice machine easy to own and less expensive to operate.

- **easyTouch[®] Display** – New icon based touch screen takes the guess work out of owning and operating an ice machine.
- **Programmable Ice Production** – Now its super easy to program your ice machine to be off at certain times of the day to save money with fluctuating electrical rates. Also programmable by daily ice production volume and night time programming.
- **Easy to Clean Foodzone** – Hinged front door swings out for easy access. Removable water-trough, distribution tube, curtain, and sensing probes for fast and efficient cleaning. Select components made with AlphaSan[®] antimicrobial.
- **Intelligent Diagnostics** – provide 24 hour preventative maintenance and diagnostic feedback for trouble free operation.
- **Acoustical Ice Sensing Probe** – Unique patented technology allows for reliable operation in challenging water conditions and environments.
- **DuraTech[™] Exterior** – provides superior corrosion resistant above stainless steel. Innovative clear-coat resists fingerprints and dirt making it easier to keep clean.
- **Available LuminIce II Virus and Bacteria Inhibitor**– Controls viruses, bacteria, mold and yeast within the food zone to keep the machine cleaner longer. A new sanitation icon lets you know the operational status.
- **Active Sense** – Insures consistent ice harvest in all environmental conditions. This software and/or hardware solution works in conjunction with the acoustical ice sensing probe improving reliability and performance.



Specifications

BTU Per Hour:

12,700 (average)
14,800 (peak)

Refrigerant:

R410A CFC free

48% less Global Warming Potential

Operating Limits:

Ambient Temperature Range:
40 to 100 F (4.4 to 43.3 C)

Water Temperature Range:
40 to 90 F (4.4 to 32.2 C)

Water Pressure Ice Maker
Water In:
Min. 20 psi (137.9 kPa)
Max. 80 psi (551.1 kPa)

Condenser Water Pressure:
Min. 20 psi (137.9 kPa)
Max. 276 psi (1902.95 kPa)

Ice Machine Electric

208-230/60/1
(230/50/1 also available)

Minimum circuit ampacity:

Air-cooled: 9.5 1ph

Water-cooled: 8.8 1ph

Maximum fuse size:

Air-cooled: 15 1ph

Water-cooled: 15 1ph

Ice Shape



Half Dice
3/8" x 1 1/8" x 7/8"
(.95 x 2.86 x 2.22 cm)



Dice
7/8" x 7/8" x 7/8"
(2.22 x 2.22 x 2.22 cm)



Regular
1 1/8" x 1 1/8" x 7/8"
(2.86 x 2.86 x 2.22 cm)



iT0900 Ice Cube Machine

2110 South 26th Street
Manitowoc, WI 54220

Tel: 1.920.682.0161
Fax: 1.920.683.7589

www.manitowocice.com



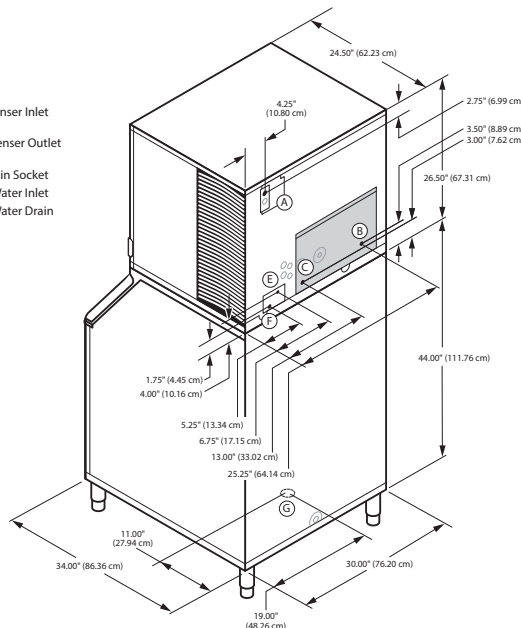
iT0900 on D-570 Storage Bin

- Ⓐ Electrical Entrance (2) Options
- Ⓑ 3/8" (0.95 cm) F.P.T. Water Condenser Inlet (water-cooled units)
- Ⓒ 1/2" (1.27 cm) F.P.T. Water Condenser Outlet (water-cooled units)
- Ⓓ 1/2" (1.27 cm) Auxiliary Base Drain Socket
- Ⓔ 3/8" (0.95 cm) F.P.T. Ice Making Water Inlet
- Ⓕ 1/2" (1.27 cm) F.P.T. Ice Making Water Drain
- Ⓖ 3/4" (1.91 cm) Bin Drain

Installation Note

Minimum installation clearance:

Top/sides: 8" (20.32 cm);
Back is 5" (12.7 cm)









Space-Saving Designs



	iT0900 D-570	iT0900 D-970
Height	76.50" 194.30 cm	76.50" 194.30 cm
Width	30.00" 76.20 cm	48.00" 121.9 cm
Depth	34.00" 86.30 cm	34.00" 86.30 cm
Bin Storage	532 lbs. 241 kgs	882 lbs. 400 kgs

Height includes adjustable bin legs 6.00" to 8.00", (15.24 to 20.32 cm) set at 6.00" (15.24 cm).
Bin capacity is based on 90% of the volume x 33 lbs/ft³ average density of ice

Specifications

		Ice Production 24 Hours					Power Usage kWh/100 lbs.@90°Air/70°F	Water Usage/100 lbs. 45.4 kgs. of Ice		ENERGY STAR®
Model		Ice Shape	70°Air/ 50°F Water		90°Air/ 70°F Water		1 Ph	Potable Water		
AIR-COOLED	IRT0900A	regular 	797 lbs	362 kg	676 lbs	307 kg	5.01	19 Gal.	71.9 L	NA
	IDT0900A	dice 	851 lbs	386 kg	695 lbs	315 kg	4.85	19 Gal.	71.9 L	★
	IYT0900A	half-dice 	865 lbs	392 kg	750 lbs	340 kg	4.58	19 Gal.	71.9 L	★
WATER-COOLED	IRT0900W	regular 	750 lbs	340 kg	665 lbs	302 kg	4.04	19 Gal.	71.9 L	NA
	IDT0900W	dice 	780 lbs	354 kg	665 lbs	302 kg	4.02	19 Gal.	71.9 L	NA
	IYT0900W	half-dice 	785 lbs	356 kg	665 lbs	302 kg	4.02	19 Gal.	71.9 L	NA
* Water-cooled Condenser Water Usage / 100 lbs. /45.4 kgs. Of Ice: 135 gal / 511 L. * Water-cooled models are excluded from ENERGY STAR qualification.										

Accessories

**LuminIce® II
Virus and Bacteria Inhibitor**
controls viruses and bacteria inside
the ice machine



Arctic Pure® Plus Water Filters

reduce sediments and
chlorine contaminants
down to .5 microns.

Use with a Pre-filter is
recommended.



IAuCS®
schedules
and performs
routine ice
machine
cleaning
automatically.



External Scoop Holder
protect the ice scoop with
the NSF
approved
versatile
scoop
holder.



2110 South 26th Street
Manitowoc, WI 54220

Tel: 1.920.682.0161
Fax: 1.920.683.7589

www.manitowocice.com
7148D_iT0900
06/22

©2022 Manitowoc. Continuing product improvement may necessitate change of specifications without notice.



50Hz

iT0900 Ice Cube Machine

Model:

☐ IRT0900A☐ IYT0900A☐ IDT0900A☐ IRT0900W

Indigo NXT Series iT0900
Ice Machine on a D570 Bin

*Ice machine and bin sold separately

Designed for operators who know that ice is critical to their business, the Indigo@NXT Series ice machine's preventative diagnostics continually monitor itself for reliable ice production. Improvements in cleanability and programmability make your ice machine easy to own and less expensive to operate.

- **easyTouch® Display**- New icon based touch screen takes the guess work out of owning and operating an ice machine.
- **Multiple Language Capability** - The easyTouch display is available in multiple languages selected in the initial start-up installation Wizard.
- **Programmable Ice Production** - Now its super easy to program your ice machine to be off at certain times of the day to save money with fluctuating electrical rates. Also programmable by daily ice production volume night time programming.
- **Easy to Clean Foodzone** - Hinged front door swings out for easy access. Removable water-trough, distribution tube, curtain, and sensing probes for fast and efficient cleaning. Select components made with AlphaSan® antimicrobial.
- **Intelligent Diagnostics** - provide 24 hour preventative maintenance and diagnostic feedback for trouble free operation.
- **Acoustical Ice Sensing Probe** - Unique patented technology allows for reliable operation in challenging water conditions and environments.
- **Available LuminIce II Virus and Bacteria Inhibitor**- Controls viruses, bacteria, mold and yeast within the food zone to keep the machine clean longer. A new sanitation icon lets you know the operational status.
- **Active sense** - insures consistent ice harvest in all environmental conditions. This software and/or hardware solution works in conjunction with the acoustical ice sensing probe improving reliability and performance.

Ice Machine Electric

230/50/1

Minimum circuit ampacity:

Air-cooled: 14 1ph
Water-cooled: 13.3 1ph
Remote: 15.6 1ph

Maximum fuse size:

Air-cooled: 20 1ph
Water-cooled: 20 1ph
Remote: 25 1ph

Specifications

BTU Per Hour:
16,200 (average),
and 19,100 (peak)

Refrigerant:

R410A CFS - Free
Lowers global warming
by 48%

Operating Limits:

- Ambient Temperature Range:
40 to 110 F (4.4 to 43.3 C)
Water Temperature Range:
40 to 90 F (4.4 to 32.2 C)
- Potable Water Pressure:
Min. 20 psi (137.9 kPa)
Max. 80 psi (551.1 kPa)
- Condenser Water Pressure:
Min. 20 psi (137.9 kPa)
Max. 276 psi (1902.95 kPa)

Ice Shape



Half Dice
3/8" x 1 1/8" x 7/8"
(.95 x 2.86 x 2.22 cm)
Cube weight 5.7 g



Dice
7/8" x 7/8" x 7/8"
(2.22 x 2.22 x 2.22 cm)
Cube weight 8.5 g



Regular
1 1/8" x 1 1/8" x 7/8"
(2.86 x 2.86 x 2.22 cm)
Cube weight 14.2 g



Welbilt Deutschland GmbH
Auf der Weh 11
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Tel.: +49 27 72 58 050
welbilt.com.de

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Montcada i Reixac
Barcelona, Spain
Tel.: +34 902 20 10 69
welbilt.com.es

Welbilt UK
Ashbourne House The Guildway,
Old Portsmouth Rd Guildford GU3
1LR United Kingdom
Tel.: +44 1483 464900
www.welbilt.uk



iT0900 Ice Cube Machine



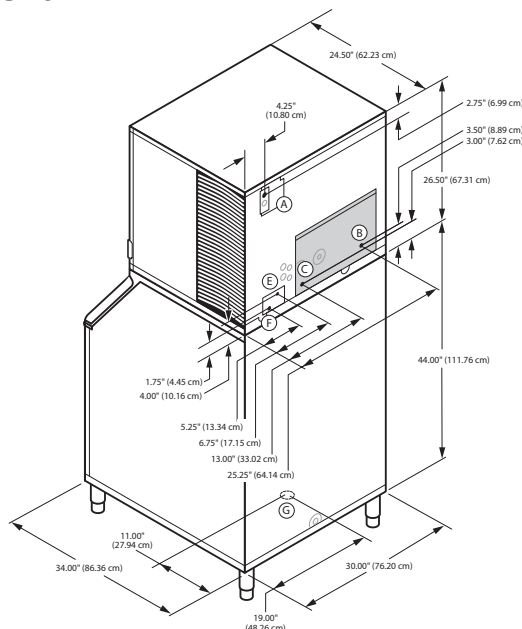
50Hz

iT0900 on D-570 Storage Bin

Installation Note

Minimum installation clearance:

Top/sides: 8" (20.32 cm); Back is 5" (12.7 cm)



Space-Saving Designs



	iT0900 D-570	iT0900 D-970
Height	76.50" 194.30 cm	76.50" 194.30 cm
Width	30.00" 76.20 cm	48.00" 121.9 cm
Depth	34.00" 86.30 cm	34.00" 86.30 cm
Bin Storage	532 lbs. 241 kgs	822 lbs. 400 kgs

Height includes adjustable bin legs 6.00" to 8.00", (15.24 to 20.32 cm) set at 6.00" (15.24 cm).
Bin capacity is based on 90% of the volume x 33 lbs/ft³ average density of ice

Specifications

		Ice Production 24 Hours				Power Usage kWh/ 45.4 kgs /100 lbs. @ 32°Air / 21°C Water 90°Air/70°F Water	Water Usage/100 lbs. 45.4 kgs. of Ice	
		Model	Ice Shape	21°Air / 10°C water 70°Air/ 50°F Water	32°Air / 21°C Water 90°Air/ 70°F Water	1 Ph	Potable Water	
AIR-COOLED		IRT0900A	regular	765 lbs 347 kg	662 lbs 300 kg	4.62	19 Gal.	71.9 L
		IDT0900A	dice	840 lbs 381 kg	688 lbs 312 kg	4.61	19 Gal.	71.9 L
		IYT0900A	half-dice	833 lbs 378 kg	741 lbs 336 kg	4.59	19 Gal.	71.9 L
WATER-COOLED		IRT0900W	regular	735 lbs 333 kg	650 lbs 295 kg	4.57	19 Gal.	71.9 L
* Water-cooled Condenser Water Usage / 100 lbs. /45.4 kgs. Of Ice: 145 gal / 549 L .								

Order ice storage bin separately. Ice storage bin and JCF900 remote condenser must be ordered separately. Consult remote condenser specification sheet for details.
This product is hermetically sealed and contains fluorinated greenhouse gas R410A

Accessories

LuminIce® II Virus and Bacteria Inhibitor

controls viruses and bacteria inside the ice machine.



External Scoop holder

protect the ice scoop with the NSF approved versatile scoop holder.



Arctic Pure® Plus Water Filters

reduce sediments and chlorine contaminants down to .5 microns. Use with a Pre-filter is recommended.



Welbilt reserves the right to make changes to the design or specifications without prior notice.

Welbilt Deutschland GmbH
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D - 35745 Herborn, Germany
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welbilt.com.es

Welbilt UK
Ashbourne House The Guildway,
Old Portsmouth Rd Guildford GU3
1LR United Kingdom
Tel.: +44 1483 464900
www.welbilt.uk



6642C_50Hz 10/2021



ICE MACHINE WARRANTY

Manitowoc Ice, Inc. (hereinafter referred to as the "COMPANY") warrants for a period of thirty-six months from the installation date (except as limited below) that new ice machines manufactured by the COMPANY shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the COMPANY and upon proper installation and start-up in accordance with the instruction manual supplied with the ice machine. The COMPANY'S warranty hereunder with respect to the compressor shall apply for an additional twenty-four months, excluding all labor charges, and with respect to the evaporator for an additional twenty-four months, including labor charges.

The obligation of the COMPANY under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the opinion of the COMPANY are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the COMPANY, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the ice machine, or shipping are the responsibility of the owner, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by a COMPANY Contracted Service Representative or a refrigeration service agency as qualified and authorized by the COMPANY'S local Distributor. The COMPANY'S liability under this warranty shall in no event be greater than the actual purchase price paid by customer for the ice machine.

The foregoing warranty shall not apply to (1) any part or assembly that has been altered, modified, or changed; (2) any part or assembly that has been subjected to misuse, abuse, neglect, or accidents; (3) any ice machine that has been installed and/or maintained inconsistent with the technical instructions provided by the COMPANY; or (4) any ice machine initially installed more than five years from the serial number production date. This warranty shall not apply if the Ice Machine's refrigeration system is modified with a condenser, heat reclaim device, or parts and assemblies other than those manufactured by the COMPANY, unless the COMPANY approves these modifications for specific locations in writing.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

In no event shall the COMPANY be liable for any special, indirect, incidental or consequential damages. Upon the expiration of the warranty period, the COMPANY'S liability under this warranty shall terminate.

The foregoing warranty shall constitute the sole liability of the COMPANY and the exclusive remedy of the customer or user. To secure prompt and continuing warranty service, the warranty registration card or register on line within five (5) days from the installation date.

MANITOWOC ICE, INC.

2110 So. 26th St., P.O. Box 1720, Manitowoc, WI 54221-1720

Telephone: 920-682-0161 • Fax: 920-683-7585

Web Site - www.manitowocice.com

Form 80-0373-3 Rev. 01/02

Submittal Sheet

10/03/2025

ITEM# 20 - ICE BIN FOR ICE MACHINES (1 EA REQ'D)

Manitowoc D570

Ice Bin, 30"W x 34"D x 50"H, with side-hinged front-opening door, side grips, 532 lbs. application capacity, AHRI certified 17.9 cu. ft., for top-mounted ice maker, Duratech exterior, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Manitowoc	1	WARRANTY-BIN/DISP	3 year parts & labor warranty, standard (nc)
Manitowoc	1		Legs, 6" adjustable stainless steel, standard

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/4"	



Ice Storage Bins

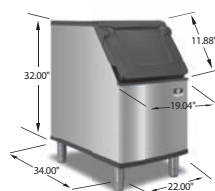
Ice Storage Bins

Model

☐ D320 ☐ D400 ☐ D420 ☐ D570 ☐ D970

D Bins

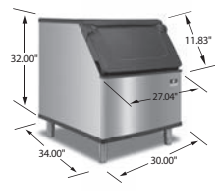
.75" (1.90 cm) Bin drain



D320
264 lbs. (120 kgs)



D570
532 lbs. (241 kgs)



D400
365 lbs. (166 kgs)



D970
882 lbs (400 kgs)



D420
383 lbs. (174 kgs)



Ergonomic NSF approved
sanitary ice scoop included

D Bin Features

New Sanitary Scoop Ergonomic NSF approved sanitary ice scoop included with each bin. Built-in knuckle and thumb guard. Unique molded retaining lip allows maximum scooping every time. Per scoop capacity approximately 5.3/ lbs (2.4 kg)

Scoop Holder options New built-in scoop holder, keeps the ice scoop handle above the ice, or purchases the optional NSF approved External Scoop Holder Kit # K00461.

New Door design Clever built in side grips allow you to lift the bin door from anywhere you are standing (left, right or center) even when you have just one hand free.

Foamed Insulated Door

Insulates the ice bin, reduces sweat on the door, helps keep ice lasting longer.

Stay up door Unique cammed bin door self-latch keeps the door in the open position and keeps the employee safe when scooping ice.

Ergonomic Door design Door is angled 53 degrees to allow for easier access to the ice in the bin especially when scooping from the bottom.

Duratech Metal Finish Manitowoc exterior material has better corrosion resistance than stainless steel, is smudge resistant and easy to keep clean.

New Bin liner Polyurethane Artic Blue bin liner accentuates the crisp clear ice from a Manitowoc Ice Machine.

Warranty

Bin & Accessories: 3 Year Parts & Labor.

D Bin Model	D-Bin Capacities				D-Bin Dimensions					
	*Application Capacity		**2018 AHRI Capacity		Height		Width		Depth	
	lbs.	kgs	Cu. ft	Cu. M	in.	cm	in.	cm	in.	cm
D320	264	119.90	8.9	0.25	38	96.5	22	55.9	34	86.4
D420	383	173.79	12.9	0.37	50	127	22	55.9	34	86.4
D400	365	165.70	12.3	0.35	38	96.5	30	76.2	34	86.4
D570	532	241.14	17.9	0.51	50	127	30	76.2	34	86.4
D970	882	400.11	29.7	0.84	50	127	48	121.9	34	86.4

*Application Capacity based on 90% of the total volume x 33 lbs/ ft³ average density of ice. Ice must be managed

***2018 AHRI certified measurement for bin capacity

Above bin heights include leg height of 6" / 15.24 cm
All bins include a sanitary plastic scoop and one set of adjustable legs chrome legs (6-7.75in/15.24-20.32cm).
External Scoop holder order separately Kit # K00461
Metal Scoop order separately Kit # K00463



Manitowoc Ice reserves the right to make changes to the design or specifications without prior notice.

2110 South 26th Street
Manitowoc, WI 54220

Tel: 1.920.682.0161
Fax: 1.920.683.7589

www.manitowocice.com
6453E
6/22



D Bins

Indigo Ice Machines Series												
Machine			iT420	iT620	iT0300	iT450	iT0500 &iF0500N	iF0600N, iF0600C, iT0750	iF0900N, iT0900, iF0900C	iT1200, iT1200C	iF1400C, iF1800C	iT1500, iT1900
Machine Capacity @90/70 F			375	465	240	378	440	555, 530	710, 714	950, 1000	1200 1470 1600	1360 1455
Bins	Bin Cap	Width	22"	22"	30"	30"	30"	30"	30"	30"	30"	48"
D320	264	22"	*	*								
D420	383	22"	*	*								
D400	365	30"	K00472	K00472	*	*	*	*	NR	NR	NR	
D570	532	30"	K00472	K00472	*	*	*	*	*	*	NR	
D970	882	48"	NR	NR	NR	K00470	K00470	K00470	K00470	K00470	K00471 + K00470	*

Manitowoc Flaker and Nugget Machines											
		Machine	RNP0320	RFP0320	RNP0620	RFP0620	RNF1020	RFF1220C	RNF1100	RFF1300 & RNF2000C	RFF2200C
Machine cap			251	286	451	540	825	958	825	874	1702
Bins	Bin cap	Width	22"	22"	22"	22"	22"	22"	30"	30"	36.7"
D320	264	22"	*	*	NR	NR	NR	NR			
D420	383	22"	*	*	*	*	NR	NR			
D400	365	30"	K00472	K00472	K00472	K00472	NR	NR	NR	NR	
D570	532	30"	NR	K00472	K00472	K00472	NR	NR	*	*	
D970	882	48"	NR	NR	K00473	K00473	K00473 if 2 used.	K00473 if 2 used.	K00470	K00470	K00470

An optional adapter is required when putting a narrower ice machine on a wider bin.

* No adapter is needed

NR= Not Recommend. Bin too small or too large for application.

Putting a wider machine on narrower bin is not an option.

Machines side by side must be water cooled, remote, or use a top air discharge for self-contained air cooled.

Application Bin Capacity shown in lbs using the AHRI rating based on 90% of total volume x 33 lbs/ft³ average density of ice.

Machine capacity shown in lbs/24hrs using the AHRI rating base at 90F ambient, 70F water temperature

Ice Storage Bins

Available Accessories

See price book for replacement: scoops, legs, specialty legs and casters

K00146 Convenient Ice Bagger

Includes bagger, D-bin adapter, and 250 bags and ties (Not for D320 or D400) Order K00068 replacement bags



K00461 External Scoop Holder

NSF approved. Can be mounted on the left or right side of bins, horizontally or vertically or on a wall.



K00463 Metal Scoop

Indestructible NFS approved aluminum alloy with sanitary knuckle and thumb guard. Works with K00461 external scoop holder or hangs inside the D-Bin series. Limited life time guarantee.



K00462 Secure Fastening Kit

Securely fast the Indigo NXT ice machine head to the pre-drilled inserts on the back of the D-bin series. Stainless steel flanged feet attach to bin and can be screwed to the floor



Manitowoc Ice reserves the right to make changes to the design or specifications without prior notice.

2110 South 26th Street
Manitowoc, WI 54220

Tel: 1.920.682.0161
Fax: 1.920.683.7589

www.manitowocice.com
6453E
6/22



LIMITED WARRANTY FOR ICE STORAGE BIN & DISPENSERS

LIMITED WARRANTY

Manitowoc Ice a division of Manitowoc FSG Operations, LLC, ("Company") warrants that new Ice Storage Bins or Dispensers sold by Company shall be free of defects in material or workmanship under normal and proper use and maintenance as specified by the Company and upon proper installation and start-up in accordance with the instruction manual supplied.

WHAT IS COVERED

- Parts and Labor for a period of three (3) years.
 - Accessory Ice Transport Carts for two (2) years parts and labor.
- The Ice Storage Bin / Dispenser warranty begins on the date of the original installation. This warranty shall not apply to any Ice Storage Bin or Dispenser initially installed more than five (5) years from the serial number production date.

The obligation of the Company under this warranty is limited to the repair or replacement of parts, components, or assemblies that in the sole opinion of the Company are defective. This warranty is further limited to the cost of parts, components or assemblies and standard straight time labor charges at the servicing location.

Time and hourly rate schedules, as published from time to time by the Company, apply to all service procedures. Additional expenses including without limitation, travel time, overtime premium, material cost, accessing or removal of the Ice Storage Bin / Dispenser, or shipping are the responsibility of the purchaser, along with all maintenance, adjustments, cleaning, and ice purchases. Labor covered under this warranty must be performed by an approved Company contracted Service Representative or a refrigeration service agency as qualified and authorized by the Company's local Distributor. The Company's liability under this warranty shall in no event be greater than the actual purchase price paid by purchaser for the Ice Storage Bin or Dispenser.

EXCLUSIONS FROM COVERAGE

- Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, use of incompatible supplies or lack of specified maintenance shall be excluded.
- Normal maintenance items.
- Failures caused by adverse environmental, water conditions, or improper drainage.
- Improper or unauthorized repair.
- Any Ice Storage Bin / Dispenser that has been installed and/or maintained inconsistent with the instructions provided by the Company.
- Parts subject to damage beyond the control of Company, or to Ice Storage Bin's / Dispenser's which have been subject to accidents, damage in shipment, fire, floods, other hazards or acts of God that are beyond the control of the Company.
- This Limited Warranty shall not apply if the Ice Storage Bin / Dispenser is modified with parts and assemblies other than those manufactured by the Company, unless the Company approves these modifications for specific locations in writing prior to the commencement of such modification.

LIMITATIONS OF LIABILITY

The preceding paragraphs set forth the exclusive remedy for all claims based on failure of, or defect in, Ice Storage Bins or Dispensers sold hereunder, whether the failure or defect arises before or during the warranty period, and whether a claim, however instituted, is based on contract, indemnity, warranty, tort (including negligence), strict liability, implied by statute, common-law or otherwise, and Company and agents shall not be liable for any claims for personal injuries or consequential damages or loss, howsoever caused. Upon the expiration of the warranty period, all such liability shall terminate. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY, COMPANY DOES NOT WARRANT ANY PRODUCTS OR SERVICES OF OTHERS.

REMEDIES

The liability of Company for breach of any warranty obligation hereunder is limited to: (i) the repair or replacement of the Ice Storage Bin or Dispenser on which the liability is based, or with respect to services, re-performance of the services; or (ii) at Company's option, the refund of the amount paid for said equipment or services. Any breach by Company with respect to any item or unit of equipment or services shall be deemed a breach with respect to that item or unit or service only.

WARRANTY CLAIM PROCEDURE

Customer shall be responsible to:

- Complete and return warranty registration card or register on line within five (5) days from the installation date.
- All warranty service must be performed by an approved Manitowoc contracted or authorized Service Representative. To schedule a service appointment contact your local Manitowoc Service Representative or visit us at www.manitowocice.com to find a Service Representative near you.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the state of Wisconsin, USA, excluding their conflicts of law principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

COMPLETE AND RETAIN FOR YOUR RECORD:

Distributor/Dealer _____

Model Number _____

Serial Number _____

Installation Date _____

Manitowoc Ice
2110 South 26th Street
P.O. Box 1720
Manitowoc, WI 54221-1720
Web site: www.manitowocice.com

Submittal Sheet

10/03/2025

ITEM# 21 - FLOOR TROUGH (1 EA REQ'D)

Eagle Group ASFT-1236-SG

Anti-Splash Floor Trough, 36"W x 12"D, stainless steel subway-style grating, 6" deep trough pan with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel removable perforated basket, all-welded 14/304 stainless steel construction, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		4"



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Anti-Splash Floor Trough with stainless steel grating, model _____. Unit constructed of 14/304 stainless steel all-welded construction. Patented anti-splash design (patent #D519,618 S) assures complete drainage while preventing splash back onto the floor. Drain accommodates up to a 4"-diameter pipe and comes standard with a stainless steel removable perforated basket. Type 304 stainless steel subway style grating shall be $\frac{3}{16}$ " x 1" vertically positioned bars spaced 1" apart for ease of drainage. Two $\frac{5}{8}$ " stainless steel rods, set $2\frac{1}{4}$ " in from each edge, are welded to the bars to eliminate swaying.



anti-splash floor trough

Options / Accessories

☐ ADA-compliant grating*

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Anti-Splash Floor Troughs with Subway-Style Stainless Steel Grating

MODELS:

<input type="checkbox"/> ASFT-1218-SG	<input type="checkbox"/> ASFT-1548-SG	<input type="checkbox"/> ASFT-1884-SG
<input type="checkbox"/> ASFT-1224-SG	<input type="checkbox"/> ASFT-1560-SG	<input type="checkbox"/> ASFT-1896-SG
<input type="checkbox"/> ASFT-1230-SG	<input type="checkbox"/> ASFT-1572-SG	<input type="checkbox"/> ASFT-18120-SG
<input type="checkbox"/> ASFT-1236-SG	<input type="checkbox"/> ASFT-1584-SG	<input type="checkbox"/> ASFT-2424-SG
<input type="checkbox"/> ASFT-1248-SG	<input type="checkbox"/> ASFT-1596-SG	<input type="checkbox"/> ASFT-2430-SG
<input type="checkbox"/> ASFT-1260-SG	<input type="checkbox"/> ASFT-15120-SG	<input type="checkbox"/> ASFT-2436-SG
<input type="checkbox"/> ASFT-1272-SG	<input type="checkbox"/> ASFT-1824-SG	<input type="checkbox"/> ASFT-2448-SG
<input type="checkbox"/> ASFT-1284-SG	<input type="checkbox"/> ASFT-1830-SG	<input type="checkbox"/> ASFT-2460-SG
<input type="checkbox"/> ASFT-1296-SG	<input type="checkbox"/> ASFT-1836-SG	<input type="checkbox"/> ASFT-2472-SG
<input type="checkbox"/> ASFT-12120-SG	<input type="checkbox"/> ASFT-1848-SG	<input type="checkbox"/> ASFT-2484-SG
<input type="checkbox"/> ASFT-1524-SG	<input type="checkbox"/> ASFT-1860-SG	<input type="checkbox"/> ASFT-2496-SG
<input type="checkbox"/> ASFT-1530-SG	<input type="checkbox"/> ASFT-1872-SG	<input type="checkbox"/> ASFT-24120-SG
<input type="checkbox"/> ASFT-1536-SG		

Design and Construction Features

- Patented "anti-splash" design (patent #D519,618 S) assures complete drainage, while preventing splash back onto floor.
- 14 gauge type 304 stainless steel all-welded construction.
- Built-in pitch towards drain insures complete drainage.
- Stainless steel drain accommodates up to a 4" (102mm) diameter pipe, and features a removable perforated stainless steel basket.
- Comes with subway-style stainless steel grating, featuring $\frac{3}{16}$ " x 1" vertically positioned bars spaced 1" apart.
- Floor troughs with gray ADA-compliant grating* available. To order, add suffix "-ADA" to end of model number. Example: ASFT-1224-SG-ADA
- Custom sizes available. Consult factory for details.

* For Floor Troughs with Stainless Steel Grating, optional ADA-compliant Grating features additional stainless steel flat bars spaced 1/4" apart. ADA-compliant Grating is available in gray color only.

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA
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www.eaglegrp.com
www.eaglegrpnews.com
www.eaglegrpnews.com

For custom configuration or fabrication needs, contact our SpecFAB® Division.
Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Certifications / Approvals



AutoQuotes



Spec sheets available for viewing, printing or downloading from our online literature library at our websites

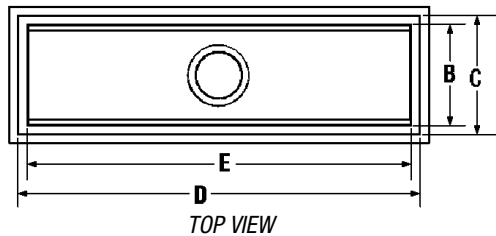
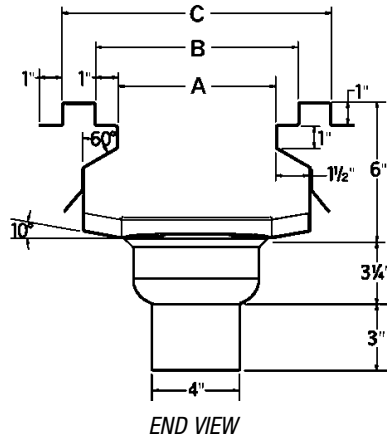
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Anti-Splash Floor Troughs with Subway-Style Stainless Steel Grating



See chart below for dimensions A through E

Grating Used in Various Floor Troughs

Floor Trough (dimension D)	Floor Trough (dimension E)	Grating Used - Quantity and Length
18" (457mm)	15" (381mm)	one 15" (381mm)
24" (610mm)	21" (533mm)	one 12" (305mm) and one 9" (229mm)
30" (762mm)	27" (686mm)	three 9" (229mm)
36" (914mm)	33" (838mm)	two 12" (305mm) and one 9" (229mm)
48" (1219mm)	45" (1143mm)	three 12" (305mm) and one 9" (229mm)
60" (1524mm)	57" (1448mm)	four 12" (305mm) and one 9" (229mm)
72" (1829mm)	69" (1753mm)	five 12" (305mm) and one 9" (229mm)
84" (2134mm)	81" (2057mm)	six 12" (305mm) and one 9" (229mm)
96" (2438mm)	93" (2362mm)	seven 12" (305mm) and one 9" (229mm)
120" (3048mm)	117" (2972mm)	nine 12" (305mm) and one 9" (229mm)

12" (305mm)-WIDE TROUGHS
 dimension A: 7" (178mm)
 dimension B: 9" (229mm)
 dimension C: 12" (305mm)
 weight

lbs.	kg	model #
55	25.0	ASFT-1218-SG
68	30.9	ASFT-1224-SG
85	38.6	ASFT-1230-SG
100	45.4	ASFT-1236-SG
116	52.6	ASFT-1248-SG
168	76.2	ASFT-1260-SG
174	78.9	ASFT-1272-SG
180	81.7	ASFT-1284-SG
185	83.9	ASFT-1296-SG
231	104.8	ASFT-12120-SG

15" (381mm)-WIDE TROUGHS
 dimension A: 10" (254mm)
 dimension B: 12" (305mm)
 dimension C: 15" (381mm)
 weight

lbs.	kg	model #
n/a	n/a	n/a
73	33.1	ASFT-1524-SG
82	37.2	ASFT-1530-SG
105	47.6	ASFT-1536-SG
147	66.8	ASFT-1548-SG
189	85.7	ASFT-1560-SG
196	88.9	ASFT-1572-SG
203	92.1	ASFT-1584-SG
245	111.1	ASFT-1596-SG
266	120.7	ASFT-15120-SG

18" (457mm)-WIDE TROUGHS
 dimension A: 13" (330mm)
 dimension B: 15" (381mm)
 dimension C: 18" (457mm)
 weight

lbs.	kg	model #
n/a	n/a	n/a
105	47.6	ASFT-1824-SG
122	55.4	ASFT-1830-SG
146	66.2	ASFT-1836-SG
177	80.3	ASFT-1848-SG
202	91.6	ASFT-1860-SG
215	97.5	ASFT-1872-SG
220	99.8	ASFT-1884-SG
249	113.0	ASFT-1896-SG
301	136.5	ASFT-18120-SG

24" (610mm)-WIDE TROUGHS
 dimension A: 19" (483mm)
 dimension B: 21" (533mm)
 dimension C: 24" (610mm)
 weight

lbs.	kg	model #
n/a	n/a	n/a
113	51.3	ASFT-2424-SG
166	75.3	ASFT-2430-SG
199	90.3	ASFT-2436-SG
213	96.6	ASFT-2448-SG
227	103.0	ASFT-2460-SG
255	115.7	ASFT-2472-SG
269	122.0	ASFT-2484-SG
307	139.3	ASFT-2496-SG
389	176.5	ASFT-24120-SG

dimension D		dimension E	
in.	mm	in.	mm
18"	457	15"	381
24"	610	21"	533
30"	762	27"	686
36"	914	33"	838
48"	1219	45"	1143
60"	1524	57"	1448
72"	1829	69"	1753
84"	2134	81"	2057
96"	2438	93"	2362
120"	3048	117"	2972

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

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Rev. 05/23

Spec sheets available for viewing, printing or downloading from our online literature library at our websites

Although every attempt has been made to ensure the accuracy of the information provided, we cannot be held responsible for typographical or printing errors. Information and specifications are subject to change without notice. Please confirm at time of order.

Submittal Sheet

10/03/2025

ITEM# 22 - DECK MOUNT FAUCET (1 EA REQ'D)

T&S Brass B-1141-CR

Faucet Workboard, swivel, deck mount, 11-3/8" long, gooseneck, 4" centers, lever handles, cerama cartridges, check valves, includes: lock washer (014200-45), 2.2 GPM aerator, low-lead, polished chrome, 1/2" male NPT, ADA Compliant, ANSI, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
T&S Brass	1	B-1100-KIT	24" Inlet Supply Hoses (3/8" Compression x 1/2" NPSM Female)

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-1141-CR

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com


ADA Compliant

This Space for Architect/Engineer Approval

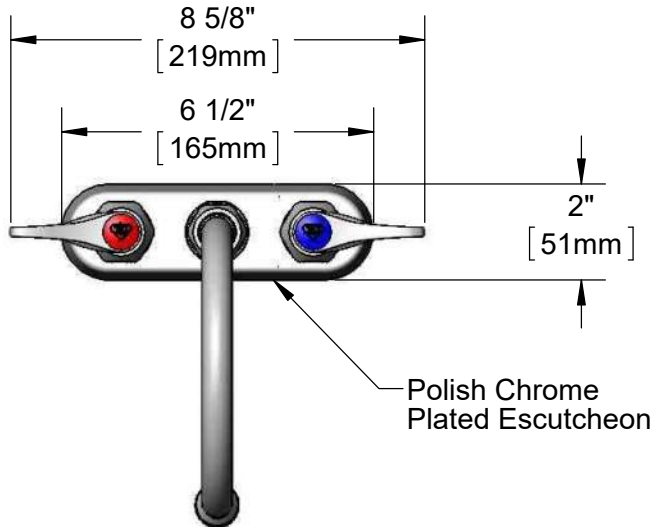
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

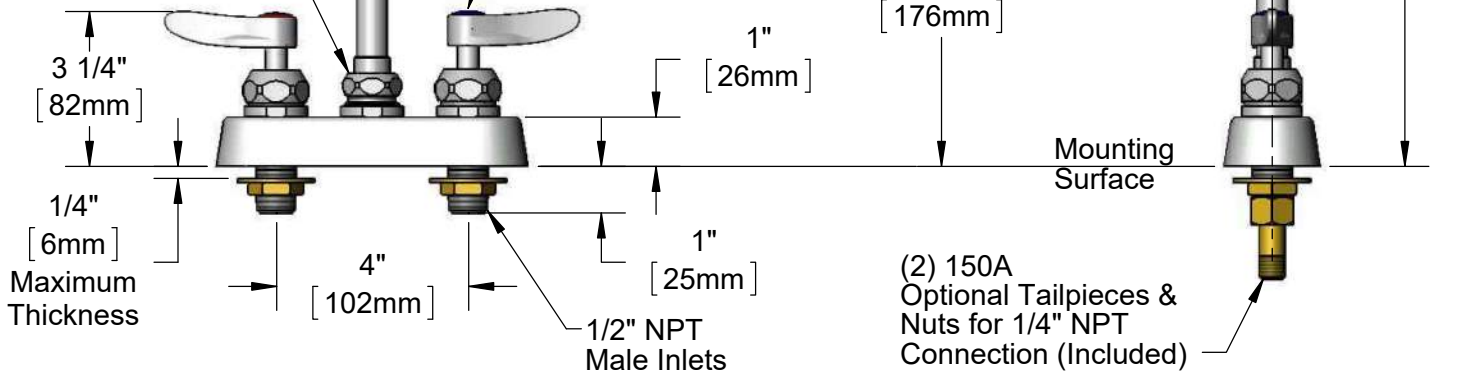
Architect/Engineer _____



133X-A22
6" Swivel Gooseneck
w/ 2.2 GPM Aerator

Swivel Joint
Converts to Rigid
w/ 014200-45
Lock Washer
(Included)

Quarter-Turn Cerama
Cartridges w/ Checks
Valves & Lever Handles
w/ Color Coded Indexes



(2) 150A
Optional Tailpieces &
Nuts for 1/4" NPT
Connection (Included)

Rough-In Requirement:
(2) \varnothing 1" [25mm] Mounting Holes

Product Specifications:

4" Deck Mount Workboard Faucet, Quarter-Turn Cerama Cartridges w/ Check Valves, Lever Handles, 6" Swivel Gooseneck, 2.2 GPM Aerator & 1/2" NPT Male Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: DMH Checked: JRM Approved: JHB Date: 06/01/16

Scale: 1:4 Sheet: 1 of 2



T&S BRASS AND BRONZE WORKS, INC.

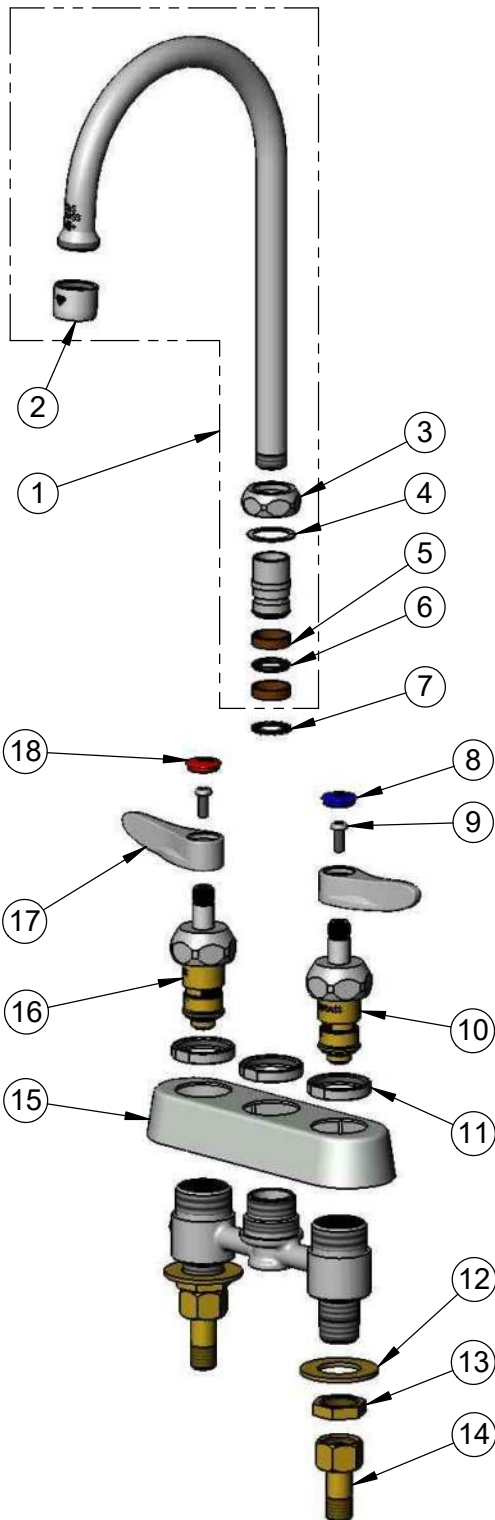
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.

B-1141-CR

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	133X-A22	6" Swivel Gooseneck w/ 2.2 GPM Aerator
2	B-0199-01	2.2 GPM Aerator, 55/64"-27 UN Female
3	019360-40	Swivel Nut (New Style)
4	009538-45	Swivel Washer
5	011429-45	Swivel Sleeves (2)
6	001074-45	O-Ring
7	014200-45	Star Washer, Anti-Rotation
8	019363-45	Blue Button Index, Press-in
9	000925-45	Lab Handle Screw
10	019385-40	Quarter-Turn New Style Cerama Cartridge w/ Check Valve, LTC
11	019376-40	Escutcheon Lock Nut
12	000999-45	Brass Lock Washer
13	002954-45	Shank Lock Nut
14	150A	1/4" NPT Tailpiece & Nut
15	019374-40	B-1110 Eterna Workboard Escutcheon
16	019384-40	Quarter-Turn New Style Cerama Cartridge w/ Check Valve, RTC
17	019362-45	Lever Handle (New Style)
18	019364-45	Red Button Index, Press-in

Product Specifications:

4" Deck Mount Workboard Faucet, Quarter-Turn Cerama Cartridges w/ Check Valves, Lever Handles, 6" Swivel Gooseneck, 2.2 GPM Aerator & 1/2" NPT Male Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: DMH

Checked: JRM

Approved: JHB

Date: 06/01/16

Scale: NTS

Sheet: 2 of 2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-1100-KIT

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



1/2" NPSM
Female



9/16-24 UN Female
(3/8" Compression)


Product Specifications:

24" Flexible Stainless Steel Supply Hoses w/ Swivel Fittings & Integral Washers

Product Compliance:

NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: KJG

Checked: LSA

Approved: JHB

Date: 07/26/21

Scale: 1:2

Sheet: 1 of 1

Submittal Sheet

10/03/2025

ITEM# 23 - S/S - HAND SINK (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Hand Sink Included in or part of Item # 27 Fabricated per plan and specification ** Approved
Shop Drawing **

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 24 - NIC BY OWNER - SOAP & TOWEL DISPENSER (3 EA REQ'D)

NIC BY OWNER

Soap and Towel Dispenser

<NIC>

Submittal Sheet

10/03/2025

ITEM# 25 - WALL / SPLASH MOUNT FAUCET (1 EA REQ'D)

T&S Brass B-0231

Sink Mixing Faucet, wall mount, 8" centers, 12" swing nozzle, lever handles, quarter-turn Eterna cartridges, 1/2" NPT female inlets, low lead, ADA Compliant

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0231

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ADA Compliant

This Space for Architect/Engineer Approval

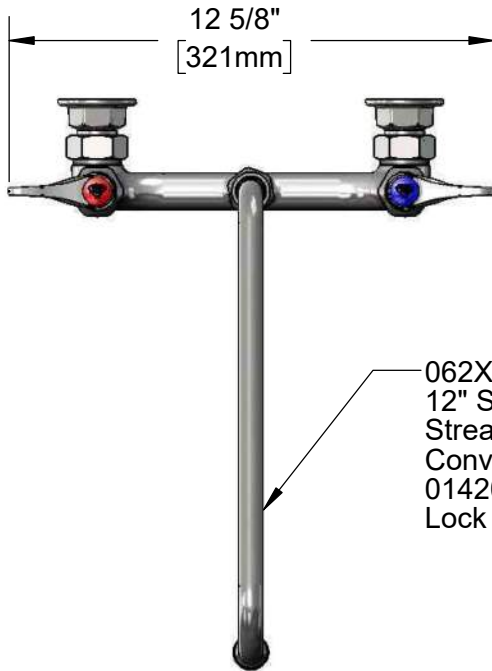
Job Name _____ Date _____

Model Specified _____ Quantity _____

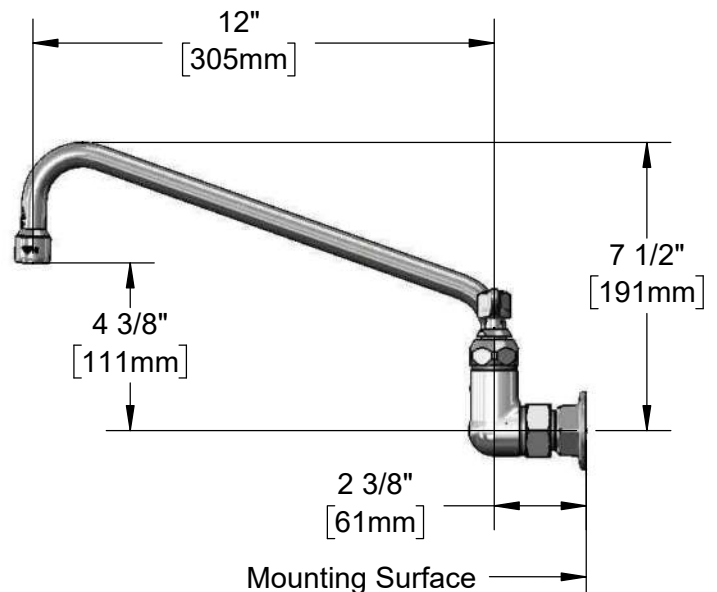
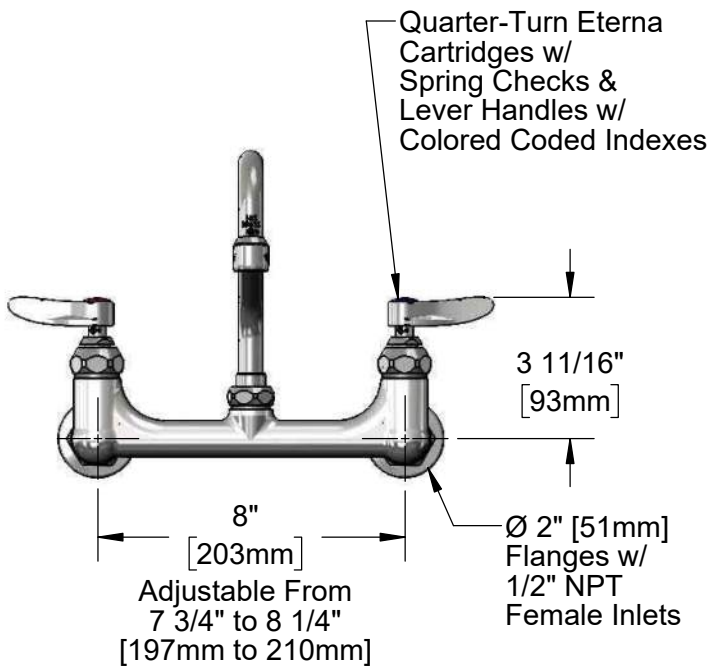
Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



062X
12" Swing Nozzle w/
Stream Regulator Outlet
Converts to Rigid w/
014200-45
Lock Washer (Included).



Product Specifications:

8" Wall Mount Mixing Faucet w/ Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 12" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)



T&S BRASS AND BRONZE WORKS, INC.

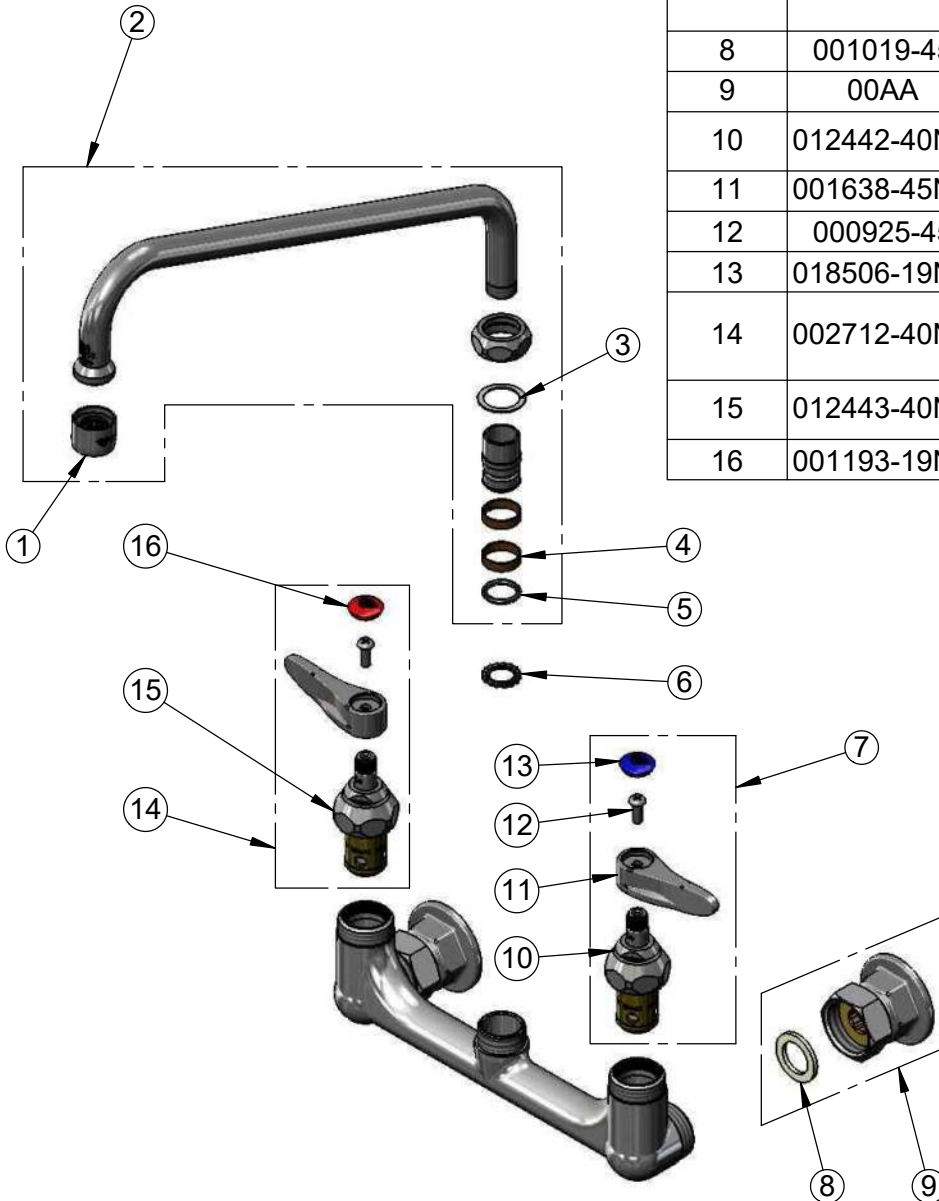
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0231

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ITEM NO.	SALES NO.	DESCRIPTION
1	B-PT	Full Flow Stream Regulator, 55/64-27
2	062X	12" Swing Nozzle
3	009538-45	Swivel Washer
4	011429-45	Swivel Sleeves (2)
5	001074-45	O-Ring
6	014200-45	Star Washer, Anti-Rotation
7	002711-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Blue Index & Screw, LTC
8	001019-45	Coupling Nut Washer
9	00AA	1/2" NPT Female Eccentric Flange
10	012442-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, LTC
11	001638-45NS	Lever Handle (New Style)
12	000925-45	Lab Handle Screw
13	018506-19NS	Blue Button Index, Press-in
14	002712-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Red Index & Screw, RTC
15	012443-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, RTC
16	001193-19NS	Red Button Index, Press-in

Product Specifications:

8" Wall Mount Mixing Faucet w/ Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 12" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: MRC

Checked: JRM

Approved: JHB

Date: 01/22/18

Scale: NTS

Sheet: 2 of 2

Submittal Sheet

10/03/2025

ITEM# 26 - S/S - DOUBLE WALLSHELF (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Double Wall Shelf Approx. Size 12" X 10'-3" Fabricated per plan and specification **

Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 27 - S/S - PREP TABLE W/SINKS (2) (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Prep Table w/Sinks (2) Approx. Size 27" X 12'-3" Fabricated per plan and specification **

Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 28 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 29 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 30 - FIRE SUPPRESSION SYSTEM (1 EA REQ'D)

Captive-Aire TANK SYSTEM

Fire Suppression System

ACCESSORIES

Mfr	Qty	Model	Spec
Captive-Aire	1		ELECTRICAL SYSTEM
Captive-Aire	1		FACTORY SERVICES

Submittal Sheet

10/03/2025

ITEM# 31 - EXHAUST HOOD CONTROLS (1 EA REQ'D)

Captive-Aire CUSTOM

INLCUED IN ITEM 30

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 32 - S/S - WALL FLASHING (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Wall Flashing to Include Joiner Strips and J Channel. Fabricated per plan and specification. **
Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 33 - EXHAUST HOOD (TYPE 1) W/PSP (1 EA REQ'D)

Captive-Aire CUSTOM

Exhaust Hood with (PSP) Perforated Supply Plenum. Refer to Shop Drawing.

Submittal Sheet

10/03/2025

ITEM# 33.1 - S/S -HOOD ENCLOSURES (1 EA REQ'D)

S/S FAB CUSTOM

Custom S/S Hood Enclosure Panels w/1-LOT Knuckle
Seams Where It Occurs.

(Size: 5'-6" W x 15'-0" L x 1'-0"H)

Submittal Sheet

10/03/2025

ITEM# 34 - MAKE-UP AIR SYSTEM (1 EA REQ'D)

Captive-Aire CUSTOM

Refer to Shop Drawing.

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 35 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 36 - CONVECTION OVEN, GAS (1 EA REQ'D)

Garland Commercial Ranges MCO-GS-20M

Master Series Convection Oven, gas, double-deck, standard depth 41-1/2", (2) speed fan, 4.3" easyTouch digital control with simple Press&Go, Cook 'n' Hold, timers, & recipe functions, dependent 60/40 doors with windows, stainless steel front, sides & top, porcelain cavity, 24" cooking cavity height, with (6) chrome plated oven racks on 13-position rack guides, 6-1/2" legs, EnerLogic Technology, 120,000 BTU (Garland), UL, cUL, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Garland Commercial Ranges	1		(2) year limited parts & (1) year labor warranty, Door warranty (5) year limited parts except window, covers products purchased and installed in the USA & Canada only, standard
Garland Commercial Ranges	1		Gas type to be specified
Garland Commercial Ranges	1		NOTE: Contact factory for other connection options
Garland Commercial Ranges	1		(2) 120v/60/1-ph, 9.8 amps, NEMA 5-15P (3/4 HP motor), standard
Garland Commercial Ranges	1		Top Oven: Stainless steel enclosed back
Garland Commercial Ranges	1		Bottom Oven: Stainless steel enclosed back
Garland Commercial Ranges	1		NOTE: Contact factory for other connection options
Dormont	2	16100BPQ2SR48	Dormont Blue Hose™ Moveable Gas Connector Hose Assembly, 1" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, 1 SnapFast® QD, 2 Swivel MAX®, coiled restraining cable with hardware, 295,000 BTU/hr minimum flow capacity, limited lifetime warranty

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	9.8		3/4		
2	120	60	1	Cord & Plug		5-15P	9.8		3/4		

ELECTRICAL 1 REMARKS

Top Oven

ELECTRICAL 2 REMARKS

Bottom Oven

GAS

	SIZE	MBTU	KW
1	3/4"	120	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

GARLAND®

Master Gas Convection Oven easyTouch® Control

Project _____
 Item _____
 Quantity _____
 CSI Section 11400
 Approved _____
 Date _____

Models

- MCO-GS-10M
- MCO-GS-20M
- MCO-GD-10M
- MCO-GD-20M



Model MCO-GS-10M

Standard Features Warranty

- EasyTouch® screen design with simple on/off switch and intuitive Press and Go interface
- Master 4.3" Controller with 150°F (66°C) to 500° (260°C) temperature range
- Cook'n'Hold
- Direct spark with 100% safety shut off
- 2-speed fan control (high & low) with .6
- HP fan motor
- Total of 60,000 BTU (17.6 kW) loading per oven cavity
- Natural or propane gas
- Stainless steel front, sides, top, and legs
- 60/40 dependent door design with double pane thermal window in both doors and interior lighting
- Full Length, stainless steel positive door closure
- Patented "Safety Door System"
- Porcelain enameled oven interior with coved corners
- 24" cooking cavity height w/6 chrome-plated oven racks on 13-position rack guides
- Double deck models available, suffix -20M
- Deep depth models available, prefix MCO-GD

- 2-year limited part & 1 year labor warranty (USA & Canada only)
- 2-year limited part & labor warranty (USA Kindergarten to grade 12 schools only)
- 5 year limited door warranty, excluding window (USA & Canada only)

Options & Accessories

- 80,000 BTU (23.4kW) burner package (natural gas)
- Stainless steel solid door or doors (specify) – No Charge
- Removable stainless steel drip pan
- Deck Fasteners
- Extra oven racks
- Swivel casters, (4) w/front brakes
- 4 Low profile casters, w/front brakes (double ovens only)
- Stainless steel open base with rack guides and shelf
- Direct connect vent
- Back enclosure (stainless steel)
- 3/4" gas flex hose & quick disconnect
- 208 or 240 volt, single phase motor (please specify)
- 50 cycle components
- Maximum security package available, contact factory for details

Specifications

Garland Master Full-Size Standard Depth, prefix MCO-GS or Deep Depth, prefix MCO-GD, gas convection oven.

60,000 BTU (17.6 kW)/cavity, .6 HP fan motor with two speed fan control. Electronic spark ignition. Natural or propane gas.

EasyTouch™ screen.

Porcelain enameled oven interior with coved corners, Six (6) oven racks and 13-position rack guides.

All model interiors are 29" (736mm) W by 24" (610mm) H, depth is 24" (610mm) for standard depth and 28" (711mm) for deep depth.

Stainless steel front, sides, top, and legs.

60/40 dependent door design with double pane thermal window in both doors and interior lighting.

Models with suffix -20M are double deck units. Specify voltage if other than 115 volt, 60 Hz, 1 phase.

UL, CUL Gas-Fired and NSF Listed.



Master Gas Convection Oven / easyTouch® Control

Garland Commercial Ranges Ltd.
 1177 Kamato Road,
 Mississauga, Ontario
 L4W 1X4 CANADA

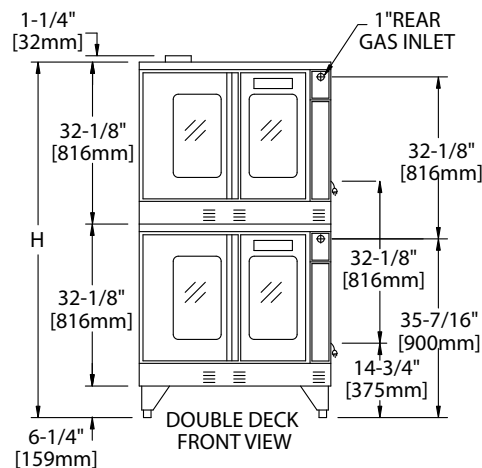
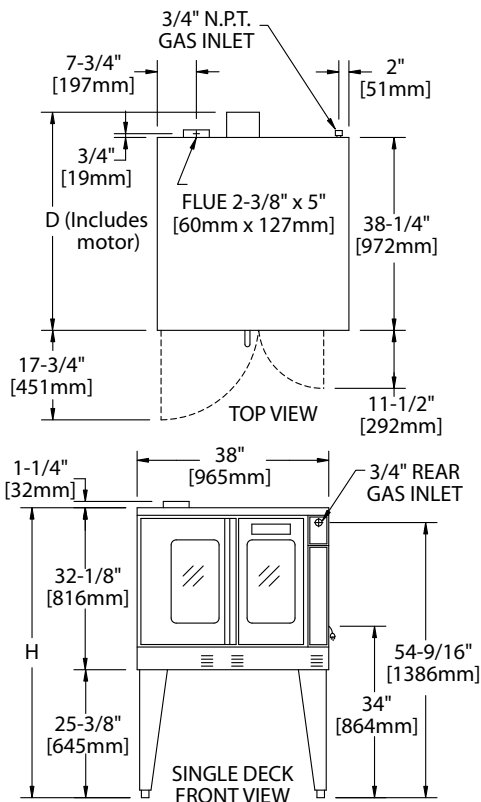
General Inquires 1-905-624-0260
 USA Sales, Parts and Service 1-800-424-2411
 Canadian Sales 1-888-442-7526
 Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
 7819B
 08/24



GARLAND®

Master Gas Convection Oven / easyTouch® Control



INSTALLATION NOTE:

Combustible Wall Clearances:

Sides: 1" (25mm) Back: 3" (76mm)

***Note:** Installations beside units with high heat sources it is recommended to leave 6" (152mm) on the right side of oven. Refer to the installation manual for more details.

Combustible Wall Clearances:

Crated: 47" (1194mm) Uncrated: 32½" (826mm)

Manifold Operating Pressure:

Natural: 4.5" WC (11 mbar) Propane: 10" WC (25 mbar) Max 13.8" WC @ 70°F

Note: Data applies only to North America

PLEASE NOTE:

Standard electrical specifications include motor requirements. (120V units) 115V, .6 HP, 2-speed motor; 1140 and 1725 rpm, 60Hz. (240V units) 200-240V, .6 HP, 2-speed motor; 1140 and 1725 rpm, 60 Hz. A 6 ft. line cord is provided for each 120V deck with a (NEMA #5-15P) plug.

Gas Input Ratings shown here are for installations up to 2,000 ft. (610m) above sea level. Specify altitudes over 2,000 ft. Please specify gas type when ordering.

SINGLE-DECK MODELS	INT. DIMENSIONS: In mm			EXT. DIMENSIONS: In mm			SHIP WT.	SHIP DIM.
	W	H	D	W	H *	D	lbs/kg	cubic Ft.
Standard Depth	29 (736)	24 (610)	24 (610)	38 (965)	57-1/2 (1461)	41-1/4(1048)	515/230	64
Deep Depth	29 (736)	24 (610)	28 (711)	38 (965)	57-1/2 (1461)	44-1/2(1130)	545/245	64

DOUBLE-DECK MODELS	INT. DIMENSIONS: In mm			EXT. DIMENSIONS In mm			SHIP WT.	SHIP DIM.
	W	H	D	W	H *	D	2@lbs/kg	Cubic Ft.
Standard Depth	29 (736)	24 (610)	24 (610)	38 (965)	70-1/2 (1791)	41-1/4(1048)	1030/465	128
Deep Depth	29 (736)	24 (610)	28 (711)	38 (965)	70-1/2 (1791)	44-1/2(1130)	1090/490	128

*Height with or without standard casters. Height with low profile casters (double deck) is 68-1/2" (1740mm).

MODELS	INPUT RATINGS, NAT & PRO			ELECTRICAL SPECIFICATIONS	
	BTU/hr	kW Eqiv.	Gas inlet	120V/1Ph.	240V/1Ph.
Single Deck	60,000	17.6	(1)@3/4" NPT	(1)@9.8A	(1)@5.2A
Double Deck	120,000	35.2	(1)@1" NPT	(2)@9.8A	(2)@5.2A

Garland reserves the right to make changes to the design or specifications without prior notice.

Garland Commercial Ranges Ltd.
1177 Kamato Road,
Mississauga, Ontario
L4W 1X4 CANADA

General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
Canadian Sales 1-888-442-7526
Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
7819B
08/24



For Commercial Applications

Job Name _____
 Job Location _____
 Engineer _____
 Approval _____

Contractor _____
 Approval _____
 Contractor's P.O. No. _____
 Representative _____
 SKU _____

Double Swivel MAX®/SnapFast® Quick-Disconnect Assemblies

Sizes: ½" to 1¼" (15 to 32mm)

Double Swivel MAX/SnapFast Quick-Disconnect Assemblies feature flexible movement and the one-handed quick-disconnect fitting with a unique thermal shut-off design that automatically shuts off the gas when the internal temperature exceeds 350°F (177°C). The 360° movement of Swivel MAX at both ends gives maximum protection to the life of the connector and greatly increases kitchen aisle space by allowing the appliance to be closer to the wall.

Features

Swivel MAX®

Multi-plane Fitting Aluminum body, plated steel fitting
 Movement 360° rotational end fitting

SnapFast® One-Handed Quick-Disconnect

Quick-Disconnect.....Brass body, aluminum collar
 Thermal Shut-off.....Shuts off gas when internal temperatures
 exceed 350°F (177°C)

Specifications

The Dormont Blue Hose®

Tubing Annealed, 304 stainless steel
 Braiding Multi-strand, stainless steel wire
 Coating Blue antimicrobial PVC, melts at 350°F (177°C),
 coating will not hold a flame
 End Fittings..... Carbon steel; zinc trivalent chromate
 Stress Guard® 360° rotational end fitting at both ends

Additional Components

Restraining Device PVC coated, steel multi-strand cable and
 mounting hardware
 Valve Full port, brass body

SnapFast®
 One-handed
 Quick-Disconnect

Swivel MAX®
 Multi-plane
 Rotation Fitting

Stress Guard®
 Rotation Technology
 Reduces Stress at Both
 Ends of the Hose

The Dormont
 Blue Hose®
 Stainless Steel Construction
 Stainless Steel Braid
 Blue Antimicrobial PVC Coating

(Cutaway shown)

Approvals & Certifications

NSF/ANSI 169 – Special-purpose food equipment and devices
 ANSI Z21.69 / CSA 6.16 – Connectors for moveable gas appliances
 ANSI Z21.41 / CSA 6.9 – Quick-Disconnect Devices for use with gas fuel appliances
 ANSI Z21.15 / CSA 9.1 – Manually operated gas valves for appliances, appliance connectors
 UL 567 _ Pipe connectors for flammable and combustible liquids and LP gas
 Meets requirements of ANSI Z223.1 / NFPA 54 National Fuel Gas Code
 Not for use in temperatures less than 32°F (0°C). For indoor use only.
 Max operating pressure 1/2 psi.

Refer to the catalog for additional approvals and certifications or go to www.dormont.com.

A restraining device is required for all moveable gas equipment.

**Safety
 System**

The Dormont Safety System™ is the first and only complete gas equipment connection system specifically engineered for the commercial kitchen. The Safety System consists of the famous Dormont Blue Hose and a variety of accessories designed for improved safety and performance in commercial kitchens. Because they are manufactured in the USA under an ISO qualified production process and to multiple design certifications, you can Connect with Confidence with the Dormont Safety System.

Dormont®

Stress Guard®
 Rotation Technology
 Reduces Stress at Both
 Ends of the Hose

Swivel MAX®
 Multi-plane
 Rotation Fitting



Double Swivel MAX® with SnapFast® Quick-Disconnect Deluxe Kit Assembly

Ordering Information

		LENGTH				
Configuration	Size I.D.	24" (607mm)	36" (914mm)	48" (1,219mm)	60" (1,524mm)	72" (1,829mm)
Deluxe Kit*	½" (15mm)	1650KIT2S24	1650KIT2S36	1650KIT2S48	1650KIT2S60	1650KIT2S72
Basic Kit**		1650BPQ2SR24	1650BPQ2SR36	1650BPQ2SR48	1650BPQ2SR60	1650BPQ2SR72
Hose Assembly***		1650BPQ2S24	1650BPQ2S36	1650BPQ2S48	1650BPQ2S60	1650BPQ2S72
Deluxe Kit*	¾" (20mm)	1675KIT2S24	1675KIT2S36	1675KIT2S48	1675KIT2S60	1675KIT2S72
Basic Kit**		1675BPQ2SR24	1675BPQ2SR36	1675BPQ2SR48	1675BPQ2SR60	1675BPQ2SR72
Hose Assembly***		1675BPQ2S24	1675BPQ2S36	1675BPQ2S48	1675BPQ2S60	1675BPQ2S72
Deluxe Kit*	1" (25mm)	16100KIT2S24	16100KIT2S36	16100KIT2S48	16100KIT2S60	16100KIT2S72
Basic Kit**		16100BPQ2SR24	16100BPQ2SR36	16100BPQ2SR48	16100BPQ2SR60	16100BPQ2SR72
Hose Assembly***		16100BPQ2S24	16100BPQ2S36	16100BPQ2S48	16100BPQ2S60	16100BPQ2S72
Deluxe Kit*	1¼" (32mm)	16125KIT2S24	16125KIT2S36	16125KIT2S48	16125KIT2S60	16125KIT2S72
Basic Kit**		16125BPQ2SR24	16125BPQ2SR36	16125BPQ2SR48	16125BPQ2SR60	16125BPQ2SR72
Hose Assembly***		16125BPQ2S24	16125BPQ2S36	16125BPQ2S48	16125BPQ2S60	16125BPQ2S72

BTU/hr Flow Capacity Natural Gas (Flow rating BTU/hr 0.64 SP. GR. @ 0.5 inch WC pressure drop)

		LENGTH				
Model	Size I.D.	24" (607mm)	36" (914mm)	48" (1,219mm)	60" (1,524mm)	72" (1,829mm)
1650BPQ2S	½" (15mm)	77,000	69,000	60,000	54,000	48,000
1675BPQ2S	¾" (20mm)	205,000	193,000	160,000	140,000	124,000
16100BPQ2S	1" (25mm)	366,000	336,000	295,000	261,000	247,000
16125BPQ2S	1¼" (32mm)	472,000	461,000	449,000	441,000	440,000

***Deluxe Kits include:** The Dormont Blue Hose, Double Swivel MAX, SnapFast, restraining device and full port valve

****Basic Kits include:** The Dormont Blue Hose, Double Swivel MAX, SnapFast, and restraining device

*****Hose Assemblies include:** The Dormont Blue Hose, Double Swivel MAX, SnapFast

Typical Installation



The Dormont Blue Hose®

The Dormont Blue Hose is a commercial, moveable-grade gas connector designed for use with moveable equipment.

Moveable equipment is defined in ANSI Standard Z21.69/CSA 6.16 as gas utilization equipment that may be mounted on casters or otherwise be subject to movement.



SwivelMAX

- Reduces stress on connector
- Increases kitchen aisle space by allowing connector to be positioned closer to the wall



SnapFast

- One-handed quick-disconnect fitting
- Thermal shut-off when internal temperature exceeds 350°F (177°C)



Restraining Device

- ANSI Z21.69 Standard section 1.7.4 states: Connectors when used on caster-mounted equipment shall be installed with a restraining device, which prevents transmission of the strain to the connector



We guarantee our commercial gas connectors for the life of the original appliance to which it is connected.

Dormont®

A Watts Water Technologies Company

ES-D-DBLSwivelSnapFast 1306



**ISO 9001-2008
CERTIFIED**

USA: Export, PA • Tel. (724) 733-4800 • Fax: (724) 733-4808 • www.dormont.com

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Submittal Sheet

10/03/2025

ITEM# 37 - HD RANGE, 36", 6 OPEN BURNERS (1 EA REQ'D)

Garland Commercial Ranges C36-6M

Garland Cuisine Series Heavy Duty Range, gas, 36", modular, (6) 35,000 BTU open burners, 7"H backguard, stainless steel front, sides, plate rail & burner box, 210,000 BTU (NG), CSA Flame, CSA Star, NSF (Garland)

ACCESSORIES

Mfr	Qty	Model	Spec
Garland Commercial Ranges	1		Two year limited parts and labor warranty, covers products purchased and installed in the USA only, standard
Garland Commercial Ranges	1		Natural gas, specify elevation if over 2,000 ft
Garland Commercial Ranges	1		1-1/4" Rear gas connection, including end cap & cover (Consult spec sheet and specify)
Garland Commercial Ranges	1		Stainless steel belly bar, standard
Garland Commercial Ranges	1	LEG KIT	LEG KIT
Dormont	1	16125BPQ2SR48	Dormont Blue Hose™ Moveable Gas Connector Hose Assembly, 1-1/4" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, 1 SnapFast® QD, 2 Swivel MAX®, coiled restraining cable with hardware, 449,000 BTU/hr minimum flow capacity, limited lifetime warranty

GAS

	SIZE	MBTU	KW
1		210	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

GARLAND®

Cuisine Series Heavy Duty Open Burner Top Range

Project _____
 Item _____
 Quantity _____
 CSI Section 11400
 Approved _____
 Date _____

Models

- C36-6R • C36-6S
- C36-6C • C36-6M



Model C36-6R
Range with 6
12" Open Burners

Standard Features

- 35,000 BTU/h (NG) Garland Starfire open top burners
- One-piece cast iron grates and bowls over each open top burner
- Stainless steel front and sides
- Stainless steel front rail
- Stainless steel burner box
- 1-1/4" NPT front gas manifold
- Can be installed individually or in a battery
- 7" (178mm) high stainless steel stub back
- 6" (152mm) stainless steel adj. legs
- Porcelain oven interior
- R model - 4 rack positions
C model - 3 rack positions
- R model - 1 chrome plated rack
C model - 3 chrome plated racks
- Fully insulated oven interior
- Safety oven pilot
- Oven thermostat control: 150°-500°F (66°- 260°C) (R/C)
- Range base convection oven (C) c/w NEMA 5-15P cord & plug, 1/3 hp motor, 120V 60Hz, 0.6A
- Modular unit (M) can be mounted on Polar Cuisine refrigerated base

Options & Accessories

- Stainless steel oven interior in lieu of porcelain oven interior - NC
- Single or double deck high shelf or back riser
- Full-height stand for modular base with legs or casters
- Stainless steel intermediate shelf for cabinet base
- Stainless steel door(s) for cabinet base units
- Stainless steel back
- Continuous plate rail, 48-72" for battery installations
- Gas shut-off valves: 3/4" (M/S models only), 1", 1 1/4" NPT (Specify)
- Gas regulator: 3/4" (M/S models only), 1", 1 1/4" NPT (Specify)
- Gas flex hose w/ quick disconnect: 3/4" (M/S models only), 1", 1 1/4" NPT (Specify)
- Rear gas connection: 3/4" (M/S models only), 1", 1 1/4" NPT (Specify)
- Set of (4) flanged feet (for fastening unit to the floor)
- Set of (4) 5" polyurethane non-marking swivel casters w/front brakes
- Set of (4) 6" swivel casters, w/front brakes
- Extra oven rack
- Extension for 1/9 pans

Specifications

Garland Cuisine 36" (914mm) wide Heavy Duty Range Series. Model _____ with total BTU/h rating of _____ when used with natural/propane gas. Stainless steel front and sides. 6" (152mm) legs with adjustable feet.

Ovens - One piece oven door. Porcelain oven interior with a heavy-duty, "keep-cool" door handle. Standard oven comes with a thermostat with a temperature range from 150° (low) to 500°F (66°- 260°C).

Open Burners - 35,000 BTU/h per burner and a one-piece, cast iron top grate and bowl over each burner.

NOTE: Range-based convection oven models can be located in the middle of a battery, banked back-to-back with other equipment, and can be positioned against a wall.

NOTE: Ranges supplied with casters must be installed with an approved restraining device.



Cuisine Series Heavy Duty Open Burner Top Range

Garland Commercial Ranges Ltd.
1177 Kamato Road,
Mississauga, Ontario
L4W 1X4 CANADA

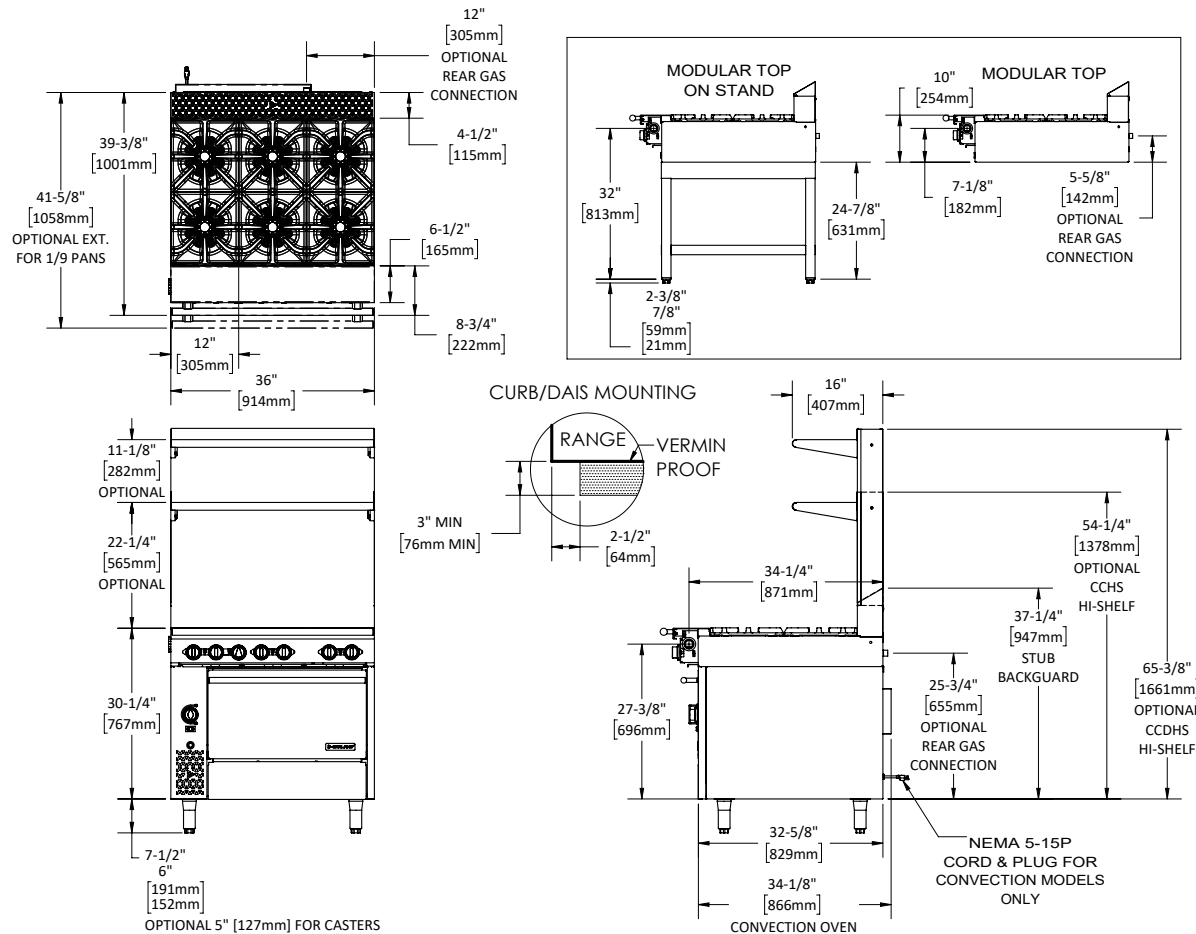
General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
Canadian Sales 1-888-442-7526
Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
7889
01/24



GARLAND®

Cuisine Series Heavy Duty Open Burner Top Range



Model #	Description	Total BTU/h NAT. Gas	Total BTU/h Propane	Shipping	
				Cu Ft	lbs/kg
C36-6R	6-Open Burners / Standard Oven	250,000	233,000	53	562/255
C36-6C*	6-Open Burners / Convection Oven	247,000	233,000	53	562/255
C36-6S	6-Open Burners / Storage Base	210,000	198,000	53	361/164
C36-6M	6-Open Burners / Modular Top	210,000	198,000	30	320/145

*120V 60Hz 0.6 A c/w NEMA 5-15P cord & plug

Combustible Wall Clearance	
Sides	Back
10" (254mm)	6" (152mm)

Individual Burner Ratings (BTU/h)					
Burner	NAT.	PRO.	Burner	NAT.	PRO.
Open Top	35,000	33,000	Std. Oven	40,000	35,000
			Conv. Oven	37,000	35,000

Interior Dimensions: In (mm)			
Product	Height	Width	Depth
Standard Oven	13-1/2 (343)	26-1/4 (667)	29 (737)
Convection Oven	13-1/2 (343)	26-1/4 (667)	25 (635)
Cabinet Base	20-1/2 (521)	32-1/4 (819)	31 (787)

Gas Pressure	NAT.	PRO.
Minimum Supply	7" WC	11" WC
Manifold Operating Pressure	6" WC	10" WC
Gas Manifold 1-1/4" NP		

Garland reserves the right to make changes to the design or specifications without prior notice.

Garland Commercial Ranges Ltd.
1177 Kamato Road,
Mississauga, Ontario
L4W 1X4 CANADA

General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
Canadian Sales 1-888-442-7526
Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
7889
01/24



For Commercial Applications

Job Name _____
 Job Location _____
 Engineer _____
 Approval _____

Contractor _____
 Approval _____
 Contractor's P.O. No. _____
 Representative _____
 SKU _____

Double Swivel MAX®/SnapFast® Quick-Disconnect Assemblies

Sizes: ½" to 1¼" (15 to 32mm)

Double Swivel MAX/SnapFast Quick-Disconnect Assemblies feature flexible movement and the one-handed quick-disconnect fitting with a unique thermal shut-off design that automatically shuts off the gas when the internal temperature exceeds 350°F (177°C). The 360° movement of Swivel MAX at both ends gives maximum protection to the life of the connector and greatly increases kitchen aisle space by allowing the appliance to be closer to the wall.

Features

Swivel MAX®

Multi-plane Fitting Aluminum body, plated steel fitting
 Movement 360° rotational end fitting

SnapFast® One-Handed Quick-Disconnect

Quick-Disconnect.....Brass body, aluminum collar
 Thermal Shut-off.....Shuts off gas when internal temperatures
 exceed 350°F (177°C)

Specifications

The Dormont Blue Hose®

Tubing Annealed, 304 stainless steel
 Braiding Multi-strand, stainless steel wire
 Coating Blue antimicrobial PVC, melts at 350°F (177°C),
 coating will not hold a flame
 End Fittings..... Carbon steel; zinc trivalent chromate
 Stress Guard® 360° rotational end fitting at both ends

Additional Components

Restraining Device PVC coated, steel multi-strand cable and
 mounting hardware
 Valve Full port, brass body

SnapFast®
 One-handed
 Quick-Disconnect

Swivel MAX®
 Multi-plane
 Rotation Fitting

Stress Guard®
 Rotation Technology
 Reduces Stress at Both
 Ends of the Hose

The Dormont
 Blue Hose®
 Stainless Steel Construction
 Stainless Steel Braid
 Blue Antimicrobial PVC Coating

(Cutaway shown)

Approvals & Certifications

NSF/ANSI 169 – Special-purpose food equipment and devices
 ANSI Z21.69 / CSA 6.16 – Connectors for moveable gas appliances
 ANSI Z21.41 / CSA 6.9 – Quick-Disconnect Devices for use with gas fuel appliances
 ANSI Z21.15 / CSA 9.1 – Manually operated gas valves for appliances, appliance connectors
 UL 567 _ Pipe connectors for flammable and combustible liquids and LP gas
 Meets requirements of ANSI Z223.1 / NFPA 54 National Fuel Gas Code
 Not for use in temperatures less than 32°F (0°C). For indoor use only.
 Max operating pressure 1/2 psi.
 Refer to the catalog for additional approvals and certifications or go to www.dormont.com.

A restraining device is required for all moveable gas equipment.

**Safety
 System**

The Dormont Safety System™ is the first and only complete gas equipment connection system specifically engineered for the commercial kitchen. The Safety System consists of the famous Dormont Blue Hose and a variety of accessories designed for improved safety and performance in commercial kitchens. Because they are manufactured in the USA under an ISO qualified production process and to multiple design certifications, you can Connect with Confidence with the Dormont Safety System.

Dormont®



Stress Guard®
 Rotation Technology
 Reduces Stress at Both
 Ends of the Hose

Swivel MAX®
 Multi-plane
 Rotation Fitting

Double Swivel MAX® with SnapFast® Quick-Disconnect Deluxe Kit Assembly

Ordering Information

		LENGTH				
Configuration	Size I.D.	24" (607mm)	36" (914mm)	48" (1,219mm)	60" (1,524mm)	72" (1,829mm)
Deluxe Kit*	½" (15mm)	1650KIT2S24	1650KIT2S36	1650KIT2S48	1650KIT2S60	1650KIT2S72
Basic Kit**		1650BPQ2SR24	1650BPQ2SR36	1650BPQ2SR48	1650BPQ2SR60	1650BPQ2SR72
Hose Assembly***		1650BPQ2S24	1650BPQ2S36	1650BPQ2S48	1650BPQ2S60	1650BPQ2S72
Deluxe Kit*	¾" (20mm)	1675KIT2S24	1675KIT2S36	1675KIT2S48	1675KIT2S60	1675KIT2S72
Basic Kit**		1675BPQ2SR24	1675BPQ2SR36	1675BPQ2SR48	1675BPQ2SR60	1675BPQ2SR72
Hose Assembly***		1675BPQ2S24	1675BPQ2S36	1675BPQ2S48	1675BPQ2S60	1675BPQ2S72
Deluxe Kit*	1" (25mm)	16100KIT2S24	16100KIT2S36	16100KIT2S48	16100KIT2S60	16100KIT2S72
Basic Kit**		16100BPQ2SR24	16100BPQ2SR36	16100BPQ2SR48	16100BPQ2SR60	16100BPQ2SR72
Hose Assembly***		16100BPQ2S24	16100BPQ2S36	16100BPQ2S48	16100BPQ2S60	16100BPQ2S72
Deluxe Kit*	1¼" (32mm)	16125KIT2S24	16125KIT2S36	16125KIT2S48	16125KIT2S60	16125KIT2S72
Basic Kit**		16125BPQ2SR24	16125BPQ2SR36	16125BPQ2SR48	16125BPQ2SR60	16125BPQ2SR72
Hose Assembly***		16125BPQ2S24	16125BPQ2S36	16125BPQ2S48	16125BPQ2S60	16125BPQ2S72

BTU/hr Flow Capacity Natural Gas (Flow rating BTU/hr 0.64 SP. GR. @ 0.5 inch WC pressure drop)

		LENGTH				
Model	Size I.D.	24" (607mm)	36" (914mm)	48" (1,219mm)	60" (1,524mm)	72" (1,829mm)
1650BPQ2S	½" (15mm)	77,000	69,000	60,000	54,000	48,000
1675BPQ2S	¾" (20mm)	205,000	193,000	160,000	140,000	124,000
16100BPQ2S	1" (25mm)	366,000	336,000	295,000	261,000	247,000
16125BPQ2S	1¼" (32mm)	472,000	461,000	449,000	441,000	440,000

***Deluxe Kits include:** The Dormont Blue Hose, Double Swivel MAX, SnapFast, restraining device and full port valve

****Basic Kits include:** The Dormont Blue Hose, Double Swivel MAX, SnapFast, and restraining device

*****Hose Assemblies include:** The Dormont Blue Hose, Double Swivel MAX, SnapFast

Typical Installation



The Dormont Blue Hose®

The Dormont Blue Hose is a commercial, moveable-grade gas connector designed for use with moveable equipment.

Moveable equipment is defined in ANSI Standard Z21.69/CSA 6.16 as gas utilization equipment that may be mounted on casters or otherwise be subject to movement.



SwivelMAX

- Reduces stress on connector
- Increases kitchen aisle space by allowing connector to be positioned closer to the wall



SnapFast

- One-handed quick-disconnect fitting
- Thermal shut-off when internal temperature exceeds 350°F (177°C)



Restraining Device

- ANSI Z21.69 Standard section 1.7.4 states: Connectors when used on caster-mounted equipment shall be installed with a restraining device, which prevents transmission of the strain to the connector



We guarantee our commercial gas connectors for the life of the original appliance to which it is connected.

Dormont®

A Watts Water Technologies Company

ES-D-DBLSwivelSnapFast 1306



**ISO 9001-2008
CERTIFIED**

USA: Export, PA • Tel. (724) 733-4800 • Fax: (724) 733-4808 • www.dormont.com

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Submittal Sheet

10/03/2025

ITEM# 38 - CHEF BASE (1 EA REQ'D)

True Mfg. - General Foodservice TRCB-72-HC


Refrigerated Chef Base, 72-3/8"W base, one-piece 300 series 18 gauge stainless steel top with V edge, (4) drawers (accommodates (2) 12" x 20" x 4" pans, NOT included), stainless steel front/sides, aluminum back, aluminum interior with stainless steel floor, 4" castors, view spec sheet for electrical information & certifications, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
True Mfg. - General Foodservice	1		7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.
True Mfg. - General Foodservice	1		Self-contained refrigeration standard
True Mfg. - General Foodservice	1		Standard marine edge top
True Mfg. - General Foodservice	1		4" Castors, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1			1	Cord & Plug							

 TRUE MANUFACTURING CO., INC. U.S.A. FOODSERVICE DIVISION 2001 East Terra Lane • O'Fallon, Missouri 63366-4434 • (636)240-2400 Fax (636)272-2408 • Toll Free (800)325-6152 • Intl Fax# (001)636-272-7546 Parts Dept. (800)424-TRUE • Parts Dept. Fax# (636)272-9471 • www.truemfg.com	Project Name: _____		A/A # S/S #
	Location: _____		
	Model #: _____		Qty: _____
Model #: _____			

Model: TRCB-72-HC	Chef Base: <i>Drawered Refrigerator with Hydrocarbon Refrigerant</i>
------------------------------------	--



TRCB-72-HC

- ▶ True's refrigerated chef bases are designed with enduring quality that protects your long term investment.
- ▶ Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.
- ▶ Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & 0.02) global warming potential (GWP).
- ▶ Extra large evaporator coil balanced with higher horsepower compressor and large condenser; maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- ▶ Cabinet top is one piece, heavy duty reinforced stainless steel. Drip resistant "V" edge protects against spills. Supports up to 1084 lbs. (492 kg).
- ▶ All stainless steel front, top and sides. Corrosion resistant GalFan coated steel back.
- ▶ Each drawer accommodates two (2) full size 12"L x 20"W x 4"D (305 mm x 508 mm x 102 mm) food pans (sold separately).
- ▶ Heavy-duty stainless steel drawer slides and rollers. Removable without tools for easy cleaning.
- ▶ Foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).

ROUGH-IN DATA






Specifications subject to change without notice.
 Chart dimensions rounded up to the nearest 1/8" (millimeters rounded up to next whole number).

Model	Drawers	Cabinet Dimensions (inches) (mm)			HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
		W	D†	H*						
TRCB-72-HC	4	72 ³ / ₈ 1837	32 ¹ / ₈ 814	20 ¹ / ₂ 520	1/3 1/3	115/60/1 220-240V/50-60Hz	4.4 2.0	5-15P ▲	10 3.05	435 198

† Depth does not include 1" (26 mm) for rear bumpers.

* Height does not include 5" (127 mm) for castors or 6" (153 mm) for optional legs.

▲ Plug type varies by country.

    	APPROVALS:	AVAILABLE AT:
10/22 Printed in U.S.A.		

Model:
TRCB-72-HC

Chef Base:

Drawered Refrigerator with Hydrocarbon Refrigerant

True®

STANDARD FEATURES

DESIGN

- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM

- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & 0.02) global warming potential (GWP).
- Oversized, factory balanced refrigeration system with guided airflow to provide uniform product temperatures.
- Extra large evaporator coil balanced with higher horsepower compressor and large condenser; maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- Sealed, self-lubricating evaporator fan motor and larger fan blades give True chef base units a more efficient, low velocity, high volume airflow design. This unique design ensures faster temperature recovery and shorter run times in the busiest of food service environments.
- Condensing unit accessed from behind side grill; slides out for easy maintenance.

CABINET CONSTRUCTION

- Exterior - stainless steel front, top and sides. Corrosion resistant GalFan coated steel back.
- Interior - attractive, white aluminum liner. Stainless steel floor with coved corners.

- Insulation - entire cabinet structure and drawer facings are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 4" (102 mm) diameter plate castors - locks provided on front set.
- Cabinet top is one piece, heavy duty reinforced 300 series stainless steel. Drip resistant "V" edge protects against spills. Supports up to 1084 lbs. (492 kg).

DRAWERS

- Stainless steel exterior drawer facings and liners. Stainless steel drawer frames.
- Each drawer fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Heavy-duty stainless steel drawer slides and rollers. Removable without tools for easy cleaning.
- Magnetic drawer gaskets of one piece construction, removable without tools for ease of cleaning.
- Each drawer accommodates two (2) full size 12"L x 20"W x 4"D (305 mm x 508 mm x 102 mm) food pans (sold separately).
- Drawers support a wide variety of incremental pan size configurations.

MODEL FEATURES

- Evaporator is epoxy coated to eliminate the potential of corrosion.
- Exterior digital temperature display.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL

- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.



115/60/1
NEMA-5-15R

RECOMMENDED OPERATING CONDITIONS

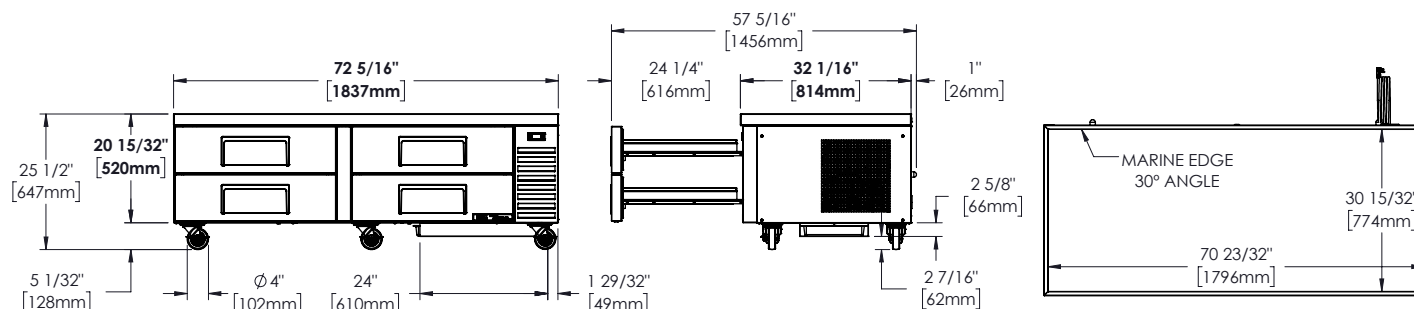
- Counter-top cooking equipment should be used in conjunction with the manufacturer supplied legs. Minimum clearance of 4" (102 mm) is required between bottom of cooking equipment heating element and the TRCB top. Failure to provide clearance voids manufacturer warranty.
- Installation of a heat shield is recommended for optimum performance (supplied by others).

OPTIONAL FEATURES/ACCESSORIES

Upcharge and lead times may apply.

- ☐ 220-240V/50-60Hz
- ☐ 6" (153 mm) standard legs (1 set of 6 leg mounting plates required).
- ☐ 6" (153 mm) seismic/flanged legs (1 set of 6 leg mounting plates required).
- ☐ Heavy duty, 16 gauge top (available for flat and marine top).
- ☐ Flat top (no marine edge).
- ☐ Additional size drawer divider bars.
- ☐ Drawer locks.

PLAN VIEW



METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



Model	Elevation	Right	Plan	3D	Back
TRCB-72-HC					

TRUE MANUFACTURING CO., INC.

2001 East Terra Lane • O'Fallon, Missouri 63366-4434 • (636)240-2400 • Fax (636)272-2408 • Toll Free (800)325-6152 • Intl. Fax# (001)636-272-7546 • www.truemfg.com

Submittal Sheet

10/03/2025

ITEM# 39 - GRIDDLE, GAS, COUNTERTOP (1 EA REQ'D)

Garland Commercial Ranges GTGG36-G36M-SIGNATURE

Signature Griddle, countertop, gas, heavy-duty, 35-7/8" W x 23" D cooking surface, 1" thick smooth steel griddle plate, manual hi-lo controls, piezo pilot igniters, 4" deep front grease trough, stainless steel front, sides and back, 4" adjustable feet, 81,000 BTU (Garland), NSF, CSA Star, CSA Flame

ACCESSORIES

Mfr	Qty	Model	Spec
Garland Commercial Ranges	1		The Garland Signature Program is applicable to standard equipment features ONLY. Models with accessories and options not listed under the Signature suffix are not applicable and standard pricing will apply.
Garland Commercial Ranges	1		One year limited parts and labor warranty, covers products purchased and installed in the USA only, standard
Garland Commercial Ranges	1		Natural gas, specify elevation if over 2,000 ft
Dormont	1	1675KIT2S48	Dormont Blue Hose™ Moveable Gas Connector Kit, 3/4" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, (1) SnapFast® QD, (2) Swivel MAX®, (1) full port valve, coiled restraining cable with hardware, 160,000 BTU/hr minimum flow capacity, limited lifetime warranty

GAS

	SIZE	MBTU	KW
1	3/4"	81.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

GARLAND®

HD Counter Series Heavy-Duty Gas Griddles

Project _____
 Item _____
 Quantity _____
 CSI Section 11400
 Approved _____
 Date _____

HD Counter Series Heavy-Duty Gas Griddles

Models

- GTGG24-GT24M • GTGG48-GT48M • GTGG72-GT72M • GTGG36-G36M • GTGG60-G60M
- GTGG36-GT36M • GTGG60-GT60M • GTGG24-G24M • GTGG48-G48M • GTGG72-G72M



Model GTGG24-GT24M

Standard Features

- Thermostat-controlled models feature precise control from LOW: 200°F, (90°C) to 550°F, (290°C), and 28,000 BTU/h input per burner, natural or propane. There is an on-off valve for every thermostat.
- Valve-control models feature hi-lo valve control with approximate plate temperature range: 320°F, (160°C) to 730°F, (388°C), and 27,000 BTU/h input per burner, natural or propane gas.
- One burner and control (hi-lo or thermostat control) for every 12" linear width of griddle surface.
- Piezo pilot ignition system
- 3/4" NPT gas regulator with "T" gas manifold connection for straight through rear or flush-mount gas connections.
- Stainless steel front, sides and back
- 4" Stainless steel adjustable legs
- Stainless steel front rail; 4" (102mm) deep overall with 3 1/2" (89mm) top work surface
- Models ordered with 4" (102mm) legs come with a deep 1.4 US gallon/5.3 litre capacity grease drawer(s) 20 1/2" (635mm) deep x 2 3/4" (70mm) high x 6" (152mm) wide.
- Models order with optional S/S skirt for dais counter surface mounting come with large capacity Stainless steel grease tray(s)
- 1" thick polished steel griddle plate
- 23" depth with 4" wide grease trough.

Options & Accessories

- Chrome griddle plate
- Full or half-grooved griddle plate
- Stainless steel skirt for dais/counter surface mounting
- Electric spark ignition; 120V 60 Hz, sgl-phase 0.1A; includes cord and NEMA 5-15P plug
- Electric spark ignition; 208/240V (50/60Hz) cord and plug is NOT supplied with this voltage option.
- Stainless stand with solid top holding shelves, adjustable feet and casters (locking front).
- Removable stainless steel attachment condiment rail with 1/9 food pan cut outs (pans supplied by others)

Specifications

Garland heavy-duty gas counter production griddles designed for side-by-side matching with other models in the product line.

Models are of nominal imperial widths from 24" (600mm) to 72" (1800mm), 13" (330mm) height, (w/std. legs), and 32" (814mm) depth.

There is an even heat "U" shaped steel track burner for every 12" of linear griddle surface width.

Each burner is individually controlled with a hi-lo valve or thermostat temperature control.

Burner input is 27,000 BTU/h each on valve-controlled models, and 28,000 BTU/h each on thermostat controlled models.

Thermostat controlled models are equipped with on-off valves for each control.

Griddle plate is standard 1" thick polished steel with a 4" wide grease trough.

Stainless steel front, sides and back with large capacity stainless steel grease tray(s).



Garland Commercial Ranges Ltd.
 1177 Kamato Road,
 Mississauga, Ontario
 L4W 1X4 CANADA

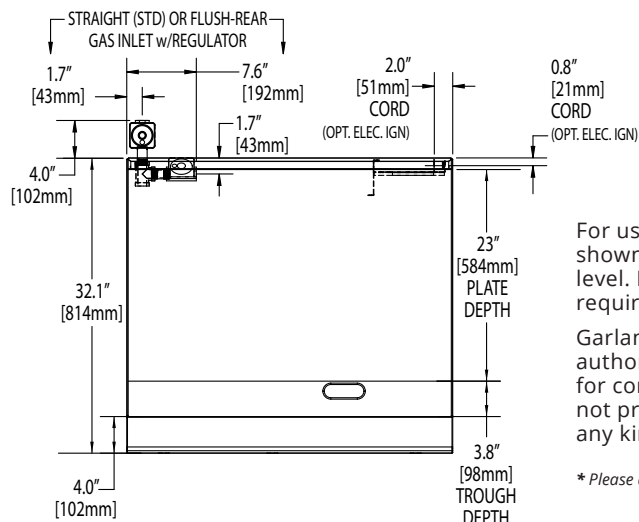
General Inquires 1-905-624-0260
 USA Sales, Parts and Service 1-800-424-2411
 Canadian Sales 1-888-442-7526
 Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
 6826C
 08/25



GARLAND®

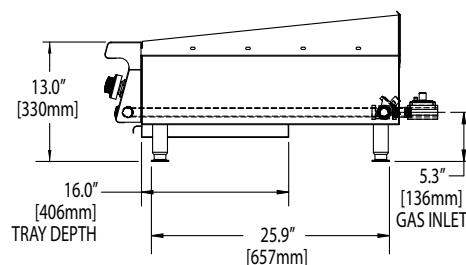
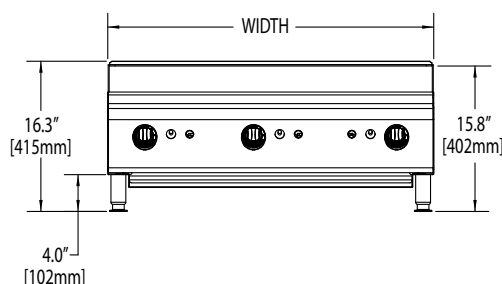
HD Counter Series Heavy-Duty Gas Griddles



For use with Natural or Propane gas only. Gas input ratings shown for installations up to 2000 ft., (610m), above sea level. Please specify altitudes over 2000 ft. and gas type required when ordering.

Garland/U.S. Range products are not approved or authorized for home or residential use, but are intended for commercial applications only. Garland / U.S. Range will not provide service, warranty, maintenance or support of any kind other than in commercial applications.

* Please add 5" (127mm) in overall depth with attachment condiment rail option.



Model #		Width In (mm)	Height (w/std legs)	Depth In (mm)	Total Input (BTU)	Shipping Information			
						Lbs/Kg	Cu Ft		
Thermostat Controlled Standard Griddle (1" steel plate)									
GTGG24-GT24M		23-5/8 (600)	13 (330)	32 (814)	56,000	270/132	21		
GTGG36-GT36M		35-7/16 (900)			84,000	405/184	29		
GTGG48-GT48M		47-1/4 (1200)			112,000	595/270	37		
GTGG60-GT60M		59-1/16 (1500)			140,000	705/320	42		
GTGG72-GT72M		70-7/8 (1800)			168,000	810/368	50		
Manually Controlled Standard Griddle (1" steel plate)									
GTGG24-G24M		23-5/8 (600)	13 (330)	32 (814)	54,000	280/127	21		
GTGG36-G36M		35-7/16 (900)			81,000	395/180	29		
GTGG48-G48M		47-1/4 (1200)			108,000	585/266	37		
GTGG60-G60M		59-1/16 (1500)			135,000	688/313	42		
GTGG72-G72M		70-7/8 (1800)			162,000	790/359	50		
SUPPLY OPERATING PRESSURE				MANIFOLD OPERATING PRESSURE				CLEARANCES	
NATURAL GAS		PROPANE		NATURAL GAS		PROPANE		INSTALLATION TO COMBUSTIBLE	
"WC	MBar	"WC	Mbar	"WC	MBar	"WC	Mbar	Sides	Rear
7	17.5	11	27.5	4.5	11	10	24.5	6" (152mm)	6" (152mm)

Garland reserves the right to make changes to the design or specifications without prior notice.

Garland Commercial Ranges Ltd.
1177 Kamato Road,
Mississauga, Ontario
L4W 1X4 CANADA

General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
Canadian Sales 1-888-442-7526
Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
6826C
08/25



Dormont®

Foodservice Moveable Equipment Installation Products

The Dormont Blue Hose™ is the heart of the Safety System, specifically engineered for caster-mounted commercial cooking equipment. The Blue Hose includes an antimicrobial protective PVC coating, and our Stress Guard® technology that makes the hose easier to install and dramatically reduces stress on the hose ends.

The fuel gas codes require the use of an ANSI Z21.69/CSA 6.16 moveable gas connector with all appliances that may or may not utilize casters and, under normal use, are moved on a regular basis for service, positioning or area cleanliness.



Rotation technology reduces stress on both ends of the hose

Stainless Steel Construction
Heavy-duty, flexible, corrugated 304 stainless steel tubing

Stainless Steel Braid
Tight-weave braid prevents corrugations from stretching as equipment is moved

Antimicrobial PVC Coating
Inhibits growth of bacteria, mold and mildew on the gas connector



The Dormont Safety System™ is the first and only complete gas equipment connection system specifically engineered for the commercial kitchen. It is a complete system of connection products designed with the safety of your kitchen, the food you serve, your employees, and your business in mind.

The Safety System includes the famous Dormont Blue Hose and our exclusive safety-based fittings - the SnapFast quick-disconnect, the Safety Quik quick-disconnect valve, and the Swivel MAX. Safe, unique, and affordable, the Dormont Safety System provides peace of mind for the gas connections in your commercial kitchen.



Safety Quik

- Prevents user from turning on gas while appliance is disconnected
- Thermal shut-off when internal temperature exceeds 350°F (177°C)



SnapFast

- One-handed quick-disconnect fitting
- Thermal shut-off when internal temperature exceeds 350°F (177°C)



SwivelMAX

- Reduces stress on connector
- Increases kitchen aisle space by allowing connector to be positioned closer to the wall



Restraining Cable

- Prevents transmission of strain to connector
- Provided 1" shorter than the gas connector



Safety-Set







- Ensures cooking equipment is always positioned in design-specified location
- Fast installation with choice of adhesive foam tape or thumbscrews



A Watts Water Technologies Company USA, 6015 Enterprise Drive, Export, PA 15632 • 1-800-DORMONT • Dormont.com



Moveable Commercial Equipment Kits

KIT SOLUTIONS	PART NUMBER	BTU/hr Minimum Flow Capacity*	 THE BLUE HOSE™	 SnapFast® QUICK-DISCONNECT	 Swivel MAX® 1st SWIVEL	 Swivel MAX® 2nd SWIVEL	 Safety Quik® VALVE	 RESTRAINING CABLE
Standard Kit (KIT)¹ The Dormont Blue Hose™ SnapFast Quick-Disconnect Restraining Cable	1650KIT36	77K	✓	✓				✓
	1650KIT48	68K	✓	✓				✓
	1650KIT60	60K	✓	✓				✓
	1675KIT36	218K	✓	✓				✓
	1675KIT48	180K	✓	✓				✓
	1675KIT60	158K	✓	✓				✓
	16100KIT36	379K	✓	✓				✓
	16100KIT48	334K	✓	✓				✓
	16100KIT60	294K	✓	✓				✓
Single Swivel MAX Kit (KITS)² The Dormont Blue Hose™ SnapFast Quick-Disconnect One Swivel MAX Swivel Restraining Cable	1650KITS36	72K	✓	✓	✓			✓
	1650KITS48	63K	✓	✓	✓			✓
	1650KITS60	56K	✓	✓	✓			✓
	1675KITS36	203K	✓	✓	✓			✓
	1675KITS48	167K	✓	✓	✓			✓
	1675KITS60	147K	✓	✓	✓			✓
	16100KITS36	353K	✓	✓	✓			✓
	16100KITS48	310K	✓	✓	✓			✓
	16100KITS60	274K	✓	✓	✓			✓
Double Swivel MAX Kit (KIT2S)³ The Dormont Blue Hose™ SnapFast Quick-Disconnect Two Swivel MAX Swivels Restraining Cable	1650KIT2S36	69K	✓	✓	✓	✓		✓
	1650KIT2S48	60K	✓	✓	✓	✓		✓
	1650KIT2S60	54K	✓	✓	✓	✓		✓
	1675KIT2S36	193K	✓	✓	✓	✓		✓
	1675KIT2S48	160K	✓	✓	✓	✓		✓
	1675KIT2S60	140K	✓	✓	✓	✓		✓
	16100KIT2S36	336K	✓	✓	✓	✓		✓
	16100KIT2S48	295K	✓	✓	✓	✓		✓
	16100KIT2S60	261K	✓	✓	✓	✓		✓
Safety Quik Kit (KITCF)⁴ The Dormont Blue Hose™ Safety Quik Quick-Disconnect Restraining Cable	1650KITCF36	77K	✓				✓	✓
	1650KITCF48	68K	✓				✓	✓
	1650KITCF60	60K	✓				✓	✓
	1675KITCF36	218K	✓				✓	✓
	1675KITCF48	180K	✓				✓	✓
	1675KITCF60	158K	✓				✓	✓
	16100KITCF36	379K	✓				✓	✓
	16100KITCF48	334K	✓				✓	✓
	16100KITCF60	294K	✓				✓	✓
Safety Quik Single Swivel MAX Kit (KITCFS)⁵	1650KITCFS36	72K	✓		✓		✓	✓
	1650KITCFS48	63K	✓		✓		✓	✓
	1650KITCFS60	56K	✓		✓		✓	✓
	1675KITCFS36	203K	✓		✓		✓	✓
	1675KITCFS48	161K	✓		✓		✓	✓
	1675KITCFS60	147K	✓		✓		✓	✓
	16100KITCFS36	353K	✓		✓		✓	✓
	16100KITCFS48	310K	✓		✓		✓	✓
	16100KITCFS60	274K	✓		✓		✓	✓

*BTU/hr Minimum Flow Capacity (0.64 Sp.Gr., 1000 BTU/ft³ Natural Gas at 0.5" wc pressure drop)

¹ Includes Full Port Gas Valve and (2) 90° Street Elbows

² Includes Full Port Gas Valve and (1) 90° Street Elbow

³ Includes Full Port Gas Valve

⁴ Includes (2) 90° Street Elbows

⁵ Includes (1) 90° Street Elbow

Indicates most commonly stocked item

ADDITIONAL CONFIGURATIONS ARE AVAILABLE IN OUR CATALOG.



Add PS to the end of any part number to include the Safety-Set® wheel placement system



We guarantee our commercial gas connectors for the life of the original appliance to which it is connected.

Submittal Sheet

10/03/2025

ITEM# 40 - TILTING SKILLET BRAISING PAN, GAS (1 EA REQ'D)

Cleveland SGL30T1

PowerPan™ Tilting Skillet, gas, 30-gallon capacity, bead blasted cooking surface, 10° tilt cooking feature, with easy manual hand tilt, spring-assisted cover with vent, gallon & liter markings, stainless steel construction with open leg frame, 125,000 BTU, CE, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Cleveland	1		1-year parts & labor warranty, standard
Cleveland	1		Performance start-up included at customer request after equipment is installed (Free Water Quality Check included) (contact Cleveland Sales Representative for details)
Cleveland	1		Gas type to be specified
Cleveland	1		Standard wattage
Cleveland	1		120v/60/1-ph, 1.4 amps, NEMA 5-15P, standard
Cleveland	1		Standard controls, temperature control dial, LED ON indicator light, main power switch with standard and high power setting, standard
Cleveland	1	DPK29	Double Pantry Faucet, with 3/4" swing spout & mounting bracket, for T1 skillets, mounts on right side of unit (add 4.5" to width) (for SEL/SGL models)
Dormont	1	1675KIT2S48	Dormont Blue Hose™ Moveable Gas Connector Kit, 3/4" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, (1) SnapFast® QD, (2) Swivel MAX®, (1) full port valve, coiled restraining cable with hardware, 160,000 BTU/hr minimum flow capacity, limited lifetime warranty

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	1.4				

GAS

	SIZE	MBTU	KW
1	3/4"	125.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

Cleveland

POWERPAN™ SERIES

GAS, 35" RIM HEIGHT,
30 & 40 GALLON (110 & 150 LITER)

Project _____
Item _____
Quantity _____
FCSI Section 11400 _____
Approved _____
Date _____

Braising Pans / Tilting Skillets

Models

- SGL-30-T1
- SGL-40-T1

Shown with
Standard
Controls



easyDial and
Core Temperature
Probe options

- Exclusive Dual Power Settings: 90,000 and 125,000 Btu for 30 gallons, 160,000 Btu and 200,000 Btu for 40 gallons provides superior heat-up and recovery.
- Open base design for easy cleaning and maintenance.
- 5/8" Stainless Steel Bead Blasted cooking surface prevents warping and keeps food from sticking.
- Durable 12 gauge, 304 Stainless Steel pan construction. 5/8" (16mm) mild steel clad bottom plus a 1/16" (1.6mm) Stainless Steel plate for even temperature distribution.
- Low 35" rim height for easy operation and cleaning.
- Splash Proof Controls and construction.
- Supplied with Cord & Plug for 115-volt controls.
- Easy-to-turn manual hand tilt with enclosed permanently lubricated gearbox. Optional power tilt with manual override available.
- Gallon/Liter Markings and Vented Spring Assist Cover standard.
- Available with Optional 2" Tangent Draw-Off Valve.
- 10° Cooking Feature. Tilt unit up to 10° without the power being turned off.
- Adjustable Solid State Thermostat accurately controls temperature from 140°F to 425°F.

Standard Control Panel includes:

Temperature Control Dial, LED ON Indicator Light, Main Power Switch with Standard and High Power Settings.

easyDial Control Panel (optional) includes:

Selector Dial with LED Ring, Large Display Screen, Three Cooking Modes, Built-In Self-Diagnostics and Display, Temperature Select Button, Timer Set Button (Hrs/Min), Settings Button, Main Power Button, Probe Connection Port, LED Indicator Lights for Heat-ON, Product Probe, Temperature, Time, Settings, Self-Diagnostics, Ignition Failure, Std and High Power Setting.

- Electronic "Spark Ignition System Standard".
- Spring-Assist Cover with full width handle and vent.
- Typical approvals include AGA, CSA, CE and NSF.

Short Form Specifications

Shall be CLEVELAND, Tilting Skillet Model Number SGL- ____-T1, gas (type ____) holding no less than ____ gallons (____ liters); Complete with Dual Power Setting, Normal and High Power Cooking Controls, Power Burner (Forced-Air) Gas Combustion System, Automatic Ignition, Splash-Proof Construction, Spring Assist Cover with Vent, Gallon/Liter Markings, 5/8" Stainless Steel Clad Cooking Surface with Bead Blasted Finish, Easy to use Manual Hand Tilt with Enclosed Permanently Lubricated Gearbox, Adjustable Feet with Rear Flanged and Front Bullet Style.

Standard Features

- Available in 30 & 40 gallon (115 & 150 liter) open frame design models. Full capacity to bottom of pouring lip.
- Exclusive Ultra Efficient Power Burner (Forced-Air) Gas Combustion System with Automatic Ignition.

Options & Accessories

- easyDial Control
- Core Temperature Probe Option
- Power Tilt with Manual Override (PT2)
- 2" (50 mm) Tangent Draw-Off Valve (TD2SK), left side only
- Double or Single Pantry Faucet (SPS14, DPS14), includes Faucet Mounting Bracket
- Faucet Bracket (FBKT1)
- Pan Carriers (PCS), not available on 30 gallon models with a Tangent Draw-Off Valve
- Vegetable Steamer Baskets (VS)
- Hot & Cold Water Pre-Rinse Spray Head with Hose (PRS-S)
- Poaching Pans (PP)
- Voltage Option:
 - VOSK3, 440/480 Volt, 60 Hz, 3 Phase
 - VOSK4, 220/240 Volt, 50 Hz, 1 Phase - for export
- Protective Control Cover (CP-PCB-T1)
- Casters, 2 swivel, 2 locking (CST1)

KE004046-92C

760 Beta Drive, Unit D
Mayfield Village, Ohio 44143

Tel 1.216.481.4900
Fax 1.216.481.3782
Email steam@clevelandrange.com

www.clevelandrange.com
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Timeless Quality, Trusted For Life®

Cleveland

DIMENSIONS

MODEL	A	B	C	D	E	E (non-combustible wall)	F	G	H
SGL-30-T1	37 7/8" (963mm)	24 1/2" (623mm)	31 3/4" (807mm)	12" (305mm)	3 1/2" (89mm)	2	18 1/4" (464mm)	5 3/4" (146mm)	8" (204mm)
SGL-40-T1	49 7/8" (1267mm)	36 1/2" (928mm)	43 3/4" (1112mm)	18" (458mm)	3 1/2" (89mm)	2	24 1/4" (616mm)	5 3/4" (146mm)	8" (204mm)

SPECIFICATIONS

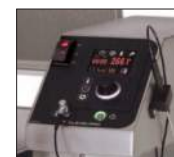
ELECTRICAL SUPPLY	GAS SUPPLY (PIPING 3/4" NPT)	CLEARANCE
VOLTS: 120 PHASE: 1 AMPS: 1.4 FREQ: 60 HZ	TYPE: NAT or LP WATER COLUMN: 3.5 (NAT), 10 (LP) BTU PER CU. FT.: 1025 (NAT), 2500 (LP) SUPPLY PRESSURE: 5" W.C. MIN (NAT), 11" W.C. MIN (LP) BTU RATINGS: SGL-30-T: 125,000 per hour SGL-40-T: 200,000 per hour	RIGHT: 4" (102mm) (manual tilt) 1" (26mm) (power tilt) LEFT: 0" REAR: 0 (non-combustible wall) 3.5" (89mm) (combustible wall)

CAPACITIES

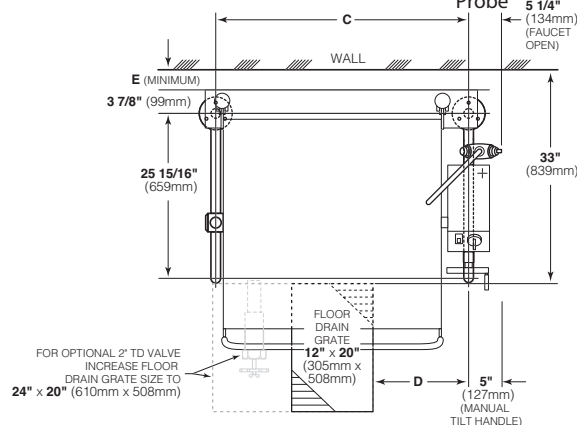
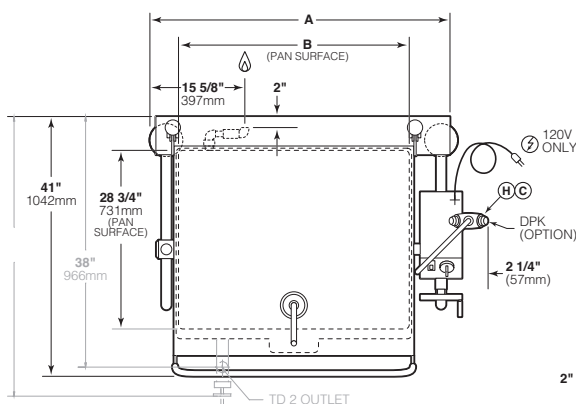
In 4 oz. servings. Other sizes may be calculated.
 30 gallons / 115 Liters.....960
 40 gallons / 150 Liters.....1280



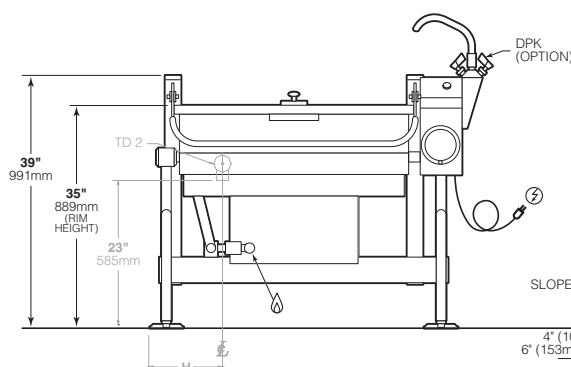
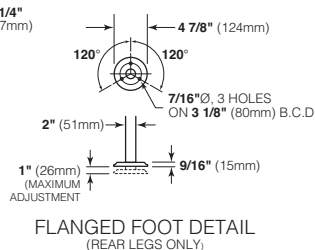
Standard Control Panel



easyDial Control Panel with Core Temperature Probe



LEG LOCATION & SUGGESTED FLOOR DRAIN DETAIL



NOTE: OPTIONAL 2" TD VALVE SHOWN IN GRAY



NOTES:

Cleveland Range reserves right of design improvement or modification, as warranted.
 Many regional, state and local codes exist and it is the responsibility of the owner and installer to comply with the codes.
 Cleveland Range equipment is built to comply with applicable standards for manufacturers. Included among those approval agencies are U.L., NSF, CGA, CSA, ETL and others.

(NOT TO SCALE)

Braising Pans / Tilting Skillets

760 Beta Drive, Unit D
 Mayfield Village, Ohio 44143

Tel 1.216.481.4900
 Fax 1.216.481.3782
 Email steam@clevelandrange.com

www.clevelandrange.com
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Timeless Quality, Trusted For Life®

Cleveland

DPK - Double Pantry Faucet SPK - Single Pantry Faucet

Project _____
Item _____
Quantity _____
FCSI Section 11400 _____
Approved _____
Date _____

Models

- DPK (Double Pantry Faucet)
- SPK (Single Pantry Faucet)



- DPK (Shown above)



- SPK (Shown above)



- DPK29 with SGLT1 easyTouch

Standard Features

Single & Double pantry faucets body design with one & two handles (hot and cold water).

Includes mounting bracket for secure attachment to kettle console or stand, faucet bracket is welded as standard with stationary kettles.

Swing spout design for reach over the kettle rim and flexible operation.

Compatible with kettle & skillet models (see below model configuration guide).

OEM accessory for Cleveland Range.

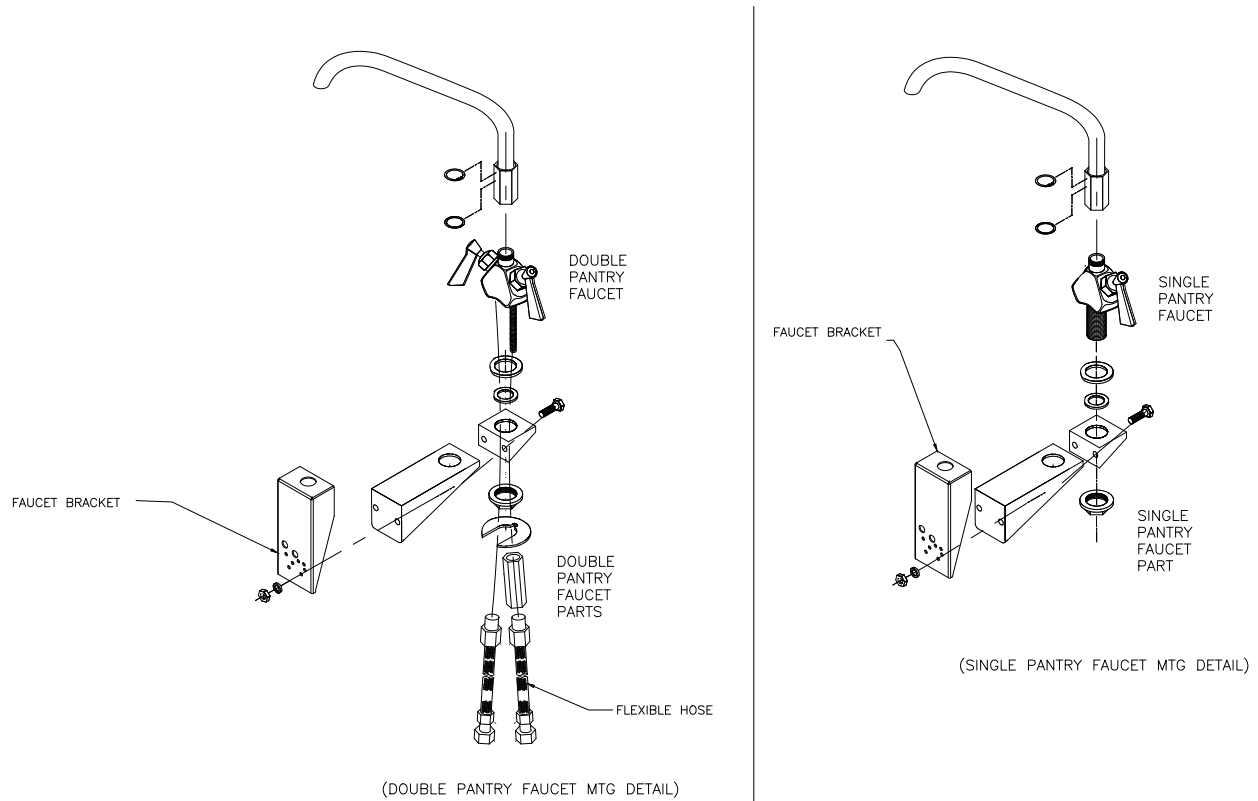
Durable construction suitable for commercial kitchen use.

Typically mounted with 3/4" water connections (check model for exact plumbing sizing).

Not installed at the factory

SPK & DPK

Cleveland



MODEL	NEW		Dimensions
	SPK	DPK	
SET-10	SPK24	DPK24	8" W x 6" H
KGL-25-T	SPK26	DPK26	14" W x 6.15625" H
KGL-40/60/80-T	SPK25	DPK25	18.5" W x 13.5" H
KGT-12-T	SPK28	DPK28	14" W x 12.5" H
KGT-12-TGB	SPK28	DPK28	14" W x 12.5" H
KGT-6-T	SPK28	DPK28	14" W x 12.5" H
KET-20-T	SPK28	DPK28	14" W x 12.5" H
KET-3/6/12-T	SPK27	DPK27	12.25" W x 10" H
KET-6/12-TGB	SPK27	DPK27	12.25" W x 10" H
SEL-T1	SPK29	DPK29	14" W x 6.15625" H
SGL-T1	SPK29	DPK29	14" W x 6.15625" H
KDL-25/40-T	SPK32	DPK32	16" W x 6.8125" H
KDL-40/60/80-TSH	SPK33	DPK33	14" W x 6.15625" H
KEL-40/60-TSH			
KDL-60/80/100-T	SPK31	DPK31	14" W x 12.5" H
KEL-25-T	SPK30	DPK30	16" W x 6.8125" H
KEL-40/60/80/100-T	SPK28	DPK28	14" W x 12.5" H
KET-20-TGB	SPK28	DPK28	14" W x 12.5" H
TKET-3-T	SPK27	DPK27	12.25" W x 10" H
TKET-6/12-T	SPK27	DPK27	12.25" W x 10" H

(NOT TO SCALE)

SPK & DPK

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The fuel gas codes require the use of an ANSI Z21.69/CSA 6.16 moveable gas connector with all appliances that may or may not utilize casters and, under normal use, are moved on a regular basis for service, positioning or area cleanliness.



Rotation technology reduces stress on both ends of the hose

Stainless Steel Construction
Heavy-duty, flexible, corrugated 304 stainless steel tubing

Stainless Steel Braid
Tight-weave braid prevents corrugations from stretching as equipment is moved

Antimicrobial PVC Coating
Inhibits growth of bacteria, mold and mildew on the gas connector



The Dormont Safety System™ is the first and only complete gas equipment connection system specifically engineered for the commercial kitchen. It is a complete system of connection products designed with the safety of your kitchen, the food you serve, your employees, and your business in mind.

The Safety System includes the famous Dormont Blue Hose and our exclusive safety-based fittings - the SnapFast quick-disconnect, the Safety Quik quick-disconnect valve, and the Swivel MAX. Safe, unique, and affordable, the Dormont Safety System provides peace of mind for the gas connections in your commercial kitchen.



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- Thermal shut-off when internal temperature exceeds 350°F (177°C)



SnapFast

- One-handed quick-disconnect fitting
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SwivelMAX

- Reduces stress on connector
- Increases kitchen aisle space by allowing connector to be positioned closer to the wall



Restraining Cable

- Prevents transmission of strain to connector
- Provided 1' shorter than the gas connector



Safety-Set







- Ensures cooking equipment is always positioned in design-specified location
- Fast installation with choice of adhesive foam tape or thumbscrews



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Moveable Commercial Equipment Kits

KIT SOLUTIONS	PART NUMBER	BTU/hr Minimum Flow Capacity*	 THE BLUE HOSE™	 SnapFast® QUICK-DISCONNECT	 Swivel MAX® 1st SWIVEL	 Swivel MAX® 2nd SWIVEL	 Safety Quik® VALVE	 RESTRAINING CABLE
Standard Kit (KIT)¹ The Dormont Blue Hose™ SnapFast Quick-Disconnect Restraining Cable	1650KIT36	77K	✓	✓				✓
	1650KIT48	68K	✓	✓				✓
	1650KIT60	60K	✓	✓				✓
	1675KIT36	218K	✓	✓				✓
	1675KIT48	180K	✓	✓				✓
	1675KIT60	158K	✓	✓				✓
	16100KIT36	379K	✓	✓				✓
	16100KIT48	334K	✓	✓				✓
	16100KIT60	294K	✓	✓				✓
Single Swivel MAX Kit (KITS)² The Dormont Blue Hose™ SnapFast Quick-Disconnect One Swivel MAX Swivel Restraining Cable	1650KITS36	72K	✓	✓	✓			✓
	1650KITS48	63K	✓	✓	✓			✓
	1650KITS60	56K	✓	✓	✓			✓
	1675KITS36	203K	✓	✓	✓			✓
	1675KITS48	167K	✓	✓	✓			✓
	1675KITS60	147K	✓	✓	✓			✓
	16100KITS36	353K	✓	✓	✓			✓
	16100KITS48	310K	✓	✓	✓			✓
	16100KITS60	274K	✓	✓	✓			✓
Double Swivel MAX Kit (KIT2S)³ The Dormont Blue Hose™ SnapFast Quick-Disconnect Two Swivel MAX Swivels Restraining Cable	1650KIT2S36	69K	✓	✓	✓	✓		✓
	1650KIT2S48	60K	✓	✓	✓	✓		✓
	1650KIT2S60	54K	✓	✓	✓	✓		✓
	1675KIT2S36	193K	✓	✓	✓	✓		✓
	1675KIT2S48	160K	✓	✓	✓	✓		✓
	1675KIT2S60	140K	✓	✓	✓	✓		✓
	16100KIT2S36	336K	✓	✓	✓	✓		✓
	16100KIT2S48	295K	✓	✓	✓	✓		✓
	16100KIT2S60	261K	✓	✓	✓	✓		✓
Safety Quik Kit (KITCF)⁴ The Dormont Blue Hose™ Safety Quik Quick-Disconnect Restraining Cable	1650KITCF36	77K	✓				✓	✓
	1650KITCF48	68K	✓				✓	✓
	1650KITCF60	60K	✓				✓	✓
	1675KITCF36	218K	✓				✓	✓
	1675KITCF48	180K	✓				✓	✓
	1675KITCF60	158K	✓				✓	✓
	16100KITCF36	379K	✓				✓	✓
	16100KITCF48	334K	✓				✓	✓
	16100KITCF60	294K	✓				✓	✓
Safety Quik Single Swivel MAX Kit (KITCFS)⁵	1650KITCFS36	72K	✓		✓		✓	✓
	1650KITCFS48	63K	✓		✓		✓	✓
	1650KITCFS60	56K	✓		✓		✓	✓
	1675KITCFS36	203K	✓		✓		✓	✓
	1675KITCFS48	161K	✓		✓		✓	✓
	1675KITCFS60	147K	✓		✓		✓	✓
	16100KITCFS36	353K	✓		✓		✓	✓
	16100KITCFS48	310K	✓		✓		✓	✓
	16100KITCFS60	274K	✓		✓		✓	✓

¹ Includes Full Port Gas Valve and (2) 90° Street Elbows

² Includes Full Port Gas Valve and (1) 90° Street Elbow

³ Includes Full Port Gas Valve

⁴ Includes (2) 90° Street Elbows

⁵ Includes (1) 90° Street Elbow

Indicates most commonly stocked item

*BTU/hr Minimum Flow Capacity (0.64 Sp.Gr., 1000 BTU/ft³ Natural Gas at 0.5" wc pressure drop)

ADDITIONAL CONFIGURATIONS ARE AVAILABLE IN OUR CATALOG.



Add PS to the end of any part number to include the Safety-Set® wheel placement system



We guarantee our commercial gas connectors for the life of the original appliance to which it is connected.

Submittal Sheet

10/03/2025

ITEM# 41 - FLOOR TROUGH (1 EA REQ'D)

Eagle Group ASFT-1224-SG

Anti-Splash Floor Trough, 24"W x 12"D, stainless steel subway-style grating, 6" deep trough pan with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel removable perforated basket, all-welded 14/304 stainless steel construction, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		4"



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Anti-Splash Floor Trough with stainless steel grating, model _____. Unit constructed of 14/304 stainless steel all-welded construction. Patented anti-splash design (patent #D519,618 S) assures complete drainage while preventing splash back onto the floor. Drain accommodates up to a 4"-diameter pipe and comes standard with a stainless steel removable perforated basket. Type 304 stainless steel subway style grating shall be $\frac{3}{16}$ " x 1" vertically positioned bars spaced 1" apart for ease of drainage. Two $\frac{5}{8}$ " stainless steel rods, set $2\frac{1}{4}$ " in from each edge, are welded to the bars to eliminate swaying.



anti-splash floor trough

Options / Accessories

☐ ADA-compliant grating*

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Anti-Splash Floor Troughs with Subway-Style Stainless Steel Grating

MODELS:

<input type="checkbox"/> ASFT-1218-SG	<input type="checkbox"/> ASFT-1548-SG	<input type="checkbox"/> ASFT-1884-SG
<input type="checkbox"/> ASFT-1224-SG	<input type="checkbox"/> ASFT-1560-SG	<input type="checkbox"/> ASFT-1896-SG
<input type="checkbox"/> ASFT-1230-SG	<input type="checkbox"/> ASFT-1572-SG	<input type="checkbox"/> ASFT-18120-SG
<input type="checkbox"/> ASFT-1236-SG	<input type="checkbox"/> ASFT-1584-SG	<input type="checkbox"/> ASFT-2424-SG
<input type="checkbox"/> ASFT-1248-SG	<input type="checkbox"/> ASFT-1596-SG	<input type="checkbox"/> ASFT-2430-SG
<input type="checkbox"/> ASFT-1260-SG	<input type="checkbox"/> ASFT-15120-SG	<input type="checkbox"/> ASFT-2436-SG
<input type="checkbox"/> ASFT-1272-SG	<input type="checkbox"/> ASFT-1824-SG	<input type="checkbox"/> ASFT-2448-SG
<input type="checkbox"/> ASFT-1284-SG	<input type="checkbox"/> ASFT-1830-SG	<input type="checkbox"/> ASFT-2460-SG
<input type="checkbox"/> ASFT-1296-SG	<input type="checkbox"/> ASFT-1836-SG	<input type="checkbox"/> ASFT-2472-SG
<input type="checkbox"/> ASFT-12120-SG	<input type="checkbox"/> ASFT-1848-SG	<input type="checkbox"/> ASFT-2484-SG
<input type="checkbox"/> ASFT-1524-SG	<input type="checkbox"/> ASFT-1860-SG	<input type="checkbox"/> ASFT-2496-SG
<input type="checkbox"/> ASFT-1530-SG	<input type="checkbox"/> ASFT-1872-SG	<input type="checkbox"/> ASFT-24120-SG
<input type="checkbox"/> ASFT-1536-SG		

Design and Construction Features

- Patented "anti-splash" design (patent #D519,618 S) assures complete drainage, while preventing splash back onto floor.
- 14 gauge type 304 stainless steel all-welded construction.
- Built-in pitch towards drain insures complete drainage.
- Stainless steel drain accommodates up to a 4" (102mm) diameter pipe, and features a removable perforated stainless steel basket.
- Comes with subway-style stainless steel grating, featuring $\frac{3}{16}$ " x 1" vertically positioned bars spaced 1" apart.
- Floor troughs with gray ADA-compliant grating* available. To order, add suffix "-ADA" to end of model number. Example: ASFT-1224-SG-ADA
- Custom sizes available. Consult factory for details.

* For Floor Troughs with Stainless Steel Grating, optional ADA-compliant Grating features additional stainless steel flat bars spaced 1/4" apart. ADA-compliant Grating is available in gray color only.

EAGLE GROUP

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www.eaglegrpnews.com
www.eaglegrpnews.com

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Certifications / Approvals



AutoQuotes



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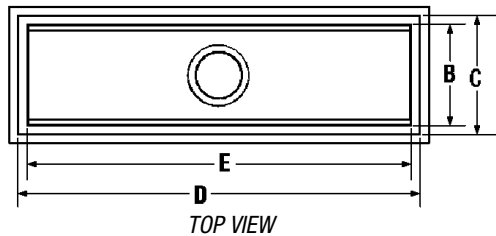
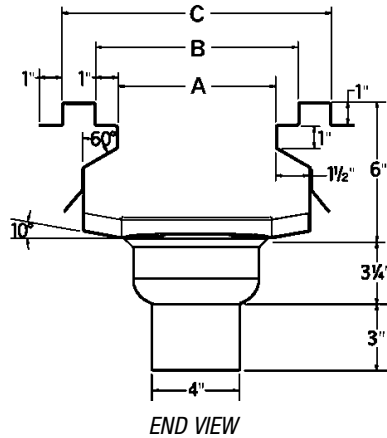
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Anti-Splash Floor Troughs with Subway-Style Stainless Steel Grating



See chart below for dimensions A through E

Grating Used in Various Floor Troughs

Floor Trough (dimension D)	Floor Trough (dimension E)	Grating Used - Quantity and Length
18" (457mm)	15" (381mm)	one 15" (381mm)
24" (610mm)	21" (533mm)	one 12" (305mm) and one 9" (229mm)
30" (762mm)	27" (686mm)	three 9" (229mm)
36" (914mm)	33" (838mm)	two 12" (305mm) and one 9" (229mm)
48" (1219mm)	45" (1143mm)	three 12" (305mm) and one 9" (229mm)
60" (1524mm)	57" (1448mm)	four 12" (305mm) and one 9" (229mm)
72" (1829mm)	69" (1753mm)	five 12" (305mm) and one 9" (229mm)
84" (2134mm)	81" (2057mm)	six 12" (305mm) and one 9" (229mm)
96" (2438mm)	93" (2362mm)	seven 12" (305mm) and one 9" (229mm)
120" (3048mm)	117" (2972mm)	nine 12" (305mm) and one 9" (229mm)

12" (305mm)-WIDE TROUGHS
 dimension A: 7" (178mm)
 dimension B: 9" (229mm)
 dimension C: 12" (305mm)
 weight

lbs.	kg	model #
55	25.0	ASFT-1218-SG
68	30.9	ASFT-1224-SG
85	38.6	ASFT-1230-SG
100	45.4	ASFT-1236-SG
116	52.6	ASFT-1248-SG
168	76.2	ASFT-1260-SG
174	78.9	ASFT-1272-SG
180	81.7	ASFT-1284-SG
185	83.9	ASFT-1296-SG
231	104.8	ASFT-12120-SG

15" (381mm)-WIDE TROUGHS
 dimension A: 10" (254mm)
 dimension B: 12" (305mm)
 dimension C: 15" (381mm)
 weight

lbs.	kg	model #
n/a	n/a	n/a
73	33.1	ASFT-1524-SG
82	37.2	ASFT-1530-SG
105	47.6	ASFT-1536-SG
147	66.8	ASFT-1548-SG
189	85.7	ASFT-1560-SG
196	88.9	ASFT-1572-SG
203	92.1	ASFT-1584-SG
245	111.1	ASFT-1596-SG
266	120.7	ASFT-15120-SG

18" (457mm)-WIDE TROUGHS
 dimension A: 13" (330mm)
 dimension B: 15" (381mm)
 dimension C: 18" (457mm)
 weight

lbs.	kg	model #
n/a	n/a	n/a
105	47.6	ASFT-1824-SG
122	55.4	ASFT-1830-SG
146	66.2	ASFT-1836-SG
177	80.3	ASFT-1848-SG
202	91.6	ASFT-1860-SG
215	97.5	ASFT-1872-SG
220	99.8	ASFT-1884-SG
249	113.0	ASFT-1896-SG
301	136.5	ASFT-18120-SG

24" (610mm)-WIDE TROUGHS
 dimension A: 19" (483mm)
 dimension B: 21" (533mm)
 dimension C: 24" (610mm)
 weight

lbs.	kg	model #
n/a	n/a	n/a
113	51.3	ASFT-2424-SG
166	75.3	ASFT-2430-SG
199	90.3	ASFT-2436-SG
213	96.6	ASFT-2448-SG
227	103.0	ASFT-2460-SG
255	115.7	ASFT-2472-SG
269	122.0	ASFT-2484-SG
307	139.3	ASFT-2496-SG
389	176.5	ASFT-24120-SG

dimension D		dimension E	
in.	mm	in.	mm
18"	457	15"	381
24"	610	21"	533
30"	762	27"	686
36"	914	33"	838
48"	1219	45"	1143
60"	1524	57"	1448
72"	1829	69"	1753
84"	2134	81"	2057
96"	2438	93"	2362
120"	3048	117"	2972

EAGLE GROUP

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Rev. 05/23

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Although every attempt has been made to ensure the accuracy of the information provided, we cannot be held responsible for typographical or printing errors. Information and specifications are subject to change without notice. Please confirm at time of order.

Submittal Sheet

10/03/2025

ITEM# 42 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 43 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 44 - S/S - CHEF'S TABLE (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Chef's Table Approx. Size 3'-0" X 15'-0" Plate Storage Below on Chef" Side. Fabricated per plan and specification. ** Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 45 - S/S - DOUBLE OVERSHELF (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Double Over Shelf. Approx. Size 15" X 15'-0". Fabricated per plan and specification. **

Approved Shop Drawing **

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 46 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 47 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 48 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 49 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 50 - REACH-IN REFRIGERATOR (1 EA REQ'D)

True Mfg. - General Foodservice STA2R-2S-HC

SPEC SERIES® Refrigerator, reach-in, two-section, (2) stainless steel doors with locks, cam-lift hinges, digital temperature control, (6) chrome shelves, LED interior lights, stainless steel front & sides, aluminum interior sides & walls, stainless floor & ceiling, 5" castors, view spec sheet for electrical information & certifications, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
True Mfg. - General Foodservice	1		7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.
True Mfg. - General Foodservice	1		Left door hinged left, right door hinged right standard
True Mfg. - General Foodservice	1		(3) chrome shelves & shelf supports standard per section
True Mfg. - General Foodservice	1		5" castors (set of 4), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115		1	Cord & Plug		5-15P	5.9		1/2		



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PROJECT NAME	LOCATION		AIA #
ITEM #	QTY	MODEL #	SIS #

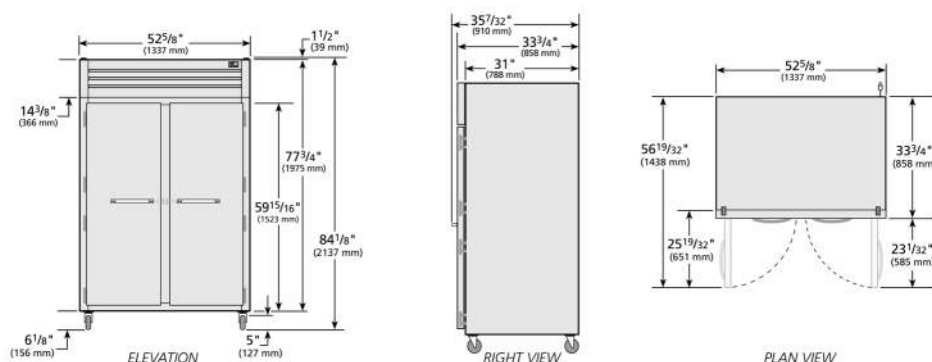
SPEC SERIES®

REACH-IN SOLID SWING DOOR REFRIGERATOR WITH HYDROCARBON REFRIGERANT

models	STR2R-2S-HC	STA2R-2S-HC	STG2R-2S-HC
--------	-------------	-------------	-------------



plan view



STR2R-2S-HC

Exterior	Stainless steel door, front & sides.
Interior	Stainless steel side walls, back, floor, door liner, & ceiling.
Shelving	(1) Interior kit option included per full section.

STA2R-2S-HC

Exterior	Stainless steel door, front & sides.
Interior	Aluminum side walls & back. Stainless steel floor & ceiling.
Shelving	(3) Heavy duty, chrome plated, wire shelves per section.

STG2R-2S-HC

Exterior	Stainless steel door, with matching aluminum sides.
Interior	Aluminum side walls & back. Stainless steel floor & ceiling.
Shelving	(3) Heavy duty, PVC coated, wire shelves per section.

SPECIFICATIONS

Dimensions	in.	mm.
Length	52 5/8	1337
Depth	33 3/4	858
Height	77 3/4	1975
Electrical	U.S.	International
Horsepower	1/2	N/A
Amps	5.9	N/A
Voltage	115/60/1	
NEMA	5-15P	
Cord Length	9 ft.	2.74 M.



* Height does not include 6 1/8" (156 mm) for castors or 6" (153 mm) for optional legs.
† Depth does not include 1 1/2" for door handle.

Specifications subject to change without notice.
Chart dimensions are rounded up to the nearest 1/8" (millimeters rounded up to the next whole number).



APPROVALS

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PROJECT NAME	LOCATION	AIA #
ITEM #	QTY	MODEL #
		SIS #

SPEC SERIES®

REACH-IN SOLID SWING DOOR REFRIGERATOR WITH HYDROCARBON REFRIGERANT

models STR2R-2S-HC STA2R-2S-HC STG2R-2S-HC



standard features

REFRIGERATION SYSTEM

- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydrocarbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Top mounted refrigeration system with evaporator positioned out of food zone to maximize capacity.
- Electronic control.

CABINET CONSTRUCTION

- Insulation - entire cabinet structure and solid door are foamed-in-place using Ecomate. A high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 5" (127 mm) diameter plate castors - locks provided on front set.

DOORS

- Lifetime guaranteed bolt style door locks.

- Lifetime guaranteed heavy duty all metal working door handles.
- Positive seal self-closing doors with 120° stay open feature. Lifetime guaranteed external cam lift door hinges, four (4) per door section.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

LIGHTING

- LED interior lighting, safety shielded.

MODEL FEATURES

- Exterior digital temperature display, available with either °F or °C.
- Evaporator epoxy coated to eliminate the potential of corrosion.
- Curb mounting ready.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL

- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

OPTIONAL FEATURES/ ACCESSORIES

(upcharge & lead times may apply)

- 6" (153 mm) standard legs.
- 6" (153 mm) seismic/flanged legs.
- 6" (153 mm) stainless steel legs.
- Field reversible hinge.
- Additional shelves.
- Stainless back. (STR, STA, STG)
- Security package.

SHELVING KIT OPTIONS

- STR series kits factory installed at no charge. STA & STG series kits field installed, upcharge applies, lead times may apply.
- Kit #1: Nine (9) sets of #1 type tray slides and pilasters (field installed), bottom support of one (1) 18"L x 26"D (458 mm x 661 mm) pan or two (2) 14"L x 18"D (356 mm x 458 mm) pans.
- Kit #2: One (1) set half-section #2 steel rod tray slides and pilasters (field installed), rim support of one (1) 18"L x 26"D (458 mm x 661 mm) pan.
- Kit #3: Six (6) sets of universal type tray slides and pilasters (field installed), bottom support of one (1) 18"L x 26"D (458 mm x 661 mm) pan, two (2) 14"L x 18"D (356 mm x 458 mm) pans or two (2) 12"L x 20"D (305 mm x 508 mm) pans.
- Kit #4: Three (3) chrome shelves 26 5/16"L x 21 1/16"D (669 mm x 548 mm). Optional wall mounted shelf support pilasters (field installed) with four (4) shelf clips per shelf available; adjustable on 1/2" (13 mm) increments (must order at time of cabinet order).
- Additional kit option components available individually.

WARRANTY

Three year warranty on all parts and labor and an additional 2 year warranty on compressor. (U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



Model	Elevation	Right	Plan	3D	Back
ST()2R-2S-HC					

Submittal Sheet

10/03/2025

ITEM# 51 - REACH-IN FREEZER (1 EA REQ'D)

True Mfg. - General Foodservice STA1F-1S-HC

SPEC SERIES® Freezer, reach-in, -10°F, one-section, (1) stainless steel door with lock, cam-lift hinges, digital temperature control, (3) chrome shelves, LED interior lights, stainless steel front & sides, aluminum interior, 5" castors, view spec sheet for electrical information & certifications, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
True Mfg. - General Foodservice	1		7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.
True Mfg. - General Foodservice	1		Door hinged right standard
True Mfg. - General Foodservice	1		(3) chrome shelves & shelf supports standard per section
True Mfg. - General Foodservice	1		5" castors (set of 4), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	6		1/2		



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PROJECT NAME	LOCATION	AIA #
ITEM #	QTY	MODEL #
		SIS #

SPEC SERIES®

REACH-IN SOLID SWING DOOR FREEZERS WITH HYDROCARBON REFRIGERANT

models	STR1F-1S-HC	STA1F-1S-HC	STG1F-1S-HC
--------	-------------	-------------	-------------



STR1F-1S-HC

Exterior	Stainless steel door, front & sides.
Interior	Stainless steel side walls, back, floor, door liner, & ceiling.
Shelving	(1) Interior kit option included per full section, factory installed.

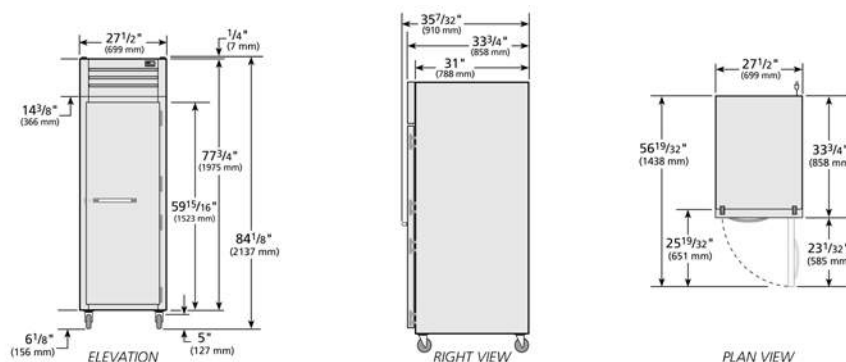
STA1F-1S-HC

Exterior	Stainless steel door, front & sides.
Interior	Aluminum side walls & back. Stainless steel floor & ceiling.
Shelving	(3) Heavy duty, chrome plated, wire shelves per section.

STG1F-1S-HC

Exterior	Stainless steel door & front, with matching aluminum sides.
Interior	Aluminum side walls & back. Stainless steel floor & ceiling.
Shelving	(3) Heavy duty, PVC coated, wire shelves per section.

plan view



SPECIFICATIONS

Dimensions	in.	mm.
Width	27 1/2	699
Depth	33 3/4	858
Height	77 3/4	1975
Electrical	U.S.	International
Horsepower	1/2	N/A
Amps	6.0	N/A
Voltage	115/60/1	
NEMA	5-15P	
Cord Length	9 ft.	2.74 M.



115/60/1
NEMA-5-15R

* Height does not include 6 1/8" (156 mm) for castors or 6" (153 mm) for optional legs. Height does not include 1/4" (7mm) for system mechanical components.
† Depth does not include 1 1/2 for door handle.

Specifications subject to change without notice.
Chart dimensions are rounded up to the nearest 1/8" (millimeters rounded up to the next whole number).



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PROJECT NAME	LOCATION	AIA #
ITEM #	QTY	MODEL #
		SIS #

SPEC SERIES®

REACH-IN SOLID SWING DOOR FREEZERS WITH HYDROCARBON REFRIGERANT

models

STR1F-1S-HC

STA1F-1S-HC

STG1F-1S-HC



standard features

REFRIGERATION SYSTEM

- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydrocarbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains -10°F (-23.3°C) temperatures. Ideal for both frozen foods and ice cream.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Top mounted refrigeration system with evaporator positioned out of food zone to maximize capacity.
- Automatic defrost system time-initiated, temperature-terminated. Saves energy consumption and provides shortest possible defrost cycle.
- Automatic evaporator fan motor delay during defrost cycle.

CABINET CONSTRUCTION

- Insulation - entire cabinet structure and solid door are foamed-in-place using Ecomate. A high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 5" (127 mm) diameter plate castors - locks provided on front set.

DOOR

- Lifetime guaranteed bolt style door lock standard.
- Lifetime guaranteed heavy duty all metal working door handle.
- Positive seal self-closing door with 120° stay open feature. Lifetime guaranteed external cam lift door hinges, four (4) per door section.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

LIGHTING

- LED interior lighting, safety shielded.

MODEL FEATURES

- Exterior digital temperature display, available with either °F or °C.
- Evaporator epoxy coated to eliminate the potential of corrosion
- Curb mounting ready.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL

- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

OPTIONAL FEATURES/ ACCESSORIES

(upcharge & lead times may apply)

- 6" (153 mm) standard legs.
- 6" (153 mm) seismic/flanged legs.
- 6" (153 mm) stainless steel legs.
- Field reversible hinge.
- Additional shelves.
- Stainless back. (STR, STA, STG)
- Security package.

SHELVING KIT OPTIONS

- STR series kits factory installed at no charge. STA & STG series kits field installed, upcharge applies, lead times may apply.
- Kit #1: Nine (9) sets of #1 type tray slides and pilasters (field installed), bottom support of one (1) 18"L x 26"D (458 mm x 661 mm) pan or two (2) 14"L x 18"D (356 mm x 458 mm) pans.
- Kit #2: One (1) set half-section #2 steel rod tray slides and pilasters (field installed), rim support of one (1) 18"L x 26"D (458 mm x 661 mm) pan.
- Kit #3: Six (6) sets of universal type tray slides and pilasters (field installed), bottom support of one (1) 18"L x 26"D (458 mm x 661 mm) pan, two (2) 14"L x 18"D (356 mm x 458 mm) pans or two (2) 12"L x 20"D (305 mm x 508 mm) pans.
- Kit #4: Three (3) chrome shelves 26 5/16"L x 21 5/16"D (669 mm x 548 mm). Optional wall mounted shelf support pilasters (field installed) with four (4) shelf clips per shelf available; adjustable on 1/2" (13 mm) increments (must order at time of cabinet order).
- Additional kit option components available individually.

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



Model	Elevation	Right	Plan	3D	Back
ST()1F-1S-HC					

Submittal Sheet

10/03/2025

ITEM# 52 - HAND SINK (2 EA REQ'D)

Eagle Group HSA-10

Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, requires splash mounted faucet, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	2	306134	T&S Extra Heavy Duty Gooseneck Faucet, splash-mounted, 4" OC, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		1-1/2"
2		



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Hand Sink, model HSA-10. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage and basket drain. Unit less faucet.

Eagle Hand Sink, model HSA-10-F. Features the same as sink #HSA-10, plus splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FA. Features the same as sink #HSA-10, plus p-trap, tailpiece, and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FAW. Features the same as sink #HSA-10, plus p-trap, tailpiece, and splash mounted gooseneck faucet with wrist handles.

Eagle Hand Sink, model HSA-10-FL. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage, polymer lever drain, and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FO. Features the same as sink #HSA-10-FL, plus polymer lever drain includes overflow.



#HSA-10-F

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Traditional Hand Sinks

MODELS:

- ☐ HSA-10
- ☐ HSA-10-F
- ☐ HSA-10-FAW
- ☐ HSA-10-FA
- ☐ HSA-10-FL
- ☐ HSA-10-FO

Design & Construction Features

- Heavy gauge type 304 stainless steel all-welded construction.
- Inverted "V" edge rim retards spillage.
- Unique deep-drawn positive-drain bowl assures complete drainage to meet the most stringent health code requirements.
- Water inlet: 1/2" (13mm) NPS.
- Drain outlet: 1 1/2" (38mm) NPS.
- Six models to choose from.

Options / Accessories

- ☐ P-trap
- ☐ Tail piece
- ☐ End splashes
- ☐ Front skirt
- ☐ Side mount wall bracket
- ☐ MICROGARD®* antimicrobial protection

* For hand sinks #HSA-10, HSA-10-F, HSA-10-FA, and HSA-10-FAW

EAGLE GROUP

100 Industrial Boulevard
Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • 800-441-8440

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www.eaglegrp.com • www.eaglemhc.com

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Certifications / Approvals



AutoQuotes



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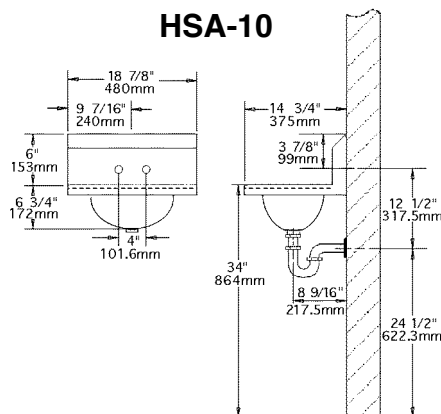


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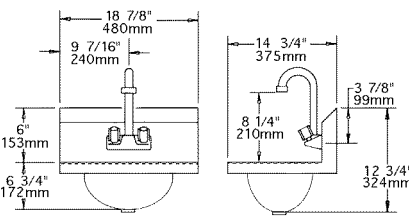
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 S.I.S. No.: _____

Traditional Hand Sinks

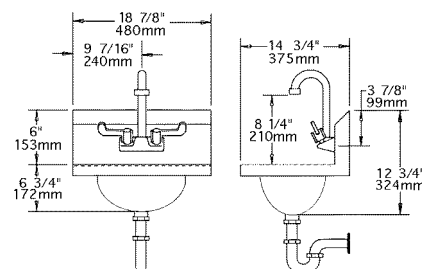
HSA-10



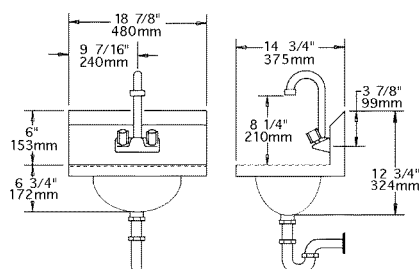
HSA-10-F



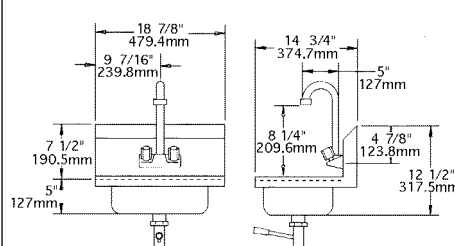
HSA-10-FAW



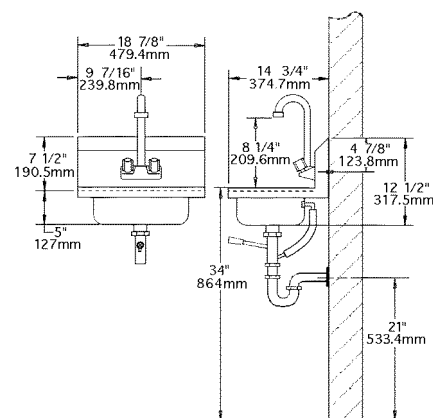
HSA-10-FA



HSA-10-FL



HSA-10-FO



model #	includes	bowl size		overall size		weight lbs. kg
		width in.	length x depth mm	width in.	length x height mm	
HSA-10 *	4" (102mm) centerline faucet holes, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	10 4.5
HSA-10-F	faucet, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	12 5.2
HSA-10-FA	faucet, p-trap, tail piece, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	14 6.4
HSA-10-FAW	faucet w/wrist handles, p-trap, tail piece, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	14 6.4
HSA-10-FL	faucet, polymer lever drain	10"	14" x 5"	14 3/4"	18 7/8" x 12 1/2"	15 6.6
HSA-10-FO	faucet, polymer lever drain w/overflow	10"	14" x 5"	14 3/4"	18 7/8" x 12 1/2"	13 5.9

* To order hand sink with no faucet holes, add suffix "-NH" to model number (example: HSA-10-NH).

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 or 800-441-8440 • Fax: 302-653-2065

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Profit from the Eagle Advantage®

Specification Sheet



splash mounted faucet



deck mounted faucet



deck mounted faucet with 8" spout



battery-powered electronic-eye faucet



T&S electronic-eye faucet



splash mounted spout



short 90°

EAGLE GROUP

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Item No.: _____
Project No.: _____
S.I.S. No.: _____

Hand Sink Accessories & Options —Faucets & Valves

FAUCETS

STANDARD FAUCETS

All standard faucets feature 4" (102mm) center, except #313075.

model #	description
303987	splash mounted, gooseneck spout
307120	wrist handles for faucet #303987
306495	splash mounted with wrist handles, gooseneck spout
302004	deck mounted, gooseneck spout
301248	deck mounted, 8" (203mm) spout
318495	drinking bubbler
313075	splash mounted, gooseneck spout, 8" (203mm) center

REPAIR KIT FOR STANDARD FAUCETS

For faucets #303987, 302004, and 301248 only.

model #	description
368421	hot/cold ceramic cartridges

BATTERY-POWERED ELECTRONIC-EYE FAUCETS

Used as a replacement for Hand Sinks with AC-Powered Electronic-Eye Faucet (EG20.42) by adding suffix "-B" when ordering hand sink, or as a replacement faucet for Hand Sinks with Battery-Powered Electronic-Eye Faucet (EG20.49) via model numbers below. Comes with Temperature Adjustment Valve (see back page).

model #	description
326014	splash-mount; (4) "AA" batteries; built-in low-battery indicator
356128	upgrade: T&S splash-mount electric-eye faucet, with batteries and AC adapter for dual operation. With AC plugged in, faucet automatically switches to AC power to conserve batteries.

SPOUT ASSEMBLY

model #	description
312162	splash-mounted replacement gooseneck for 120V AC electronic or pedal-operated models

SHORT 90° FOR SPLASH MOUNT FAUCETS

model #	description
376740	set of two, 1/2" NPT female x male

AUTOQUOTES



EG20.52A Rev. 11/15



Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Hand Sink Accessories & Options—Faucets & Valves



emergency
eye wash unit
#326272



#377563



anti-scald valve
#373848



anti-scald valve
#326696



tempering valve



temperature
adjustment valve



non-temperature
adjustment valve



shut-off valve



foot pedal valve
(double pedal)



foot pedal valve
(single pedal)



knee pedal valve
(double pedal)

FAUCET-MOUNT EMERGENCY EYE WASH UNITS

Fits in place of standard aerator on spout.

IMPORTANT: If anti-scald valve is needed, order #373848 only.

model #	description
326272	pull valve activation, includes two dust covers, chrome
377563	rotate to activate, "eye-pod" design, polished stainless

VALVES

ANTI-SCALD VALVE FOR EMERGENCY EYE WASH UNIT #326272

Meets ANSI Z358.1 and ASSE 1071 standards.

model #	description
373848	1/2" (13mm) NPT, 65°-90°F

ANTI-SCALD VALVE

Features automatic shutdown with either hot or cold water failure. ASSE 1016 and 1017 listed.

IMPORTANT: Do not use with emergency eye wash unit (#326272).

model #	description
326696	1/2" (13mm) NPT, 100°-145°F

TEMPERING VALVE

120°F maximum output. Maximum pressure of 150 psi. ASSE 1016 and 1070 listed.

model #	description
375612	thermoplastic body, 3/8" (10mm) male compression fittings, 80°F-120°F, 0.5-2.5 gpm, built-in check valve

TEMPERATURE ADJUSTMENT VALVE ("MIXING VALVE")

For hand sinks with AC-powered electronic faucet or hand sinks with single-pedal valve. Cast brass body. 3/8" (10mm) all connections.

model #	description
326015	built-in check valves to prevent backflow, adjustable screw valves to mix hot and cold

REPLACEMENT NON-ADJUSTABLE Y-INLET MIXING VALVE

Standard only on AC-powered electronic hand sinks and hand sinks with single-pedal valve. "Y" shaped single-piece component. Chrome-plated brass body.

model #	description
342938	male connections; threads are 9/16-24 UNEF

SHUT-OFF VALVE

Antibacterial surface. Screws onto faucet aerator. Polished chrome.

model #	description
349921	shut-off push valve

KNEE/FOOT PEDAL VALVES

Replacement cartridge available for all pedal valves: Model #374955.

Double Pedals		Single Pedals	description
model #	model #	model #	
300604	355994		foot pedal valve, floor mount
313481	351738		knee pedal valve

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Rev. 11/15

Submittal Sheet

10/03/2025

ITEM# 53 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 54 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 55 - REACH-IN REFRIGERATOR (1 EA REQ'D)

True Mfg. - General Foodservice STA1R-1G-HC

SPEC SERIES® Refrigerator, reach-in, one-section, (1) glass door with lock, cam-lift hinges, digital temperature control, (3) chrome shelves, LED interior lights, stainless steel front & sides, aluminum interior sides & walls, stainless floor & ceiling, 5" castors, view spec sheet for electrical information & certifications, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
True Mfg. - General Foodservice	1		7 year compressor warranty, 7 years parts warranty, 7 year labor warranty, standard. Visit www.truemfg.com for specifics.
True Mfg. - General Foodservice	1		Door hinged right standard
True Mfg. - General Foodservice	1		(3) chrome shelves & shelf supports standard per section
True Mfg. - General Foodservice	1		5" castors (set of 4), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	3.8		1/4		



TRUE FOOD SERVICE EQUIPMENT, INC. • 2001 East Terra Lane • O'Fallon, Missouri 63366-4434
ph. 636.240.2400 • toll free 800.325.6152 • fax 636.272.2408 • parts fax 636.272.9471 • www.truemfg.com

PROJECT NAME	LOCATION	AIA #
ITEM #	QTY	MODEL #
		SIS #

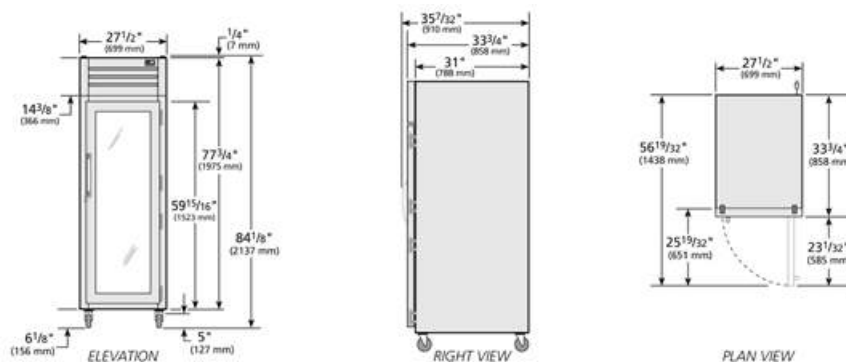
SPEC SERIES®

REACH-IN GLASS SWING DOOR REFRIGERATORS WITH HYDROCARBON REFRIGERANT

models	STR1R-1G-HC	STA1R-1G-HC	STG1R-1G-HC
--------	-------------	-------------	-------------



plan view



Specifications subject to change without notice.
Chart dimensions are rounded up to the nearest 1/8" (millimeters rounded up to the next whole number).

STR1R-1G-HC

Exterior	Stainless steel door, front & sides.
Interior	Stainless steel side walls, back, floor, door liner, & ceiling.
Shelving	(1) Interior kit option included per full section, factory installed.

STA1R-1G-HC

Exterior	Stainless steel door, front & sides.
Interior	Aluminum side walls & back. Stainless steel floor & ceiling.
Shelving	(3) Heavy duty, chrome plated, wire shelves per section.

STG1R-1G-HC

Exterior	Stainless steel door & front, with matching aluminum sides.
Interior	Aluminum side walls & back. Stainless steel floor & ceiling.
Shelving	(3) Heavy duty, PVC coated, wire shelves per section.

SPECIFICATIONS

Dimensions	in.	mm.
Length	27 1/2	699
Depth	33 3/4	858
Height	77 3/4	1975
Electrical	U.S.	International
Horsepower	1/4	N/A
Amps	3.8	N/A
Voltage	115/60/1	
NEMA	5-15P	
Cord Length	9 ft.	2.74 M.



115/60/1
NEMA-5-15R

* Height does not include 6 1/8" (156 mm) for castors or 6" (153 mm) for optional legs. Height does not include 1/4" (7mm) for system mechanical components.
† Depth does not include 1 1/2 for door handle.



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PROJECT NAME	LOCATION	AIA #
ITEM #	QTY	MODEL #
		SIS #

SPEC SERIES®

REACH-IN GLASS SWING DOOR REFRIGERATOR WITH HYDROCARBON REFRIGERANT

models	STR1R-1G-HC	STA1R-1G-HC	STG1R-1G-HC
--------	-------------	-------------	-------------



standard features

REFRIGERATION SYSTEM

- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydrocarbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Top mounted refrigeration system with evaporator positioned out of food zone to maximize capacity.
- Electronic control.

CABINET CONSTRUCTION

- Insulation - entire cabinet structure is foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 5" (127 mm) diameter plate castors - locks provided on front set.

DOOR

- "Low-E", double pane thermal insulated glass.

- Lifetime guaranteed bolt style door lock standard.
- Lifetime guaranteed heavy duty all metal working door handle.
- Positive seal self-closing door with 120° stay open feature. Lifetime guaranteed external cam lift door hinges, four (4) per door section.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

LIGHTING

- LED interior lighting, safety shielded.

MODEL FEATURES

- Exterior digital temperature display, available with either °F or °C.
- Evaporator epoxy coated to eliminate the potential of corrosion.
- Curb mounting ready.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL

- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

OPTIONAL FEATURES/ ACCESSORIES

(upcharge & lead times may apply)

- 6" (153 mm) standard legs.
- 6" (153 mm) seismic/flanged legs.
- 6" (153 mm) stainless steel legs.
- Field reversible hinge.
- Additional shelves.
- Stainless back. (STR, STA, STG)
- Security package.

SHELVING KIT OPTIONS

- STR series kits factory installed at no charge. STA & STG series kits field installed, upcharge applies, lead times may apply.
- Kit #1: Nine (9) sets of #1 type tray slides and pilasters (field installed), bottom support of one (1) 18"L x 26"D (458 mm x 661 mm) pan or two (2) 14"L x 18"D (356 mm x 458 mm) pans.
- Kit #2: One (1) set half-section #2 steel rod tray slides and pilasters (field installed), rim support of one (1) 18"L x 26"D (458 mm x 661 mm) pan.
- Kit #3: Six (6) sets of universal type tray slides and pilasters (field installed), bottom support of one (1) 18"L x 26"D (458 mm x 661 mm) pan, two (2) 14"L x 18"D (356 mm x 458 mm) pans or two (2) 12"L x 20"D (305 mm x 508 mm) pans.
- Kit #4: Three (3) chrome shelves 26 5/16"L x 21 1/16"D (669 mm x 548 mm). Optional wall mounted shelf support pilasters (field installed) with four (4) shelf clips per shelf available; adjustable on 1/2" (13 mm) increments (must order at time of cabinet order).
- Additional kit option components available individually.

WARRANTY*

Three year warranty on all parts and labor and an additional 2 year warranty on compressor. (U.S.A. only)

*RESIDENTIAL APPLICATIONS: TRUE assumes no liability for parts or labor coverage for component failure, factory defect or any other damages for units installed in non-commercial foodservice or residential applications.

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



Model	Elevation	Right	Plan	3D	Back
ST()1R-1G-HC					

Submittal Sheet

10/03/2025

ITEM# 56 - MOBILE HEATED CABINET (1 EA REQ'D)

Metro C569-SDS-U

C5™ 6 Series Heated Holding Cabinet, mobile, full height, insulated, solid Dutch doors, top mount controls & analog thermometer, ducted heating system, thermostat 70° to 200°F temp, universal wire (17) 18" x 26" or (32) 12" x 20" x 2-1/2" pan capacity, 1-1/2" adjustable wire slides, 5" casters (2 with brakes), 304 stainless steel, 120v/60/1-ph, 2000 watts, 16 amps, NEMA 5-20P, cULus, NSF, ENERGY STAR®

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	1		Use model number with "L" in the middle (Ex: C589L-SDS-UA) for lower wattage models
Metro	1		1 year warranty against manufacturing defects

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-20P	16.0	2.0			

{13.96}

Metro® C5 6 Series Heated Holding Cabinet

Metro C5 6 Series cabinets provide control of temperature for safe and hot food.

Control: Temperature is displayed on an “always-on” analog thermometer for continuous monitoring of the cabinet temperature, even when turned off or unplugged.

Performance: Rapid heat-up and recovery times are achieved with a thermostatically controlled ducted heating system.

Passive Humidity: An integral water pan system can be used to add humidity to the cabinet environment, improving food quality

Available sizes & configurations:

- **Sizes:** Full, ¾, half, and under counter models
- **Doors:** Choose from full-length or dutch-solid and clear insulated
- **Pan slides:** Universal to accommodate 12"x20" steam/GN pans and 18"x26" sheet pans, adjustable on 1.5" increments. Lip load to exclusively accommodate 18"x26" sheet pans on 1.5" fixed increments.
- **Pass-thru:** On full and half height models.

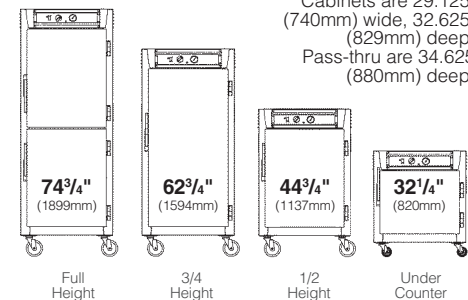
Reliability: Reliability and durability are designed into C5 from the ground up. High-quality components and robust construction provide a long life of service and worry-free use.

Top-Mounted Controls: Ergonomic user-friendly controls are mounted at the top of the cabinet for easier access, better readability, to prevent damage, and to simplify cleaning.

ENERGY STAR: Full Height, ¾ Height, and 1/2 Height Stainless Steel reach-in models with solid doors, and 1/2 Height Stainless Steel reach-in models with clear doors are ENERGY STAR rated.



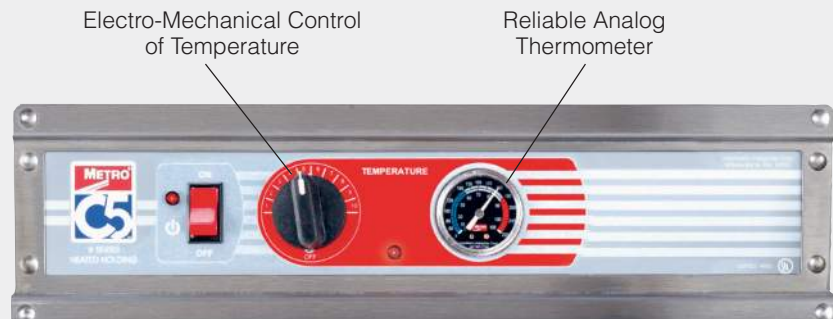
Full Height
Dutch Solid Doors



Cabinets are 29.125" (740mm) wide, 32.625" (829mm) deep.
Pass-thru are 34.625" (880mm) deep.

6 Series Controller:

- **Temperature:** The easy-to-use dial puts you in control of cabinet temperature.
- **Reliable Readout:** Measures and displays actual cabinet temperature even when the cabinet is off.
- **Analog Thermometer:** An “always-on” thermometer makes it ideal for transport applications.



Metro Heated cabinets are for hot food holding applications only.

All Metro Catalog Sheets are available on our website: metro.com

LO3-264 | 10/24

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metro.com

North Washington Street, Wilkes-Barre, PA 18705
Product Information: U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: metro.com/contactus

{13.96}

Metro® C5 6 Series Heated Holding Cabinet

Specifications

Cabinet Material: Type 304 stainless steel;
20-gauge polished exterior; 22-gauge interior.

Insulation: Full perimeter, 2.5" thick, high-density fiberglass. R Value=9.9

Casters: Four casters with 5" donut neoprene wheel, double ball bearing swivel, ball bearing axle, nickel plated, two with brake. 3" rubber casters on Under Counter models.

Doors: Solid doors are fully insulated, double-panel construction. Clear doors are double-pane, tempered glass. Argon filled with Low-E coating. Self-closing, lift-off, with long-life nylon bearings. Field reversible.

Gaskets: High temperature, cabinet mounted, Santoprene gaskets.

Latches: Chrome plated, high-strength magnetic pull latch with lever-action release.

Handles: Four built-in polymer handles.

Universal Wire Slides: ¼" (6.4mm) diameter nickel-chrome wire adjustable on 1-½" (38mm) increments. Type 304, stainless steel vertical uprights.

Lip Load Slides: 1 ½" x ½" x .063" (38mm x 13mm x 1.6mm) extruded aluminum channel slides on stainless steel vertical uprights.

Display and Controls: Analog thermometer with independent thermostat control knob.

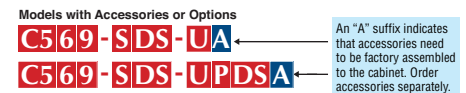
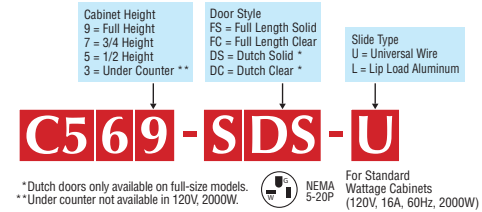
Heat Generation System: Thermostatically controlled closed loop feedback with tubular heating elements, ball bearing blower motor, and ducted air system.

Cord: 7 ½' (229cm) cord with NEMA 5-20P plug on 120V 2000W models, NEMA 5-15P plug on 120V 1440W models, and NEMA 6-15P plug on 220-240V 1681-2000W models. Cord mounted on top (Full, 3/4 heights or back (1/2 height, Under Counter) can be field reversed without re-wiring .

Performance: 90°F (32°C) to 200°F (93°C), temperature range.

Recommended Clearances for Enclosures: 1 ½" (38mm)" clearance from cabinet walls on sides and back, and 6" (152mm) clearance on top. Minimum ½" (13mm) clearance above under counter units is required.

Reach-In Model Number Description



Options/Accessories:

- Small Item Shelf (C5-SHELF-S)
- Universal Slide Pair, chrome (C5-USLIDEPR-C)
- Universal Slide Pair, stainless (C5-USLIDEPR-S)
- Flush Door Latch (C5-LATCHFLUSH)*
- Key Locking Door Latch (C5-LATCHLOCK)*
- Travel Latch/Hasp (C59-TRVL)*
- Rear Push Handle (C5-HANDLE)
- Control Panel Cover (C5-COVER)
- 6" Stainless Steel Legs (C5-SSLEGS)
- 6" Casters (C5-6CASTER)
- 5" Rear Rigid Casters (C5-5RDGCASTR)
- Straight Plug, 20 Amp, 120V (C5-STRPLG-20)
- Straight Plug, 15 Amp, 120V (C5-STRPLG-15)
- Twist Lock Plug, 20 Amp, 120V (C5-RTWSTPLG)
- Twist Lock Plug, 15 Amp, 120V (C5-RTWSTPLG-15)
- Factory Left Hand Hinging (DD3768)
- Factory Same-Side Pass-thru Door Hinging (C5-SAMESIDE)
- Stainless Steel Universal Slide Upgrades
 - Full Height (C5-USLIDE-9S)
 - 3/4 Height (C5-USLIDE-7S)
 - 1/2 Height (C5-USLIDE-5S)
 - Under Counter (C5-USLIDE-3S)

*Please note: (1) door latch must be ordered for each door (i.e. - dutch doors require (2) door latches; pass-thru dutch doors require (4) door latches)

	Universal Wire Pan Capacity								Lip Load Pan Capacity
Cabinet Size	Slide Pairs		Sheet Pans	Steam Pans			Gastronorm 65mm Depth		Sheet Pans 18"x26"
	Provided	Max*	18"x26"	12"x20"x2.5"	12"x20"x4"	12"x20"x6"	2/1	1/1	
Full Height	18	36	18	34	24	14	17	34	35
Full Height Dutch	18	35	17	32	22	12	16	32	34
3/4 Height	14	28	13	26	16	12	13	26	27
1/2 Height	9	17	8	16	10	6	8	16	17
Under Counter	5	9	5	10	6	4	5	10	10

*Maximum number of slide pairs @ 1½" spacing. Additional slide pairs ordered separately.



Submittal Sheet

10/03/2025

ITEM# 57 - S/S - SERVICE COUNTER (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Approx. Size 3'-0" X 10'-0" To Include provisions for drop in equipment. Fabricated per plan and specification. ** Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 57A - S/S - SERVICE COUNTER (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel CURB

Submittal Sheet

10/03/2025

ITEM# 58 - COLD FOOD WELL UNIT, DROP-IN, REFRIGERATED (1 EA REQ'D)

Delfield N8130BP

Drop-In Mechanically Cooled Pan, 30-3/4"W x 26" D, 2-pan size, 1" dia. drain, insulated pan, stainless steel inner liner & top, galvanized steel outer liner, includes adapter bars, self-contained refrigeration, R290 Hydrocarbon refrigerant, 1/6 hp, (29-3/4" x 25" cutout required), cUL, UL, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Delfield	1		Introducing: Freight Made Simple
			6% on Single purchase orders shipping to one location**. Liftgate & inside delivery not included. Nationwide Freight*
			*Continental United States only
			**6% Must be manually calculated on your purchase order total, \$200 minimum.
			If you have any questions, please contact Customer Service at 1-800-733-8948
Delfield	1	0460000N	1 year parts & labor warranty, standard
Delfield	1	W00003A	5 year compressor warranty (NET priced – no further discount)
Delfield	1		115v/60/1-ph, 2.0 amps, NEMA 5-15P, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/6		
2	115	60	1	Cord & Plug		5-15P	2.0				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1"	



N8100BP

Drop-In Self-Contained Mechanically Cooled Cold Pans

Models

- N8118BP 18" mechanically cooled cold pan
- N8130BP 30" mechanically cooled cold pan
- N8143BP 43" mechanically cooled cold pan
- N8156BP 56" mechanically cooled cold pan
- N8169BP 69" mechanically cooled cold pan
- N8181BP 81" mechanically cooled cold pan



N8156BP

Standard Features

- Integral V-stamped pan rest
- 20-gauge stainless steel top construction
- 2 BF stainless steel interior liner wrapped and spot clipped with refrigeration lines; thermal transfer compound is applied for superior cooling
- Adapter bars are provided standard for 12" x 20" openings
- Standard 1" plastic drain
- High density Environmentally friendly, Kyoto Protocol Compliant, Non ODP (Ozone Depletion Potential), Non GWP (Global Warming Potential) polyurethane foam insulation throughout unit
- Galvanized exterior body
- Non-marring press fit top gasket
- Condensing unit is suspended below on a 16-gauge galvanized frame
- R290 refrigerant
- 8' cord and plug
- Stainless steel louver provided for field installation
- 1 year parts and labor standard warranty

Options & Accessories

- Custom sizes and styles
- Single or double service flip-up sneezeguards
- Relocate compressor
- Remote toggle switch assembly (shipped loose) (AS000-473-003W)

Specifications

Top is one-piece 20-gauge stainless steel. Interior liner is 22-gauge stainless steel and is creased to a 1.00" (2.5cm) diameter drain. Integral V-stamped pan rest recessed 2" (5cm) to accommodate 12" x 20" (30cm x 51cm) pans 4" (10cm) or 6" (15cm) deep supplied by others. Product temperatures of 33°F (1°C) to 41°F (5°C) are maintained at 86°F (29°C) ambient room temperature, meeting NSF 7 requirements. Adapter bars for 12" x 20" (30cm x 51cm) pans are standard.

Sides are wrapped with refrigeration lines. Sides and bottom are fully insulated with high-density environmentally friendly, Kyoto Protocol Compliant, Non ODP (Ozone Depletion Potential), Non GWP (Global Warming Potential) closed-cell polyurethane. Exterior housing is 24-gauge galvanized steel.

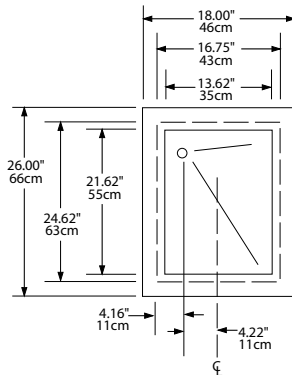
Condensing unit is suspended below the cold pan on a 16-gauge steel frame and uses R290 refrigerant. Electronic temperature control. Unit has an 8' (2.4m) cord and NEMA 5-15P plug.

A stainless steel louver is provided for field installation; cutout dimension is 11.5" x 22.5" (30cm x 60cm).



N8100BP: Drop-In Self-Contained Mechanically Cooled Cold Pans

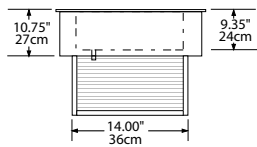
Delfield®



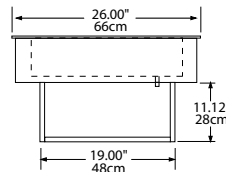
Plan View, N8118BP

Drain Location If Facing Service Side:

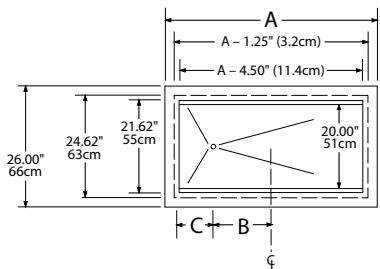
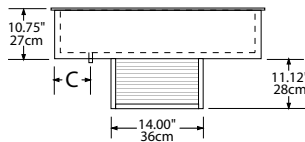
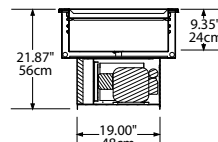
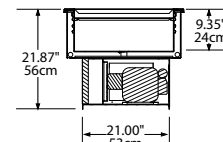
- N8118BP - back
- All Other N8100BP Models - left



Elevation View, N8118BP



Right End View, N8118BP

Plan View
N8100BP Models Except N8118BPElevation View
N8100BP Models Except N8118BPRight End View
N8130BP, N8143BP, N8156BPRight End View
N8169BP & N8181BP

Dimension Chart

Model	A	B	C
N8130BP	30.75" (78cm)	8.75" (22cm)	6.00" (15cm)
N8143BP	43.50" (110cm)	9.82" (25cm)	11.31" (29cm)
N8156BP	56.25" (143cm)	9.82" (25cm)	17.69" (45cm)
N8169BP	69.00" (175cm)	9.82" (25cm)	24.06" (61cm)
N8181BP	81.75" (208cm)	9.82" (25cm)	30.43" (77cm)

Specifications									
Model	Counter Cutout Dimensions	12"x20" Pan Capacity	V/Hz/Ph	Amps	H.P.	Nema Plug	BTU Load	System Capacity	Ship Weight
N8118BP	17.00" X 25.00" (43cm X 64cm)	1	115/60/1	2	1/6	5-15P	230	675	103lbs/46kg
N8130BP	29.75" X 25.00" (76cm X 64cm)	2	115/60/1	2	1/6	5-15P	346	741	161lbs/72kg
N8143BP	42.50" X 25.00" (108cm X 64cm)	3	115/60/1	3.1	1/4	5-15P	661	1143	184lbs/83kg
N8156BP	55.25" X 25.00" (140cm X 64cm)	4	115/60/1	3.1	1/4	5-15P	877	1255	233lbs/105kg
N8169BP	68.00" X 25.00" (173cm X 64cm)	5	115/60/1	3.1	1/4	5-15P	1092	1346	243lbs/109kg
N8181BP	80.75" X 25.00" (205cm X 64cm)	6	115/60/1	4.6	1/3	5-15P	1631	1831	260lbs/117kg

Welbilt reserves the right to make changes to the design or specifications without prior notice.

980 S. Isabella Rd.
Mt. Pleasant, Michigan 48858

Phone: 800-733-8948 or 989-773-7981
Fax: 800-669-0619
www.delfield.com

www.delfield.com
7112B
11/25



Drop-In Self-Contained Mechanically Cooled Cold Pans

N8100BP

Submittal Sheet

10/03/2025

ITEM# 59 - HOT FOOD WELL UNIT, DROP-IN, ELECTRIC (1 EA REQ'D)

Wells (Middleby) MOD-200TDM

(QUICK SHIP) (MIDDLEBY ESSENTIALS ITEM) Food Warmer, top-mount, built-in, electric, (2) 12" x 20" openings with manifold drains with one valve, wet/dry operation, thermostatic controls, stainless steel interior, insulated aluminum steel housing, cULus

ACCESSORIES

Mfr	Qty	Model	Spec
Wells (Middleby)	1		1 year parts & labor warranty, standard
Wells (Middleby)	1		Note: Must specify voltage and phase
Wells (Middleby)	1		208/240v/60/1-ph, 1.24/1.65 kW per well, field wired

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208/240	60	1	Direct				2.48/3.3			

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1"	
2	1"	



*Over 90 Years Of Quality Foodservice
Products And Service*

Job _____ Item No. _____

MOD200 Series 12" X 20" Two-Well Heavy Duty, Top-Mount, Rectangular Drop-In Food-Warmers



Model MOD200

DESCRIPTION

Wells heavy-duty, top-mount, drop-in, Modular food warmers are designed to hold heated foods at safe and fresh serving temperatures. Wells MOD200 Series accommodates two 12" X 20" standard food pans or equivalent fractional inset pans and are designed for wet or dry operation

SPECIFICATIONS

Construction - One-piece stainless steel top flange and heavy-gauge, deep-drawn stainless steel warming pans are standard features on all models. Wellsloks are standard for quick and easy installation.

Insulation - Sides, front, back and bottom are fully insulated for energy savings, efficiency, quicker pre-heat and faster recovery.

Controls & Heating- Individual controls for each well provide maximum versatility. Models with thermostatic or infinite controls are available. High-limits prevent overheating. Temperature-ready indicator lights are standard on all control types. Powerful tubular heating elements are located under the warming pans for quick and efficient heating and for even heat distribution.

Additional Features Available

- Auto water-fill to maintain proper water level
- All models are field convertible from 1Ø to 3Ø
- Drains
- Drains with manifolds
- Infinite or thermostatic controls

STANDARD FEATURES

- ☐ Accommodates two 12" X 20" standard inset pans or equivalent fractional pans
- ☐ One-piece stainless steel top flange and heavy-gauge, deep-drawn stainless steel warming pans
- ☐ Suitable for wet or dry operation (wet recommended for best results)
- ☐ Energy-saving fully-insulated construction
- ☐ Fully Insulated models are perfect for non-metal counters
- ☐ Thermostatic or infinite controls
- ☐ Separate control for each individual well
- ☐ High limits prevent overheating
- ☐ Thermostatic controls are recessed in a one-piece, drawn, front-mounted panel
- ☐ Wellslok standard for ease of installation
- ☐ Powerful tubular heating elements
- ☐ ½" drains and manifolds available
- ☐ Cords & plugs available on all 208/240V models
- ☐ 1-Year Limited Parts & 1-Year Limited Labor Warranty

OPTIONS & ACCESSORIES

- ☐ Adaptor tops for round insets
- ☐ Inset with lid
- ☐ 8oz. soup ladle
- ☐ Drain value extension kit
- ☐ Drain screens
- ☐ Wellslok extension kits for wood counter installations
- ☐ Cords & plugs available on all 208/240V models (T-Stat units only)
- ☐ Optional 72" wiring

CERTIFICATIONS



Wells Manufacturing

265 Hobson St., Smithville, TN 37166
Phone: 800-264-7827 | Fax: 314-781-5445
We: wells-mfg.com

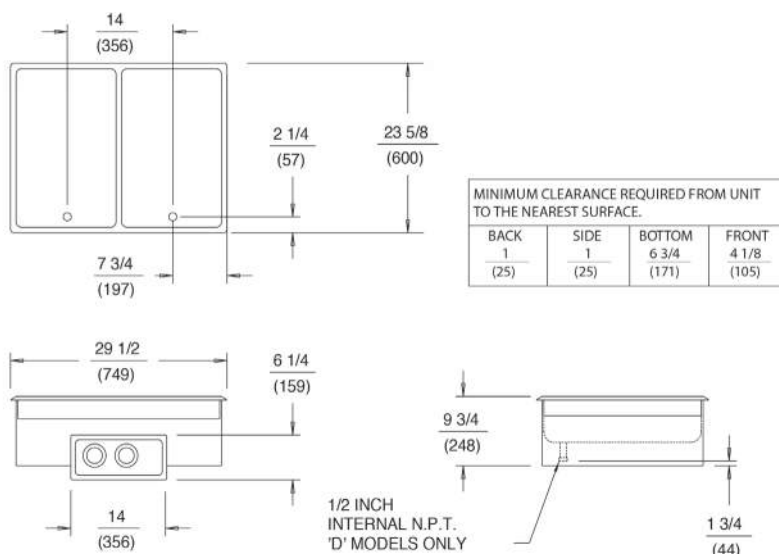
NOTE: Specifications are subject to change without notice and are not intended for installation purposes. See installation instructions prior to installing the unit.

MOD200_Standard_Rev-B_(07-21)



**Over 90 Years Of Quality Foodservice
Products And Service**

MOD200 Series 12" X 20" Two-Well Heavy Duty, Top-Mount, Rectangular Drop-In Food-Warmers



SPECIFICATIONS

Model Number	Description	Volts	Watts Per Well	Phase	Optional Power Cord Supply	OVERALL Width Left to Right Inches (MM)	OVERALL Length Front to Back Inches (MM)	OVERALL Height Inches (MM)	CONTROL PANEL Width Front to Back Inches (MM)	CONTROL PANEL Height Left to Right Inches (MM)	Shipping Weights Pounds (KG)	Crate Size Cubic Feet (Cubic Meters)	Approvals
MOD200	Infinite Controls no Drains	208V 240V	900 1200	1Ø	NONE	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N U
MOD200CSA	Infinite Controls no Drains	208V 240V	1800 2400	1Ø	NONE	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N C
MOD200D	Infinite Controls with Drains	208V 240V	900 1200	1Ø	NEMA 6-15P	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N U
MOD200DM	Infante Controls with Drains & Manifold	208V 240V	900 1200	1Ø	NEMA 6-15P	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N U
MOD200T	Thermostatic Controls no Drains	208V 240V	1240 1650	1Ø	NEMA 6-15P	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N U
MOD200TD	Thermostatic Controls with Drains	208V 240V	1240 1650	1Ø	NEMA 6-15P	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N U
MOD200TDM	Thermostatic Controls with Drains & Manifold	208V 240V	1240 1650	1Ø	NEMA 6-15P	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	14 (356)	6-1/4 (159)	51 (23.2)	7.89 (0.384)	N U
MOD200TDMAF	Thermostatic Controls with Drains, Manifold & Auto-Fill	208V 240V	1240 1650	1Ø	NEMA 6-15P	29-1/2 (749)	23-5/8 (600)	9-3/4 (248)	18 (457)	6-1/4 (159)	56 (25.5)	7.89 (0.384)	N U

Cords and plugs are available on thermostatic control models only (208/240V models)

AutoFill models require a water connection. Please refer to the operator's manual and installation instructions for details.

Due to periodic changes in designs, methods, procedures, policies and regulations, the specifications contained in this sheet are subject to change without notice. While Wells exercises good faith efforts to provide information that is accurate, we are not responsible for errors or omissions in information provided or conclusions reached as a result of using the specifications. By using the information provided, the user assumes all risks in connection with such use.



Wells Manufacturing

265 Hobson St., Smithville, TN 37166
Phone: 800-264-7827 | Fax: 314-781-5445
We: wells-mfg.com

NOTE: Specifications are subject to change without notice and are not intended for installation purposes. See installation instructions prior to installing the unit.

MOD200_Standard_Rev-B_(07-21)

Submittal Sheet

10/03/2025

ITEM# 60 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 61 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 62 - S/S - THREE(3) COMP SINK (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Three(3) Compartment Sink Approx. Size 34" X 10'-1/2" Fabricated per plan and specification. ** Approved Shop Drawing **

ACCESSORIES

Mfr	Qty	Model	Spec
T&S Brass	3	B-3952-01	Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with overflow assembly (replaces B-3917-01)

WATER

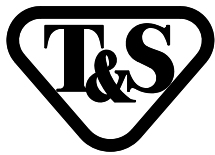
	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2" to 2"	

PLUMBING 1 REMARKS

2" NPT Male Thread, 1-1/2 NPT Female Thread Outlet


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-3952-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____

Twist Handle w/
Heat Resistant
Plastic Grip (Shown
in Open Position)

Removable
Snap-in Strainer

Ø4 7/16"
[113mm]

Ø2 11/16"
[68mm]

Ø1 1/4" [32mm] O.D.
Overflow Tube

19 1/2"
[495mm]

12 1/4" ± 1/4"
[312mm]

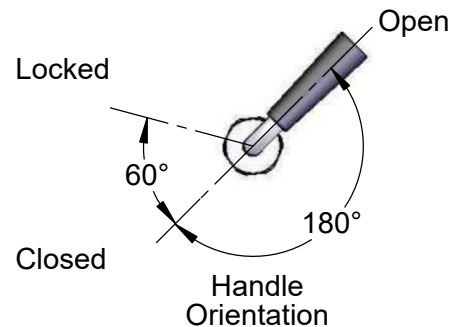
4 1/2"
[114mm]

2 5/8"
[67mm]

15 3/8"
[391mm]

2" NPT Male Thread,
1-1/2" NPT Female Thread

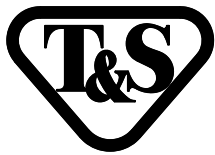
Ø2" [51mm]
Opening Required


Product Specifications:

Rotary Waste Drain Valve w/ Twist Handle, 3 1/2" Sink Opening, 2" Male NPT / 1-1/2" Female NPT Outlet & Overflow Tube & Head

Product Compliance:

ASME A112.18.2 / CSA B125.2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

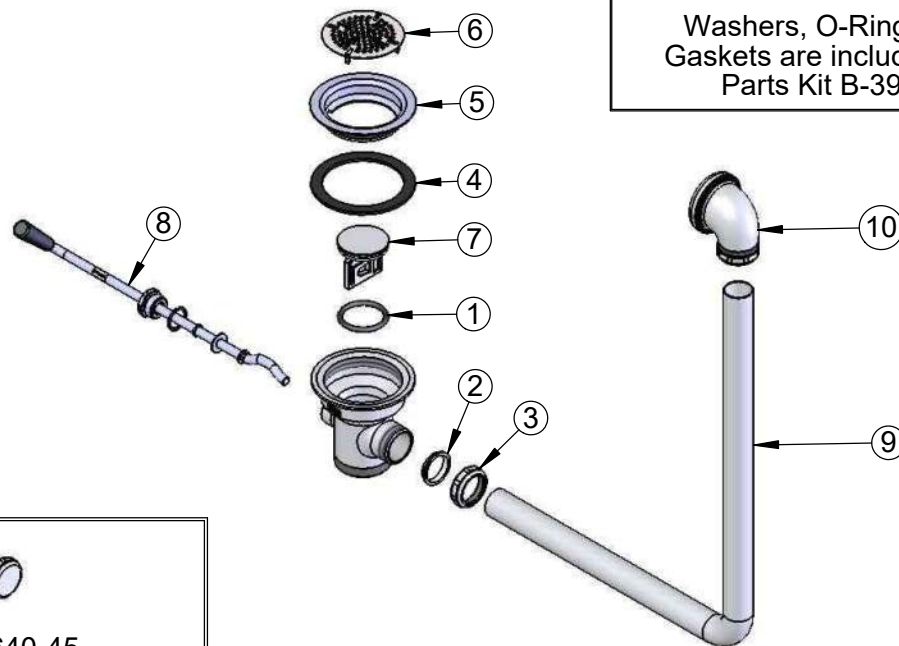
Model No.

B-3952-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

ITEM	SALE NO.	DESCRIPTION
1	010389-45	O-Ring, Plunger
2	010390-45	Ferrule, Coupling Nut
3	010391-45	Nut, Coupling for Twist Drain
4	010382-45	Gasket, 3 1/2" Face Flange
5	010384-45	Flange, 3 1/2" Face
6	010386-45	Strainer, 3 1/2" Snap-in Removable
7	010388-45	Plunger, Lever and Twist Drain
8	010393-45	Handle, Rotary Waste Valve Twist
9	011355-45	Tube, Overflow Elbow
10	011356-45	Head, Overflow Tube



Washers, O-Rings &
Gaskets are included in
Parts Kit B-39K



012640-45
Waste Drain Overflow Cap
w/ Sealing Washer
(Included)

Product Specifications:

Rotary Waste Drain Valve w/ Twist Handle, 3 1/2" Sink Opening, 2" Male NPT / 1-1/2" Female NPT Outlet & Overflow Tube & Head

Product Compliance:

ASME A112.18.2 / CSA B125.2

Submittal Sheet

10/03/2025

ITEM# 63 - S/S - WALLSHELF DBL (2 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Wall Shelf Approx. Size 12" X 60" Fabricated per plan and specification. ** Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 64 - WALL / SPLASH MOUNT FAUCET (1 EA REQ'D)

T&S Brass B-0231

Sink Mixing Faucet, wall mount, 8" centers, 12" swing nozzle, lever handles, quarter-turn Eterna cartridges, 1/2" NPT female inlets, low lead, ADA Compliant

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0231

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ADA Compliant

This Space for Architect/Engineer Approval

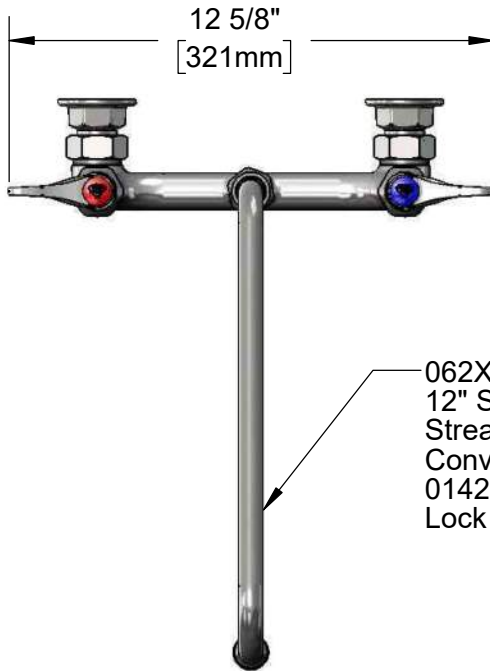
Job Name _____ Date _____

Model Specified _____ Quantity _____

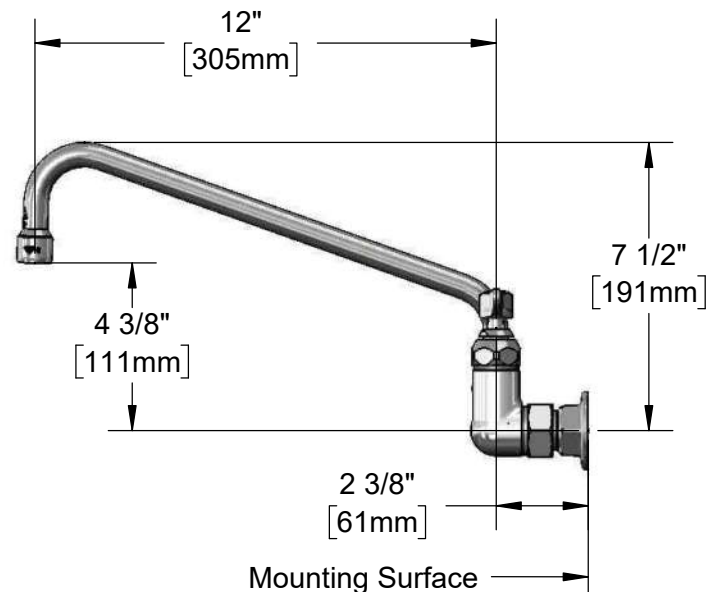
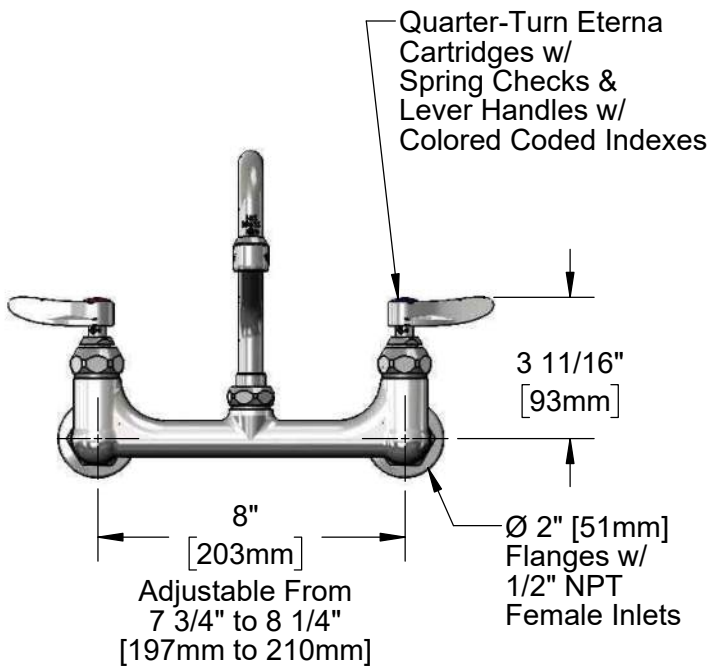
Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



062X
12" Swing Nozzle w/
Stream Regulator Outlet
Converts to Rigid w/
014200-45
Lock Washer (Included).



Product Specifications:

8" Wall Mount Mixing Faucet w/ Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 12" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)



T&S BRASS AND BRONZE WORKS, INC.

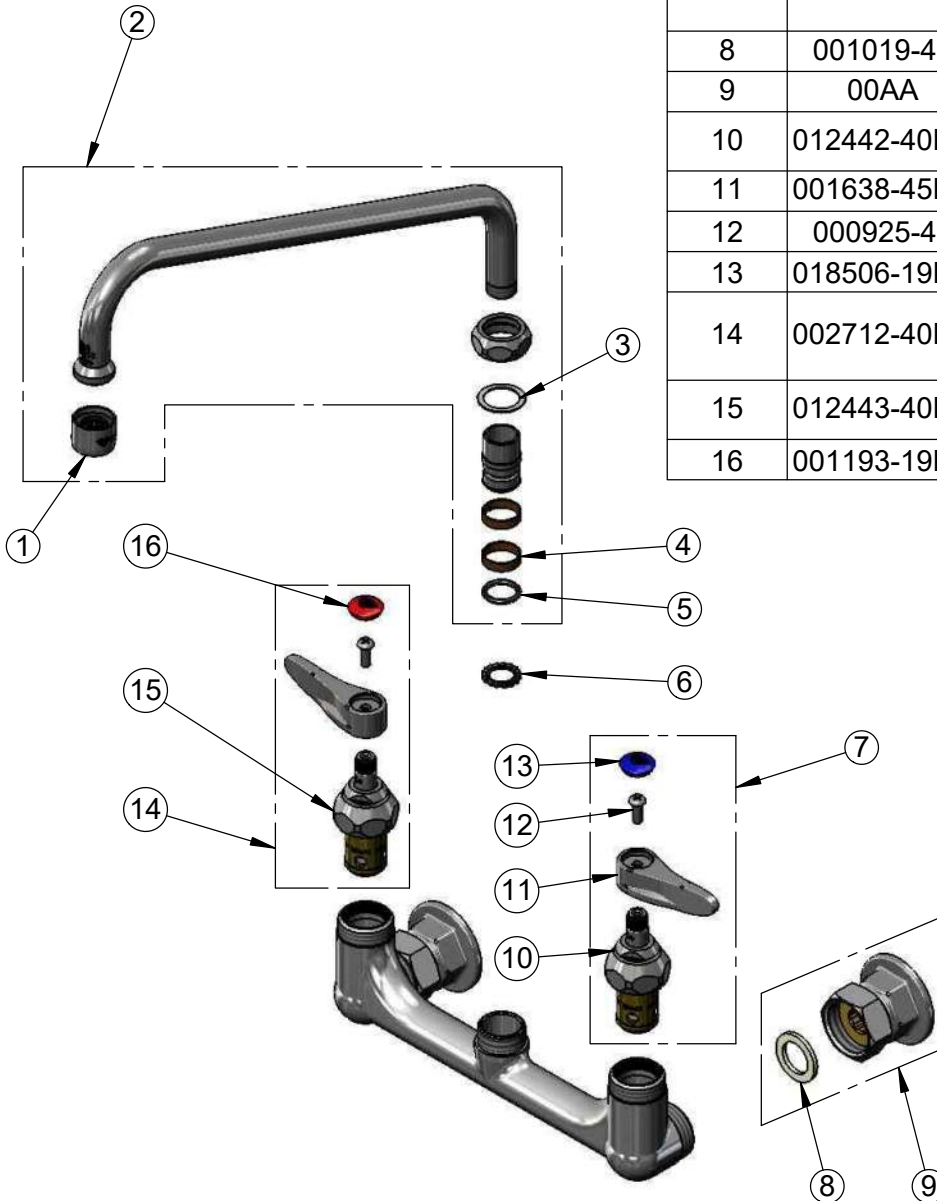
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0231

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ITEM NO.	SALES NO.	DESCRIPTION
1	B-PT	Full Flow Stream Regulator, 55/64-27
2	062X	12" Swing Nozzle
3	009538-45	Swivel Washer
4	011429-45	Swivel Sleeves (2)
5	001074-45	O-Ring
6	014200-45	Star Washer, Anti-Rotation
7	002711-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Blue Index & Screw, LTC
8	001019-45	Coupling Nut Washer
9	00AA	1/2" NPT Female Eccentric Flange
10	012442-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, LTC
11	001638-45NS	Lever Handle (New Style)
12	000925-45	Lab Handle Screw
13	018506-19NS	Blue Button Index, Press-in
14	002712-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Red Index & Screw, RTC
15	012443-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, RTC
16	001193-19NS	Red Button Index, Press-in

Product Specifications:

8" Wall Mount Mixing Faucet w/ Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 12" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: MRC

Checked: JRM

Approved: JHB

Date: 01/22/18

Scale: NTS

Sheet: 2 of 2

Submittal Sheet

10/03/2025

ITEM# 65 - PRE-RINSE FAUCET ASSEMBLY, WITH ADD ON FAUCET (1 EA REQ'D)

T&S Brass B-0133-ADF08-B

EasyInstall Pre-Rinse Unit, with 6" wall bracket, wall mount base, 8" centers, 44" flexible hose with overhead spring body & B-0107 spray valve, 18" riser, add-on faucet with 8" swing nozzle, lever handles, 1/2" NPT female inlets, quarter-turn Eterna cartridges, low lead

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0133-ADF08-B

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

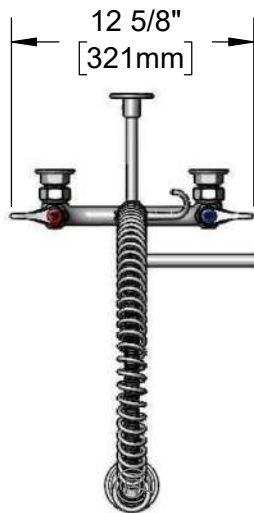
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



060X
8" Swing Nozzle
w/ Stream Regulator
Outlet



44" Flexible Stainless
Steel Hose w/ Spring
& Spray Valve

Items Not Shown
For Clarity

3/8" NPT x 18" Riser

Finger Hook

B-0107
1.15 GPM
Spray Valve

EasyInstall
Lock Nut
& Bushing

B-0109-01
6" Wall
Bracket

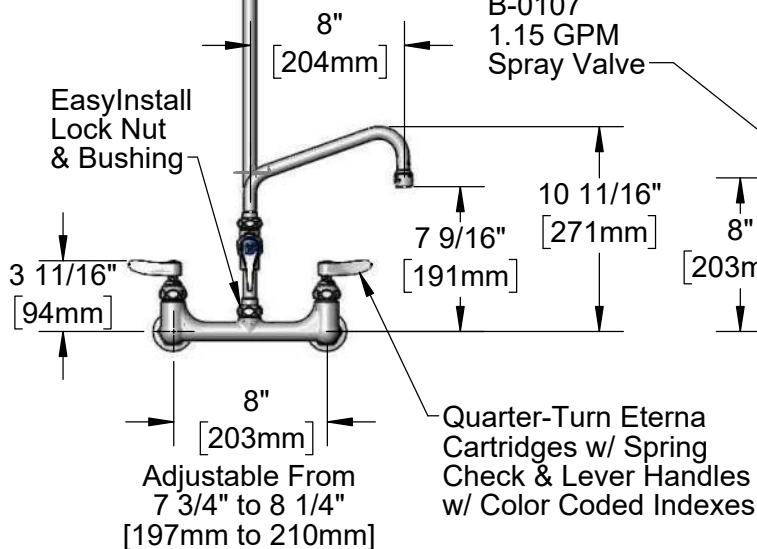
37 9/16"
[954mm]

2 5/16"
[59mm]

EasyInstall
Add-On Faucet
w/ Quarter-Turn
Eterna Cartridge
& Lever Handle

Ø 2" [51mm]
Flanges w/
1/2" NPT
Female Inlets

Mounting Surface



Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, Add-On Faucet, 8" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve, 6" Wall Bracket & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn: KJG

Checked: JRM

Approved: JHB

Date: 11/21/19

Scale:

1:10

Sheet: 1 of 2



T&S BRASS AND BRONZE WORKS, INC.

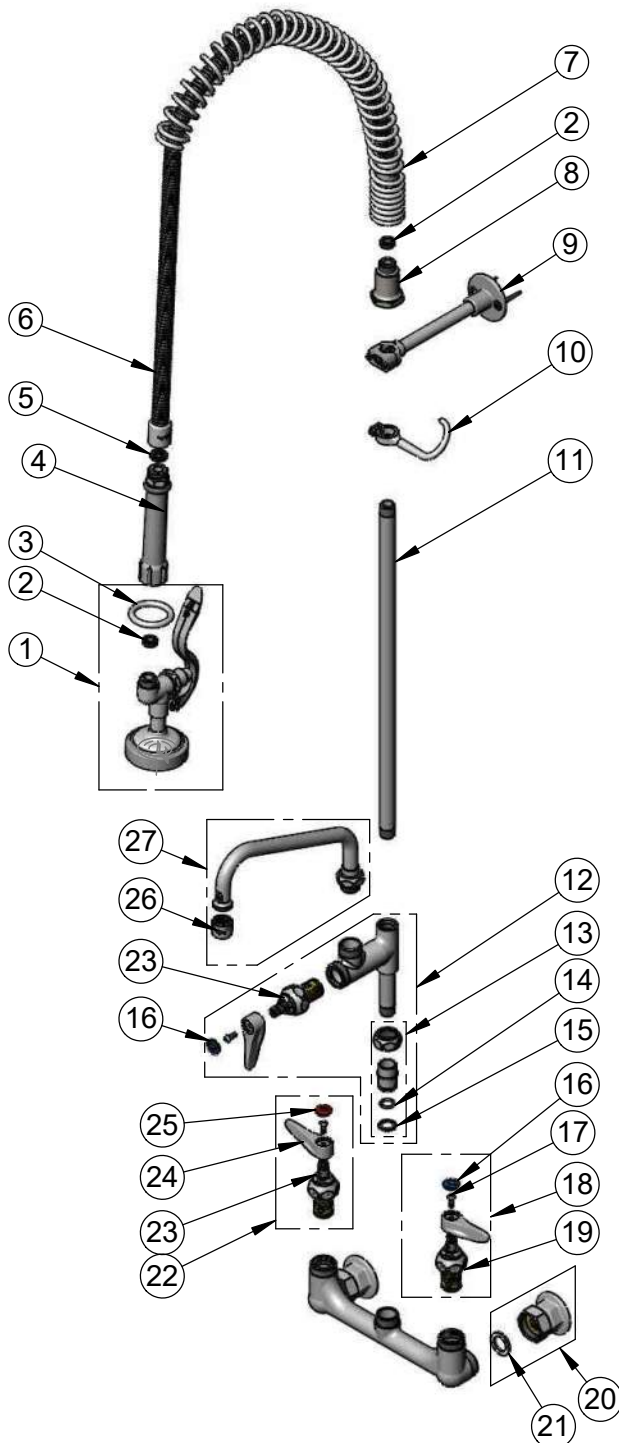
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0133-ADF08-B

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107	1.15 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	B-0044-H2A	44" Flexible Stainless Steel Hose, Less Handle
7	000888-45	EasyInstall Overhead Spring
8	000821-40	Spring Body
9	B-0109-01	6" Wall Bracket
10	004R	Finger Hook
11	000369-40	3/8" NPT x 18" Riser
12	B-0155-LNEZ	Add-On Faucet w/ 1/4 Turn Eterna Cartridge, RTC & Lever Handle (Less Nozzle)
13	EZ-K	EasyInstall Kit: Nut, Bushing, O-ring & Lock Washer
14	001065-45	O-Ring
15	014200-45	Star Washer, Anti-Rotation
16	018506-19NS	Blue Button Index, Press-in
17	000925-45	Lab Handle Screw
18	002711-40NS	Quarter-Turn Eterna Cartridge, LTC w/ Spring Check, Handle, Index & Screw
19	012442-40NS	Quarter-Turn Eterna Cartridge, LTC w/ Spring Check
20	00AA	1/2" NPT Female Eccentric Flange
21	001019-45	Coupling Nut Washer
22	002712-40NS	Quarter-Turn Eterna Cartridge, RTC w/ Spring Check, Handle, Index & Screw
23	012443-40NS	Quarter-Turn Eterna Cartridge, RTC w/ Spring Check
24	001638-45NS	Lever Handle (New Style)
25	001193-19NS	Red Button Index, Press-in
26	B-PT	Full Flow Stream Regulator, 55/64-27
27	060X	8" Swing Nozzle w/ Stream Regulator Outlet

Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, Add-On Faucet, 8" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve, 6" Wall Bracket & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn: KJG

Checked: JRM

Approved: JHB

Date: 11/21/19

Scale: NTS

Sheet: 2 of 2

Submittal Sheet

10/03/2025

ITEM# 66 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 67 - S/S - WALLSHELF (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Wall Shelf Approx. Size 12" X 48" Fabricated per plan and specification. ** Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 68 - S/S - CLEAN DISH LANDING (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Clean Dish Table. Fabricated per plan and specification. ** Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 69 - EXHAUST HOOD (TYPE 2) (1 EA REQ'D)

Captive-Aire CUSTOM

Condensation Hood Full Perimeter Gutter.

Submittal Sheet

10/03/2025

ITEM# 69.1 - S/S -HOOD ENCLOSURES (1 EA REQ'D)

S/S FAB CUSTOM

S/S HOOD ENCLOSURE PANELS 12'-0" X 18" MAX

Submittal Sheet

10/03/2025

ITEM# 70 - DISHWASHER, DOOR TYPE (1 EA REQ'D)

Hobart CDH-1

Centerline Dishwasher, door type, high temperature sanitizing, 208-240/60/3 (field convertible to single phase), single-point standard, (51) racks/hr, pumped-rinse, 0.73 gal/rack, with booster, standard or extended cycle options, tri-prong combination wash/rinse arms, Delime Notification with Cycle, service diagnostics with error notifications, recirculating design, pumped drain, soft start, 18-inch pillarless vertical door opening, straight-thru or corner installation, door-actuated start. Ships with (1) peg rack and (1) combination rack, cULus, NSF, ENERGY STAR® (Pricing options available, please contact your local rep for more information) (NET price shown)

ACCESSORIES

Mfr	Qty	Model	Spec
Hobart	1		Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA
Hobart	1	DWT-AM16*C	Drain water tempering (single valve) kit with Pumped Drain Air Gap
Hobart	1	ACC-INSTALL-HOB	Accessory Installation - For installations within 100 miles (accessible by public roadway) of a Hobart Service Office during normal business hours with appropriate notice; Installation beyond 100 miles locations in Alaska, Hawaii or New York City or those not accessible by public roadway will be quoted by Service. Includes installation of this item only, final electrical or plumbing connections by others. Recommendation: coordinate accessory installation with machine assembly/ installation (NET)
Hobart	1		NOTE: For water of 3-grains of hardness or more, Hobart suggests adding a water softener.

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208-240	60	3	Direct							

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	3/4"								

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	



CDH HIGH TEMPERATURE Door-Type Dish Machine



SPECIFIER STATEMENT

Specified unit will be NSF rated, Centerline™ by Hobart high temperature door-type dishwasher. Features recirculating design, two selectable cycles, pumped rinse, pumped drain, 18" door opening, .73 gallons per rack, LED temperature and operator display, service diagnostics, interchangeable tri-prong wash and rinse arms. Constructed of stainless steel, rated at 51 racks per hour. 208-240/60/3/1 field convertible standard voltage.

1 year parts and labor warranty.

Project _____

AIA # _____ SIS # _____

Item # _____ Quantity _____ C.S.I. Section 114000

MODEL

☐ **CDH** High temperature

STANDARD FEATURES

- + 51 racks per hour
- + .73 gallons of water per rack
- + High temperature sanitizing
- + Recirculating design
- + Top-mounted user interface with digital temperature display
- + Single point electrical connection standard
- + 3 phase standard, field convertible to single phase
- + 4-sided door
- + 1 standard cycle with optional extended cycle
- + 18" pillarless door opening
- + Tri-prong snap-in, revolving upper and lower anti-clogging wash & rinse arm; low-profile design
- + Removable, stainless steel scrap screen
- + Soft start
- + Built-in booster
- + Automatic pumped drain
- + Pumped rinse
- + Automatic fill
- + Service diagnostics with error notifications
- + Delime notification and cycle
- + Electric tank heat
- + Straight through or corner installation

OPTIONS & ACCESSORIES (Available at extra cost)

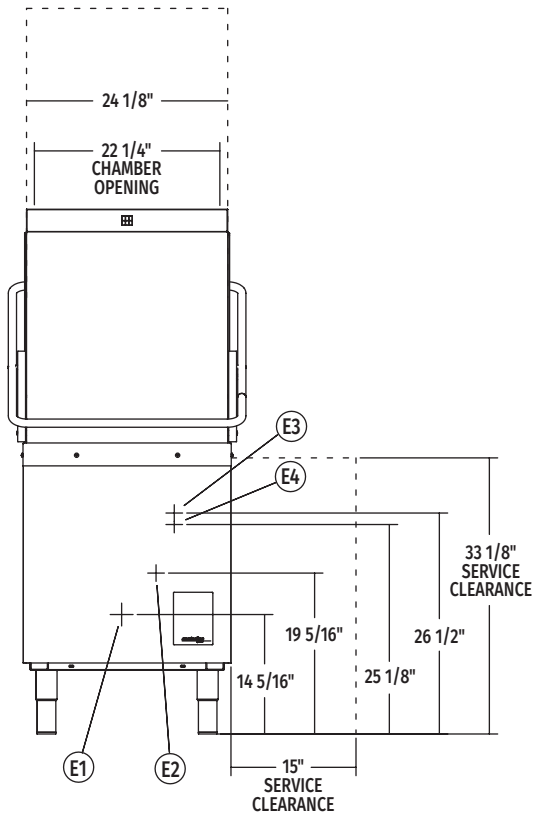
- ☐ Chemical pumps
- ☐ Chemical sensing indicators (low chemical alert)
- ☐ Corner splash kit
- ☐ Water hammer arrestor kit
- ☐ Drain water tempering kit
- ☐ Pumped drain air gap kit
- ☐ Peg rack
- ☐ Combination rack
- ☐ Flanged feet

CDH HIGH TEMPERATURE

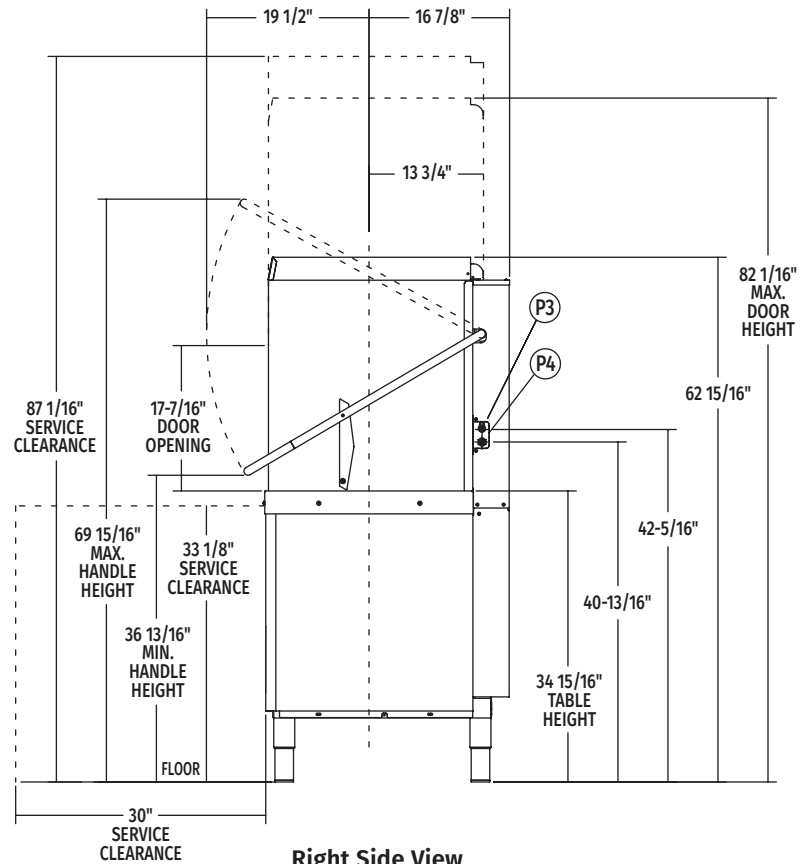
Approved by _____ Date _____ Approved by _____ Date _____



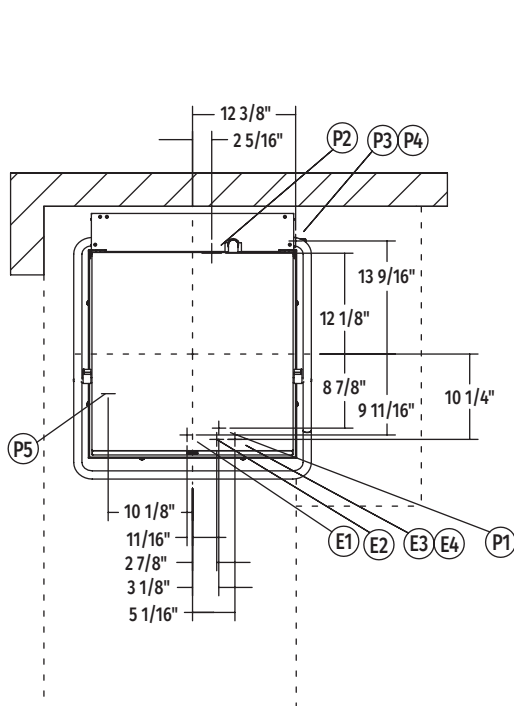
CDH HIGH TEMPERATURE Door-Type Dish Machine



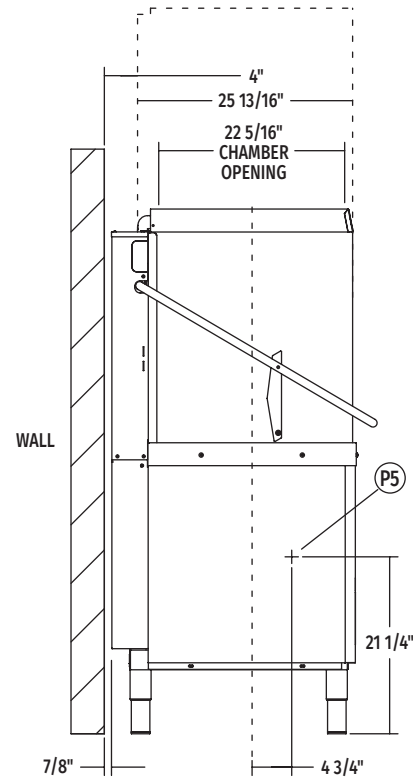
Front View



Right Side View



Top View



Left Side View

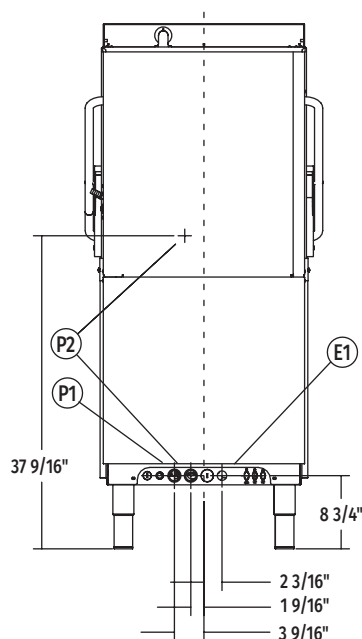
MODEL: CDH
00-563599
REV. C



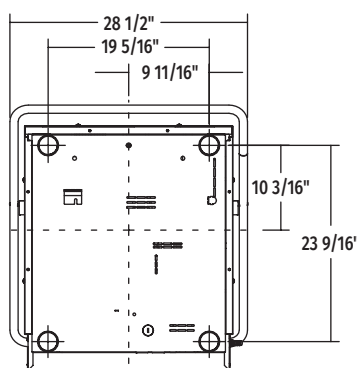
CDH HIGH TEMPERATURE Door-Type Dish Machine

LEGEND

Electrical Connections	
E1	Electrical connection: 1-1/8" dia. hole for 1" trade size conduit; 8-3/4" AFF.
E2	Electrical connection: Detergent & rinse agent feeders, (DET1 & DET2) 1.5 amps @ 120V supply voltage, (RNS1 & RNS2) 1.5 amps @ 120V supply voltage; 19-5/16" AFF.
E3	Electrical connection: Vent fan control (VFC1 & VFC2) switching circuit only 1.5 amps @ nameplate supply voltage; 26-1/2" AFF.
E4	Electrical connection: Drain water tempering (optional), (DWT1 & DWT2) switching circuit only 1.5 amps @ nameplate supply voltage; 25-1/8" AFF.
Plumbing Connections	
P1	Single fill and rinse connection: 3/4" female garden hose fitting on 9' long hose supplied with machine; 120°F water minimum.
P2	Drain connection: 19mm barb fitting with 9' long hose supplied with machine.
P3	Chemical supply: Detergent. Approximately 42-5/16" AFF. 15mm barb fitting.
P4	Rinse agent feeder: Remove 1/8" NPT pipe plug to access 1/8" NPT tapped hole; 40-13/16" AFF.
P5	Detergent probe sensor: Remove cap and stud assembly to access 7/8" hole; 21-1/4" AFF.



Back View



Bottom View

SPECIFICATIONS

Capacities

Racks per Hour (maximum)	51
Dishes per Hour (average 25 per rack)	1,275
Glasses per Hour (average 45 per rack)	2,295
Wash Tank (U.S. gallons)	7.9

Motor Horsepower

Rinse Pump	0.25
Wash Pump	0.80
Drain Pump	0.04

Rinse

Gallons per Rack	0.73
Gallons per Hour (maximum consumption)	37.2

Peak Rate of Drain Flow

Gallons per Minute (initial rate with full tank)	15
--	----

Heating

Electric Booster (kW)	6.5
Electric Heating Unit (kW)	5

Exhaust Requirements

Shipping Weight (approximate) 232 lbs.

Crated Dimensions 90.0"H x 30.0"W x 33.0"L

WARNING: Electrical and grounding connections must comply with the applicable portion of the National Electrical Code and/or other local electrical codes.

Plumbing connections must comply with applicable sanitary, safety, and plumbing codes.

CDH Single Point Electrical Service Connection as Shown Below			
Elec. Specs	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208/60/1	31.7	40	40
208/60/3	35.0	40	40
240/60/1	31.7	40	40
240/60/3	35.0	40	40



CDH HIGH TEMPERATURE Door-Type Dish Machine

Plumbing Notes:

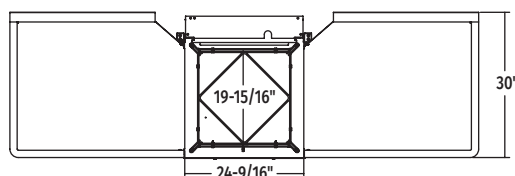
1. Water hammer arrestor (meeting ASSE-1010 standard or equivalent) to be supplied (by others) in common water supply line at service connection.
2. Recommended water hardness to be 3 grains or less for best results.
3. Recommended building flowing water pressure to the dishwasher at or above 20 PSI. Pressures lower than 20 PSI may affect machine fill/start-up times.
4. This is a pumped rinse machine. Pressure regulating valve is not necessary unless incoming flowing water pressure is greater than 65 PSI.
5. For convenience when cleaning, water tap should be installed near machine with heavy duty hose and squeeze valve.

Miscellaneous Notes:

1. All vertical dimensions taken from floor line may increase or decrease 1-1/4" depending on leg adjustment.
2. Vent hood (if required) to provide a minimum of 450 CFM exhaust (ref installation instructions).
3. Net weight of machine including booster: 210 lbs. Domestic shipping weight including booster: 232 lbs.
4. Size of racks – 19³/₄" x 19³/₄".

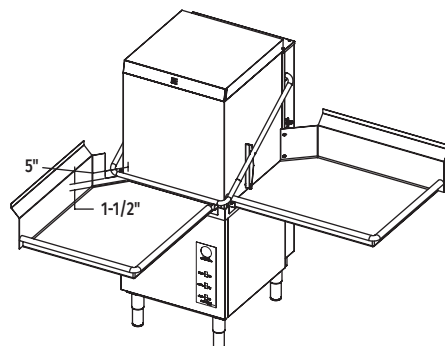
Approximate Heat Gain to Space without Vent Hood

Type	Latent (BTU/Hr.)	Sensible (BTU/Hr.)
208/60/1	9,300	4,000
208/60/3	16,100	6,900
240/60/1	12,000	5,200
240/60/3	20,400	8,700

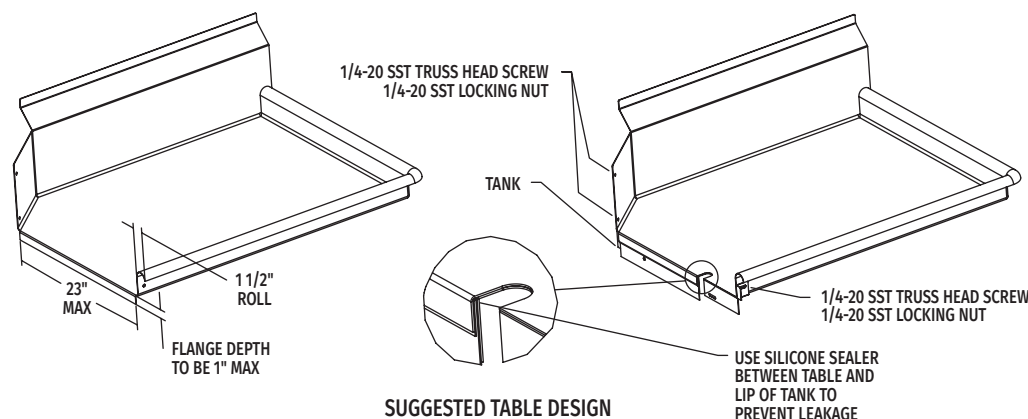
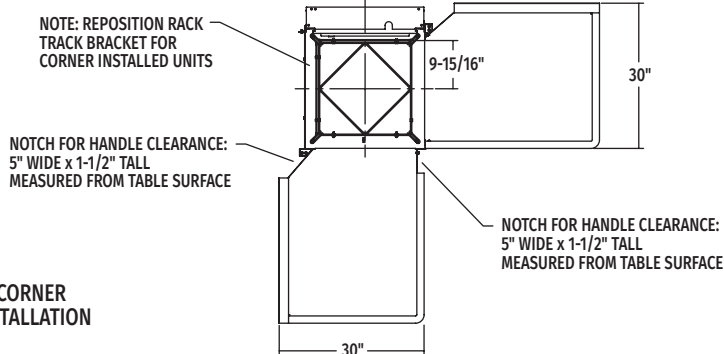


PASS THRU
INSTALLATION

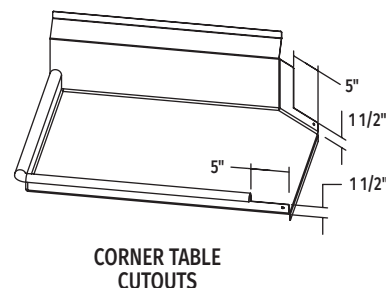
TOP INSIDE VIEW OF MACHINE



CORNER
INSTALLATION



SUGGESTED TABLE DESIGN



CORNER TABLE
CUTOUTS

Submittal Sheet

10/03/2025

ITEM# 71 - PRE-RINSE FAUCET ASSEMBLY (1 EA REQ'D)

T&S Brass B-0133

EasyInstall Pre-Rinse Unit, wall mount mixing faucet with 8" adjustable centers, quarter-turn Eterna cartridges with spring checks, lever handles with color-coded indexes, 18" EasyInstall riser, 44" flexible stainless steel hose with heat-resistant gray handle & hold down ring, 1.15 GPM spray valve (B-0107), finger hook, polished chrome-plated brass faucet body, 1/2" NPT female inlets, CSA

ACCESSORIES

Mfr	Qty	Model	Spec
T&S Brass	1	B-0109-01	Wall Bracket, 6"
T&S Brass	1	B-0230-K	Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "EII" 1/2" NPT female x male
T&S Brass	1	B-0230-KIT	Inlet Kit, 1/2" NPT nipple, close elbows, 24" flex supply hoses
T&S Brass	1	B-3952-01	Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with overflow assembly (replaces B-3917-01)

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		
2	1-1/2" to 2"	

PLUMBING 2 REMARKS

2" NPT Male Thread, 1-1/2 NPT Female Thread Outlet



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.

B-0133

Item No.

This Space for Architect/Engineer Approval

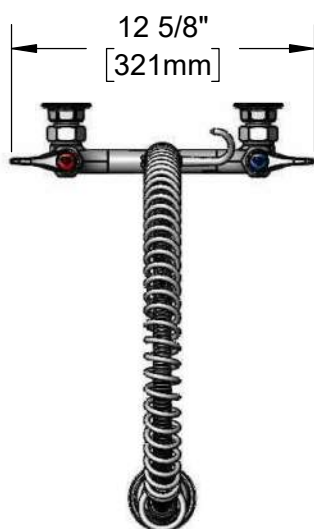
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



44" Flexible Stainless Steel Hose w/ Spring & Spray Valve

Items Not Shown for Clarity

Finger Hook

3/8" NPT x 18" Riser

Quarter-Turn Eterna Cartridges w/ Spring Checks & Lever Handles w/ Color Coded Indexes

Ø2" [51mm] Flanges w/ 1/2" NPT Female Inlets

EasyInstall Lock Nut & Bushing

3 11/16" [94mm]

8" [203mm]

Adjustable From 7 3/4" to 8 1/4" [197mm to 210mm]

3 3/4" [95mm]

B-0107 1.15 GPM Spray Valve

33 3/8" [848mm]

14 1/16" [357mm]

2 3/8" [61mm]

Mounting Surface

Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II



T&S BRASS AND BRONZE WORKS, INC.

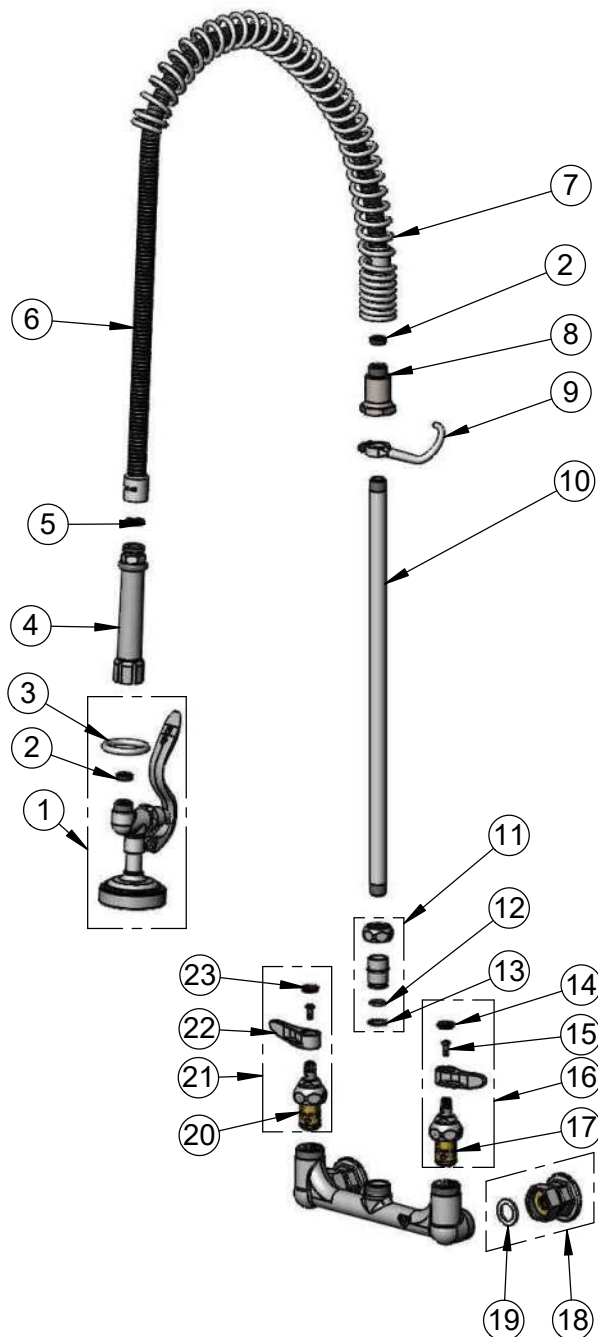
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0133

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107	1.15 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	B-0044-H2A	44" Stainless Steel Flexible Hose, Less Handle
7	000888-45	EasyInstall Overhead Spring
8	000821-40	Spring Body
9	004R	Finger Hook
10	000369-40	3/8" NPT x 18" Riser
11	EZ-K	EasyInstall Kit
12	001065-45	O-Ring
13	014200-45	Star Washer, Anti-Rotation
14	018506-19NS	Blue Button Index, Press-in
15	000925-45	Lab Handle Screw
16	002711-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Blue Index & Screw, LTC
17	012442-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, LTC
18	00AA	1/2" NPT Female Eccentric Flange
19	001019-45	Coupling Nut Washer
20	012443-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, RTC
21	002712-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Red Index & Screw, RTC
22	001638-45NS	Lever Handle (New Style)
23	001193-19NS	Red Button Index, Press-in

Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0109-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

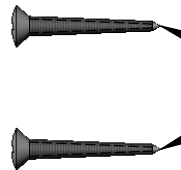
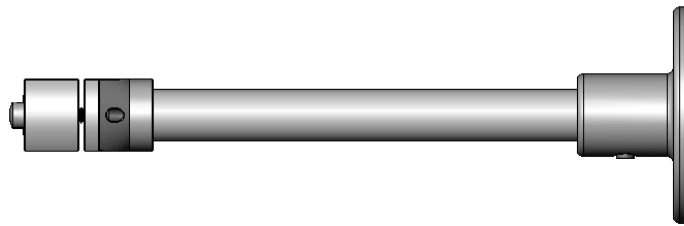
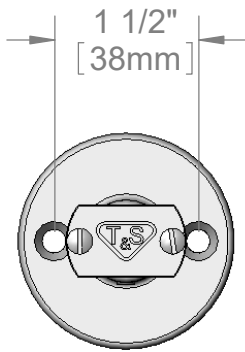
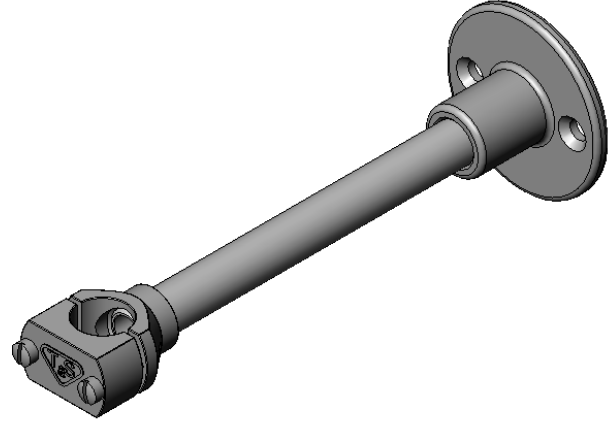
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

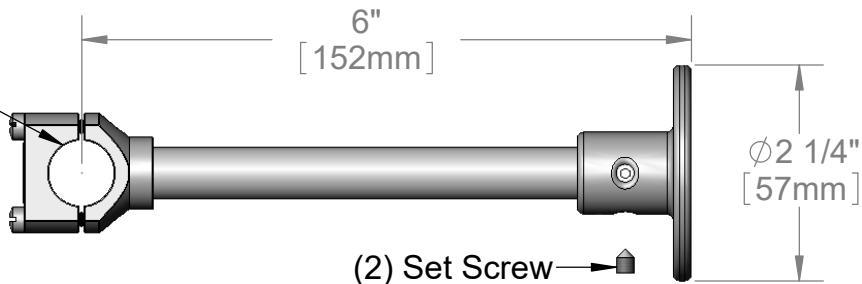
Contractor _____

Architect/Engineer _____



Chrome Plated Brass Wood Screws
for Wall Mounting (Included)

Fits 3/8" Pipe


Product Specifications:

**6" Wall Bracket Assembly for 3/8" Pipe
w/ Mounting Hardware**

Drawn
JRM
Checked
KJG
Approved
JHB
Scale:
1:2
Date:
06/02/14

Sheet: 1 of 1


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0230-K

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

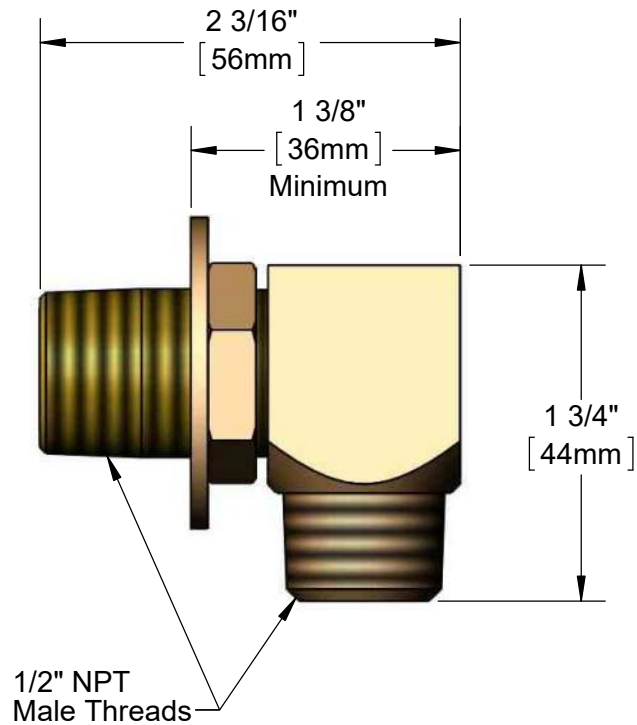
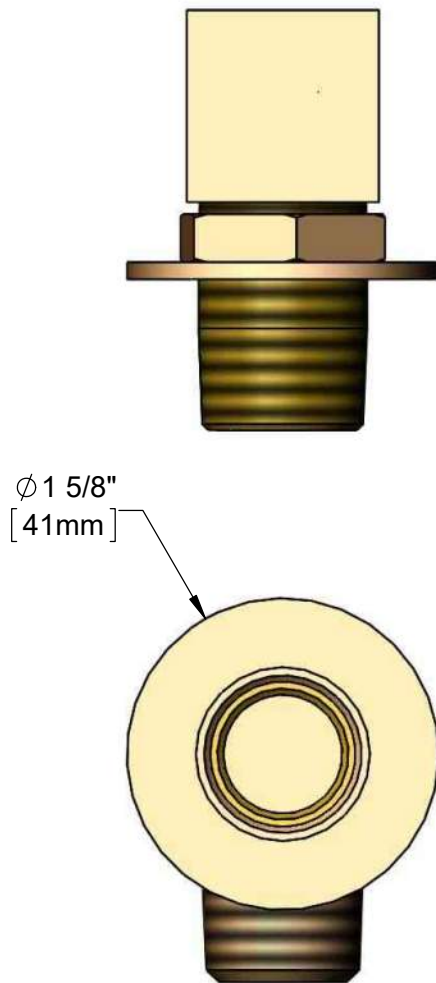
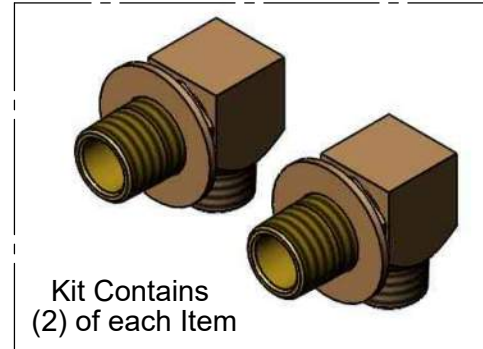
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____


Product Specifications:

1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

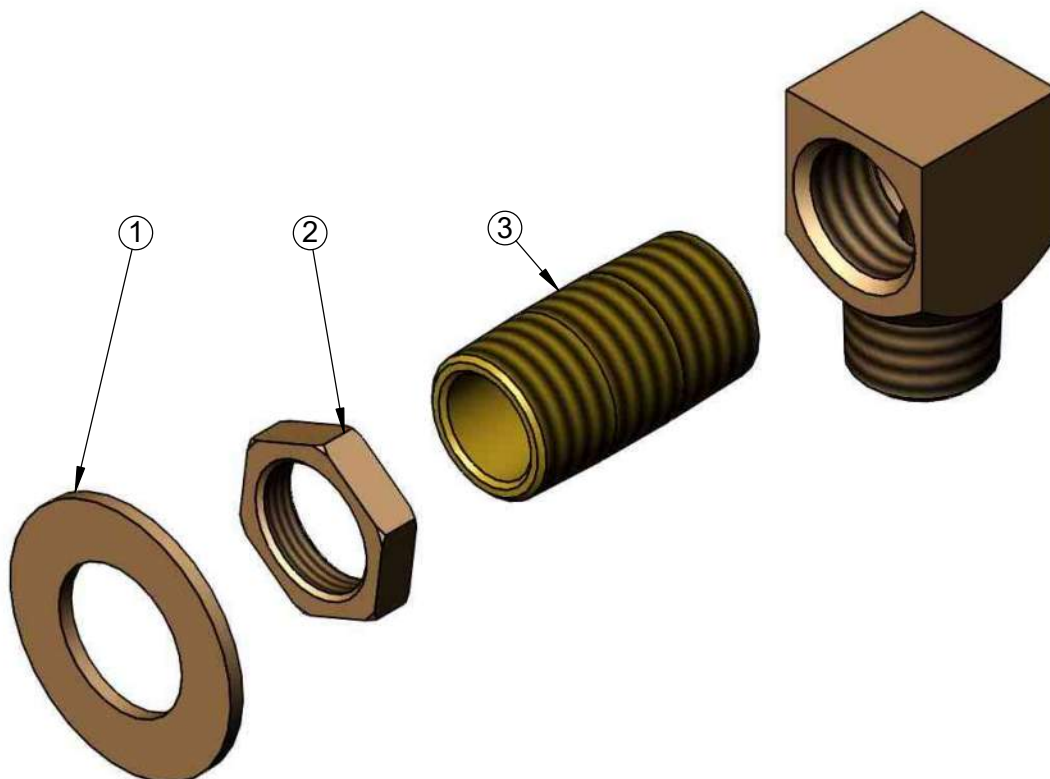
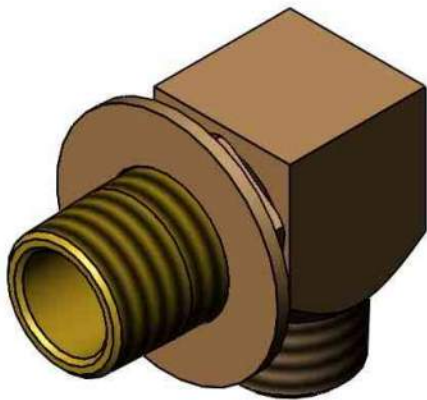
Model No.

B-0230-K

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

ITEM NO.	SALES NO.	DESCRIPTION
1	000999-45	Brass Lock Washer
2	002954-45	Shank Lock Nut
3	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple



Product Specifications:
1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: DHL Checked: JRM Approved: JHB Date: 03/13/14 Scale: NTS Sheet: 2 of 2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.

B-0230-KIT

Item No.

This Space for Architect/Engineer Approval

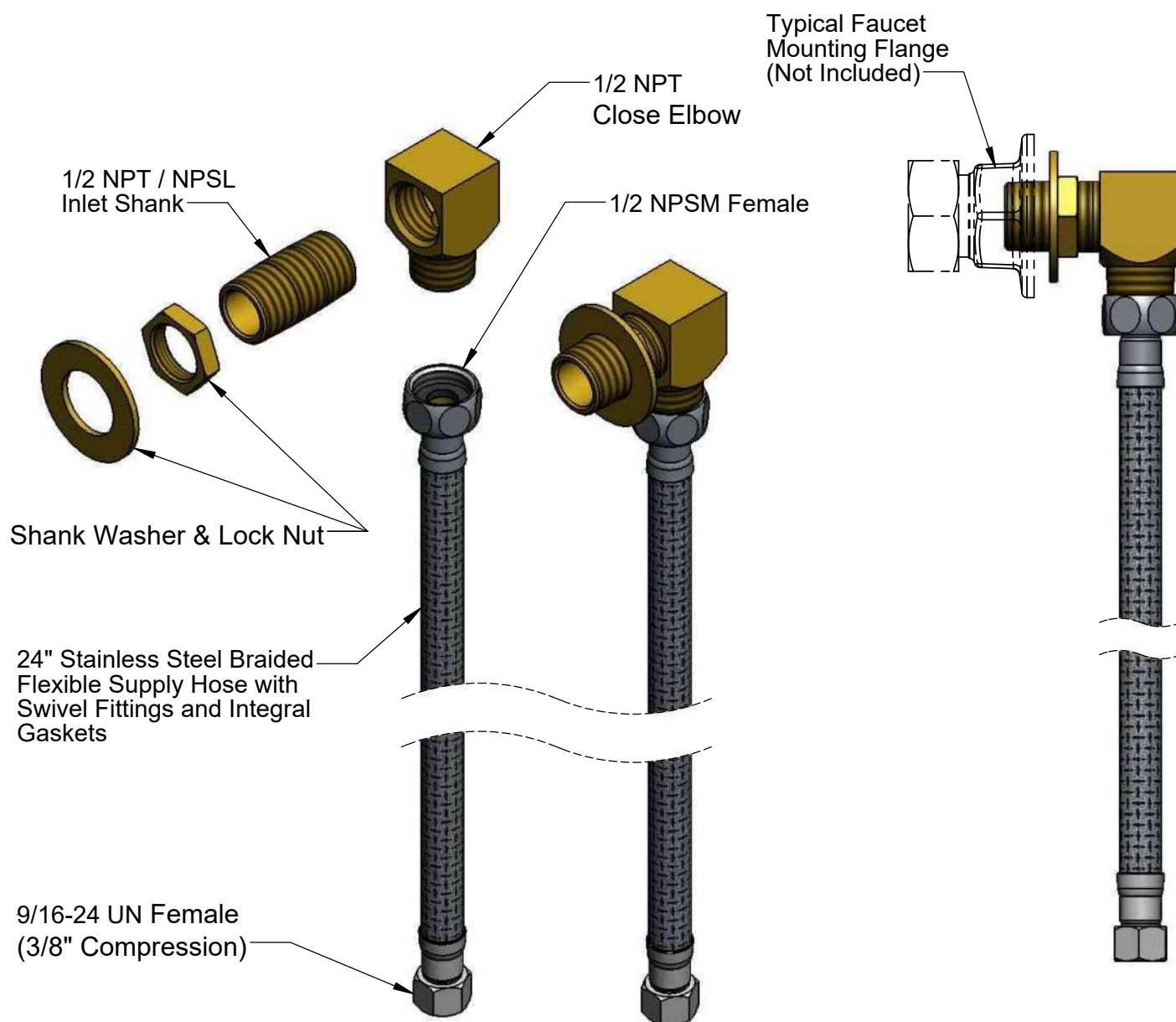
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



Product Specifications:

Inlet Kit:

1/2" Inlet Shanks, Close Elbows
and 24" Flexible Supply Hoses

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: JBC

Checked: JRM

Approved: JHB

Date: 02/23/16

Scale: 1:4

Sheet: 1 of 2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

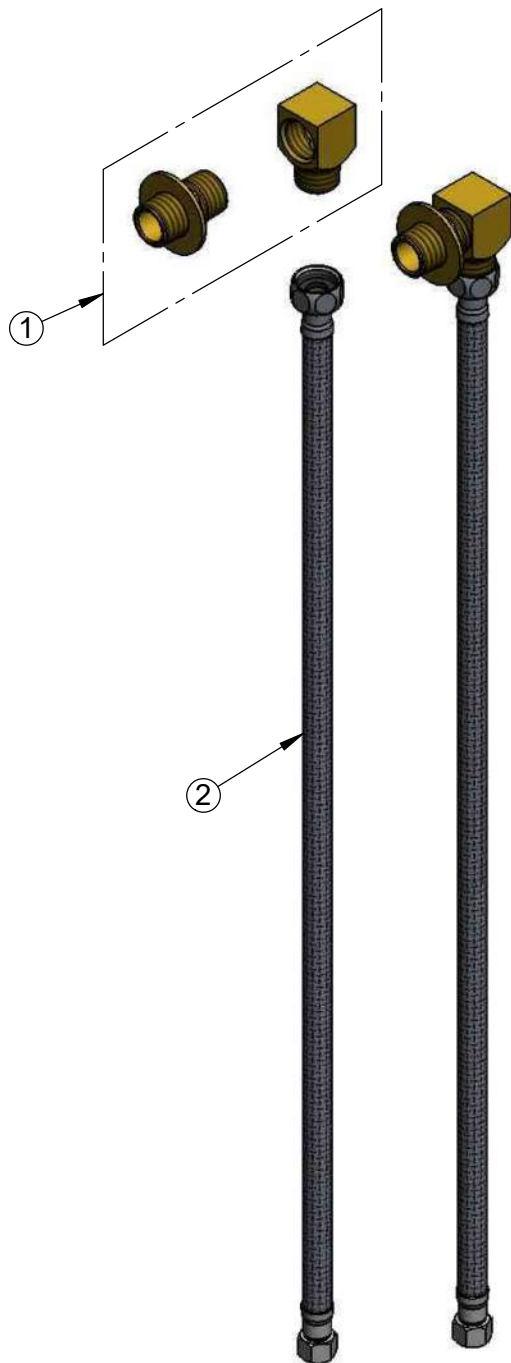
Model No.

B-0230-KIT

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

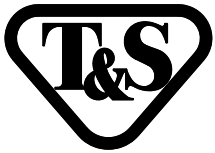
ITEM NO.	SALES NO.	DESCRIPTION
1	B-0230-K	1/2" Inlet Assembly Kit (2 Sets per Kit)
2	017420-45	24" Flexible Supply Hose (Sold Individually)


Product Specifications:
Inlet Kit:

1/2" Inlet Shanks, Close Elbows
and 24" Flexible Supply Hoses

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-3952-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

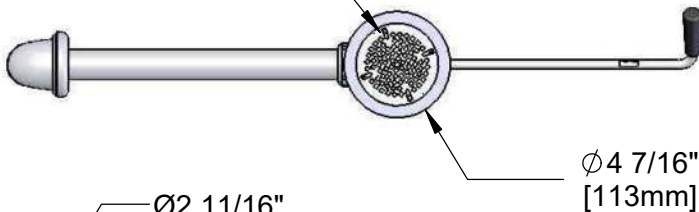
Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____

Twist Handle w/
Heat Resistant
Plastic Grip (Shown
in Open Position)

Removable
Snap-in Strainer



Ø2 11/16"
[68mm]

Ø4 7/16"
[113mm]

Ø1 1/4" [32mm] O.D.
Overflow Tube

19 1/2"
[495mm]

4 1/2"
[114mm]

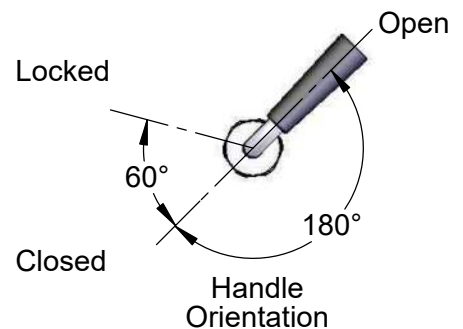
12 1/4" ± 1/4"
[312mm]

2 5/8"
[67mm]

15 3/8"
[391mm]

2" NPT Male Thread,
1-1/2" NPT Female Thread

Ø2" [51mm]
Opening Required

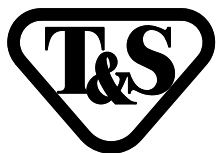


Product Specifications:

Rotary Waste Drain Valve w/ Twist Handle, 3 1/2" Sink Opening, 2" Male NPT / 1-1/2" Female NPT Outlet & Overflow Tube & Head

Product Compliance:

ASME A112.18.2 / CSA B125.2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

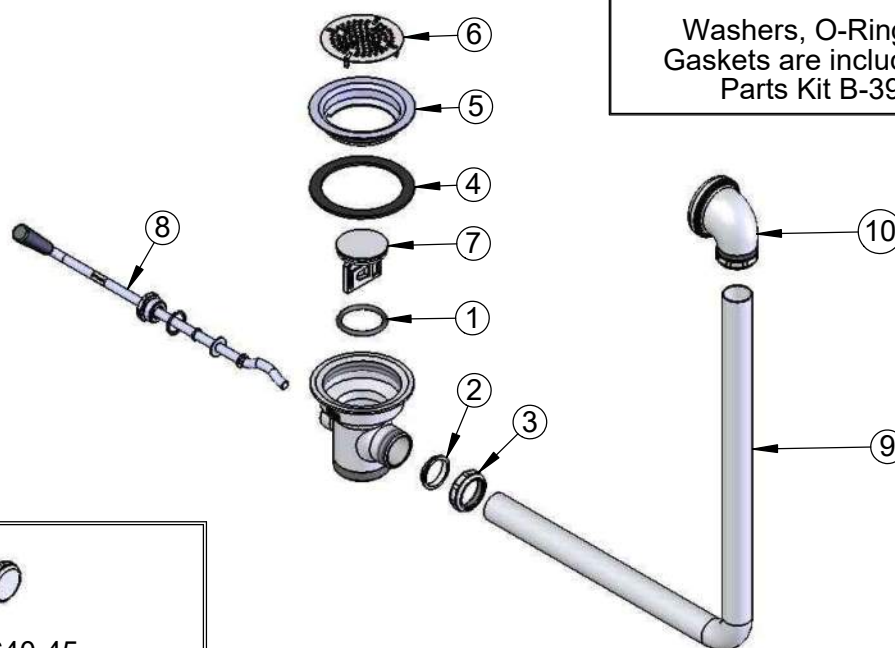
Model No.

B-3952-01

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

ITEM	SALE NO.	DESCRIPTION
1	010389-45	O-Ring, Plunger
2	010390-45	Ferrule, Coupling Nut
3	010391-45	Nut, Coupling for Twist Drain
4	010382-45	Gasket, 3 1/2" Face Flange
5	010384-45	Flange, 3 1/2" Face
6	010386-45	Strainer, 3 1/2" Snap-in Removable
7	010388-45	Plunger, Lever and Twist Drain
8	010393-45	Handle, Rotary Waste Valve Twist
9	011355-45	Tube, Overflow Elbow
10	011356-45	Head, Overflow Tube



Washers, O-Rings &
Gaskets are included in
Parts Kit B-39K



012640-45
Waste Drain Overflow Cap
w/ Sealing Washer
(Included)

Product Specifications:

Rotary Waste Drain Valve w/ Twist Handle, 3 1/2" Sink Opening, 2" Male NPT / 1-1/2" Female NPT Outlet & Overflow Tube & Head

Product Compliance:

ASME A112.18.2 / CSA B125.2

Submittal Sheet

10/03/2025

ITEM# 72 - S/S - SCRAP SINK (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Scrap Sink w Rails Included in or part of Item # 73. Fabricated per plan and specification. **

Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 73 - S/S - SOILED DISH LANDING (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Soiled Dish Table Fabricated per plan and specification.

**** Approved Shop Drawing ****

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 74 - COMMERCIAL WASTE CONTAINER (1 EA REQ'D)

CFS Brands 84103223












Carlisle - Bronco™ Waste Bin Trash Container, 32 gallon, 28"H x 21-2/5" dia., round, stackable, double-reinforced stress ribs, ergonomic handles, integrated bag cinches, drag skids, deep hand holds on base, polyethylene, gray, NSF, Made in USA

WASTE CONTAINERS

BRONCO™ ROUND WASTE CONTAINERS

- Color-coded to align with HACCP practices and promote an integrated sanitary maintenance system
- Heavy-duty construction and reinforced with drag skids for maximum longevity
- Stackable design prevents vacuum sealing when stacked
- Ergonomic hand holds on the bottom of the can make emptying contents easy and efficient
- Integrated bag cinches
- NSF 2 and NSF 21 certified for storing, separating, and color-coding various food products



					
Brown (01)	White (02)	Black (03)	Yellow (04)	Red (05)	Green (09)
					
Blue (14)	Gray (23)	Orange (24)	Bright Pink (26)	Purple (89)	

Prod No	Description	Color	UOM	Case Qty	List Price
Bronco™ Waste Containers					
841010 △	Round Waste Container - 10 Gallon	01, 02, 03, 04, 05, 09, 14, 23, 24, 26, 89	CS	6	\$169.08
841020 △	Round Waste Container - 20 Gallon	01, 02, 03, 04, 05, 09, 14, 23, 24, 26, 89	CS	6	\$252.00
841032 △	Round Waste Container - 32 Gallon	01, 02, 03, 04, 05, 09, 14, 23, 24, 26, 89	CS	4	\$234.48
841044 △	Round Waste Container - 44 Gallon	01, 02, 03, 04, 05, 09, 14, 23, 24, 26, 89	CS	3	\$270.72
841055 △	Round Waste Container - 55 Gallon	01, 02, 03, 04, 05, 09, 14, 23, 24, 26, 89	CS	2	\$291.60

Submittal Sheet

10/03/2025

ITEM# 75 - S/S - SLANTED GLASS RACK (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Slanted Glass Sorting Rack. Approx. Size 20" X 42" Fabricated per plan and specification. **
Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 76 - SPARE NO.

<Spare No.>

Submittal Sheet

10/03/2025

ITEM# 77 - S/S - PASS SHELF (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Pass/Pick-up Shelf. Approx. Size 14" X 10'-0" Fabricated per plan and specification. **

Approved Shop Drawing **

<INCLUDED >

Submittal Sheet

10/03/2025

ITEM# 78 - S/S - BEVERAGE COUNTER (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Beverage Counter Approx. Size 36" X 16'-0" Fabricated per plan and specification. **

Approved Shop Drawing **

Submittal Sheet

10/03/2025

ITEM# 78A - S/S - SERVICE COUNTER (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel CURB

Submittal Sheet

10/03/2025

ITEM# 79 - COFFEE BREWER (1 EA REQ'D)

FETCO C53016

Handle Operated Series Coffee Brewer, twin, 2.0 gallon capacity, automatic, on/off switch, two-portion standard, gravity flow dispense tube system, programmable recipes, gourmet coffee brew basket locks during brew cycle, hot water service, tank drain, 2 x 3.0kW heaters, 120/208-240v, 1-ph, 3+G wires, 22.0 - 25.4 max amp draw, 4.6 - 6.1kW, terminal block, 4.0 - 20.0 gallons per hour, UL, cUL, NSF (Use with FETCO D450 or D453 - sold separately)

ACCESSORIES

Mfr	Qty	Model	Spec
FETCO	1		NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation
FETCO	1		Circuit board: 3 year parts & 1 year labor warranty, standard
FETCO	1		Electro-mechanical parts: 2 year parts & 1 year labor warranty, standard
FETCO	1		All other parts: 1 year parts & 1 year labor warranty, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120/208-240						25.4	6.1			

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1						3/8"			

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

PLUMBING 1 REMARKS

20-75 psig, 1.25 gpm minimum flow rate

HANDLE OPERATED COFFEE BREWER

CBS-5000 Series

CBS-52H-20

Twin 2.0 Gallon Brewer



Shown with 2.0 Gallon LUXUS® Thermal Dispensers (L4D-20)

The **CBS-5000 Series** was designed for simplicity. The Handle Operated Series brewers save the operator time and effort by delivering quick and consistent results from your pre-programmed coffee recipe. It is the reliable choice for serving high-volumes of single batch coffee all day long.



Handle operation — a quick start!

Simply twist the handle to begin the brew cycle and in minutes your perfectly brewed coffee is ready to serve.



Manual water faucet.

Safely dispense hot water away from steam and brew basket.



Set it and forget it.

Program your recipe once and this brewer delivers consistent and repeatable results.

FETCO®
TRUSTED | RELIABLE | QUALITY



Water Specification

Water Inlet ¾" male flare fitting	Minimum Flow Rate 1¼ gpm [4.71 lpm]	Water Pressure 20-75 psig [138-517 kPa]
--------------------------------------	--	--



Electrical Configuration

Configuration Code	Heater Configuration	Voltage	Phase	Wires	KW	Electrical Connection	Max Amp Draw	Gallon [Liter] /Hour
US & CANADA								
C53016	2 x 3.0 kW	120/208-240	1	3+G	4.6-6.1	Terminal Block	22.0-25.4	14.0-20.0 [53.0-75.7] ⁽¹⁾
C53026	2 x 4.0 kW	120/208-240	1	3+G	6.1-8.1	Terminal Block	29.3-33.8	20.0-26.0 [75.7-98.4] ⁽¹⁾
C53036 ⁽²⁾	3 x 3.0 kW	120/208-240	3	4+G	7.0-9.1	Terminal Block	19.4-22.4	22.0-30.0 [83.3-113.6] ⁽¹⁾
C53046 ⁽²⁾	3 x 4.0 kW	120/208-240	3	4+G	9.1-12.1	Terminal Block	25.6-29.6	33.0-40.0 [113.6-151.4] ⁽¹⁾
C53186 ⁽²⁾	3 x 4.0 kW	440-480	3	3+G	10.3-12.1	Terminal Block	13.6-14.8	34.0-40.0 [128.7-151.4] ⁽¹⁾
INTERNATIONAL								
C53076 ⁽²⁾	3 x 3.0 kW	220-240/380-415	3	4+G	7.8-9.1	Terminal Block	11.8-12.9	26.0-30.0 [98.4-113.6] ⁽¹⁾
C53086 ⁽²⁾	3 x 4.0 kW	220-240/380-415	3	4+G	10.3-12.1	Terminal Block	15.7-17.1	34.0-40.0 [128.7-151.4] ⁽¹⁾
C53096	2 x 3.0 kW	220-240	1	2+G	5.1-6.1	Terminal Block	23.3-24.4	18.0-20.0 [68.1-75.7] ⁽¹⁾
C53106	2 x 4.0 kW	220-240	1	2+G	6.8-8.1	Terminal Block	30.9-33.8	24.0-26.0 [90.8-98.4] ⁽¹⁾

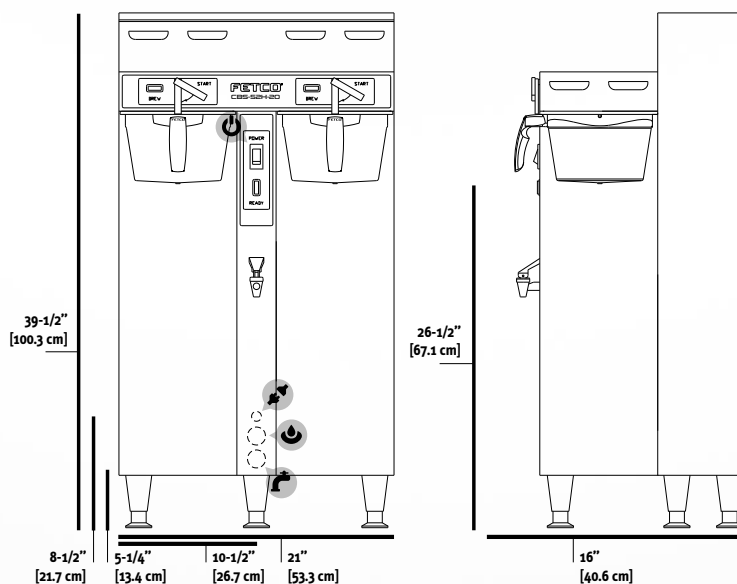
(1) Based on standard factory settings: 4.0 minute brew time; 0% prewet; 200°F water.

(2) Requires 3 phase Electrical Power System (Z056).



Measurements

Height 39½" [100.3 cm]	Width 21" [53.3 cm]	Depth 16" [40.6 cm]	Empty Weight 87 lbs [39.5 kg]	Filled Weight 150 lbs [68.0 kg]	Shipping Weight 100 lbs [45.4 kg]	Shipping Dimensions: 38" x 23" x 24" [96.5 x 58.4 x 61.0 cm]
---------------------------	------------------------	------------------------	----------------------------------	------------------------------------	--------------------------------------	---



- Electrical Connector
- Tank Drain
- Water Inlet
- On / Off Switch



Compatible Dispensers

2.0 Gallon LUXUS® Thermal Server (L4S-20)

Must be used with S4S Serving Stations.

2.0 Gallon LUXUS® Thermal Dispenser (L4D-20)

D453

D450



Customize Your Brewer

Single Serving Station for L4S-15/20 Server

Twin Serving Station for L4S-15/20 Server

Triple Serving Station for L4S-15/20 Server

Identifier Plates, Acrylic

A150

A151

A152

A069



Cups per Hour*

8oz. 475 12oz. 317 16oz. 238 20oz. 190

* Approximate based on maximum power setting.



Paper Coffee Filters

15" x 5.5" (500/Case)

F001



Information

fetco.com

info@fetco.com

847.719.3000
1.800.338.2699 USA
847.719.3001Food Equipment Technologies Co.
600 Rose Road
Lake Zurich, IL 60047
USA

Submittal Sheet

10/03/2025

ITEM# 80 - COFFEE TEA BREWER (1 EA REQ'D)

FETCO M1221US-1A117-PM001

Extractor Plus™ Series Multi Beverage Brewer System, tall, 3 L coffee & 3 gallons of iced tea output, 4.4 gallons per hour, digital touchpad operation, adjustable brew time & volume, streamlined programming & diagnostic, USB, hot water faucet, fits airpots & iced tea dispensers (Not included), 1.7kW heater, 120v/60/1-ph, 14.7 amps, 1.8 kW, NEMA 5-15P, cULus, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
FETCO	1		NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	14.7	1.8			

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				1/4"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

Submittal Sheet

10/03/2025

ITEM# 81 - S/S - BEVERAGE COUNTER TROUGH DRAIN (1 EA REQ'D)

S/S FAB CUSTOM

Custom Stainless Steel - Beverage Counter Trough Drain. Approx. Size 4-3/4" X 48" Fabricated per plan and specification. ** Approved Shop Drawing **

<INCLUDED >

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Horizontal louver blinds with aluminum slats.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
- C. Samples for Initial Selection: For each type and color of horizontal louver blind indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type and color of horizontal louver blind indicated.
 - 1. Slat: Not less than 12 inches long.
 - 2. Tapes: Full width, not less than 6 inches long.
 - 3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
 - 4. Valance: Full-size unit, not less than 12 inches wide.
 - 5. Cornice: Full-size unit, not less than 12 inches wide.
- E. Window Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.
- F. Product Certificates: For each type of horizontal louver blind, signed by product manufacturer.
- G. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.3 QUALITY ASSURANCE

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

BUILDING AND SITE IMPROVEMENTS
WESTEND NAVIGATION CENTER

1.5 PROJECT CONDITIONS

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

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gypsum board that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 1 year.
- B. Installer's Warranty: 1 year.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Horizontal Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed, but no fewer than 2 units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum Slats: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Levolor. (Basis of Design)
 - 2. Hunter Douglas.
 - 3. Or equal.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. The Riviera Classic DustGuard 1 inch Blind:
 - 1. Headrail:

BUILDING AND SITE IMPROVEMENTS
WESTEND NAVIGATION CENTER

- a. 0.025 inch thick steel, "U" shaped, 1 inch high by 1-9/16 inch wide with flanged edges at top, and coated with baked-on finish. Hardware shall be enclosed in metal headrail.
2. Tilter:
 - a. Guardian Tilter mechanism, not less than .042 inch thick steel housing with self-lubricating nylon, automatically disengaging worm and gear mechanism to provide maximum closure, eliminate overdrive, and prevent strain or damage to blind.
3. Tilt Wand:
 - a. Transparent with hexagonal cross section approximately 5/16 inch across flats.
4. Cord Lock:
 - a. 0.042 inch thick steel and shall be securely attached to headrail. Crash-proof type with sufficient sensitivity to lock slats at desired height upon release of cords.
5. Drum and Cradle: Provide for each ladder.
 - a. Drum: 0.031 inch thick steel having 2 holes with rolled edges to anchor barbs of both ladder ends.
 - b. Cradles: 0.042 inch thick steel having 2 holes with rolled edges to guide cords through bottom of headrail without abrasion. They shall provide bearing support for the tilt rod, thus preventing weight of blind from being transferred to tilter. Cradles shall center drums over ladder openings.
6. Tilt Rod:
 - a. U-shaped, with a circular radius of approximately 0.125 inch designed to achieve minimum torsional deflection.
 - b. For blinds over 60 inch wide and under 80 inch long, or over 55 inch wide and over 80 inch long, tilt rod shall be solid D-shaped with average cross section of 0.28 inch designed to achieve minimum torsional deflection.
7. End Braces:
 - a. 0.037" thick steel with reinforcing ribs and field adjustable tabs. End braces shall incorporate field adjustable tab to insure secure installation, center blind in window, and prevent lateral movement.
8. Installation Brackets:
 - a. 0.048 inch thick steel with baked-on finish to match headrail. Brackets shall incorporate rivet-hinged safety locking front cover to permit removal of headrail without lateral movement.
 - b. Mounting holes shall be located to accommodate overhead, side, or face mounting.
9. Intermediate Brackets:
 - a. 0.050 inch thick steel and shall be installed with blinds over 60 inch wide and under 80 inch long, or over 55 inch wide and over 80 inch long. Brackets shall be supplied as required.
10. Ladders (slat supports):
 - a. Braided polyester yarn dyed to Levolor color standard. Two vertical components shall be 0.076 inch by 0.038 inch designed for maximum flexibility combined with minimum stretch and tensile strength of not less than 50 lbs. per cable.
 - b. Horizontal components (rungs) shall consist of not less than 2 cables inter-braided with vertical components. Ladder shall support slats without visible distortion. Distance between slats shall not exceed 19.5 mm - nominally 15.7 slats per vertical foot (with LightMaster option, 18.0 mm - nominally 16 slats per vertical foot).
 - c. Distance between ladders shall not exceed 23 inch for blinds up to 80 inch long. For blinds over 80 inch long, distance between ladders shall not be greater than 22 inch.
 - d. Distance between end ladder and end of slat shall not exceed 7 inch.
11. Slats:

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- a. 5000 series magnesium aluminum alloy only, not to include reprocessed metals. Aluminum alloy shall be tempered to optimize tensile and yield strength for superior slat strength, resiliency, and corrosion resistance.
 - b. Slats shall be nominally 1 inch wide and .0075 inch \pm .0003 inch (prior to coating); after coating the thickness of the slats shall be .0085". Slats shall have a coating thickness of 0.8 mil to 1.5 mil.
 - c. Unperforated slats shall perform to 500 hours of 100% relative humidity testing, 300 hours of 5% salt spray solution at 95 degree F testing, and 250 hours of accelerated weathering testing without blistering, fading, corroding, or adhesive failure.
 - d. Slat thickness and ladder support distances shall prevent visible sag or bow after continued use indoors.
12. Finish:
- a. DustGuard, permanent, proprietary paint process that disrupts the natural static attraction of airborne dust particles, reducing dust buildup by 50-70 percent.
13. Slats:
- a. Unperforated.
14. Bottomrail:
- a. 0.031" thick steel formed after coating and shall be provided with color compatible molded plastic ladder and end caps having integral protrusions designed to prevent bottom bar from marring window sill and/or mullions.
15. Lift Cord:
- a. Braided of high strength, 1.4mm diameter polyester fiber with a high tenacity polyester core, 34 picks per inch, 16 carrier smooth braids, and shall be flexible, have minimum stretch, maximum abrasion resistance characteristics, and a minimum breaking strength of 130 lbs.
 - b. Cord shall be of sufficient length equalized to properly control raising and lowering of blind and spaced not over 46 inch between cords.
16. Color:
- a. As selected from over 70 Riviera Classic standard solid colors, Tiltone colors, specialties, or standard metallic slat finishes and complementary standard accessory finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.

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3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

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

END OF SECTION 122113

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SECTION 133424 - FABRICATED SHEDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fabricated shed.
- B. Related Sections:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete pad and anchor bolts.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years.
- B. Installers Warranty: Two years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fabricated shed: Subject to compliance with requirements, provide products by one of the following:
 - 1. Tuff Shed. (Basis of Design)
 - 2. Or equal.

2.2 FABRICATED SHED

- A. Product: Garden Ranch Shed by Tuff Shed or equal.
 - 1. Size: 10' x 12'.

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2. Door: 4' x 6'-2" single shed door.
3. Paint: Pre-finished grey.
4. Wall vent: 16" x 4".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install prefabricated portable shed according to manufacturer's written instructions.

3.3 ADJUSTING

- A. Adjust doors and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.
- C. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 133424

SECTION 14 20 00

ELEVATORS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Related Documents: Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections apply to this Section.
- B. Bidders Note:
 - 1. The base bid shall be in accordance with the Construction Documents (Specifications and Drawings).
 - 2. All clarifications, exceptions and qualifications to the Construction Documents will be considered as unsolicited alternates and must be submitted at bid time in the format of marking up this document to reflect your proposed product for this project.
 - 3. Include all deductive pricing of the unsolicited alternates.
 - 4. Mark-Up Architects Drawings to reflect any changes to dimensions to accommodate the base bid and any unsolicited deductive alternates.
 - 5. Additional pages in letter form with regard to work by others or instructions to the contractor are acceptable, but all other clarifications to this document will be submitted with the bid as a mark-up of this document together with itemized pricing. The marked-up document when submitted will be reviewed, negotiated and will become a part of the Contract.
- C. Work Included in This Section: Provide hydraulic elevators complete as shown and specified.
- D. Related Work Interfaced With This Section:
 - 1. Life Safety or Public Address Speakers: Furnished by others; wire from machine room to car, accommodations and installation in car canopy by this Section. Provide assistance with installation, hook-ups and testing at no additional cost to Owner.
 - 2. Card Readers: Furnished by others; wire from machine room to car, interfacing with elevator controls and installation in elevator car by this Section. Provide assistance with installation, hook-ups and testing at no additional cost to Owner.
 - 3. Closed Circuit T.V. or Camera: Furnished by others; wire from machine room to elevator car by this Section. Provide assistance with installation, hook-ups and testing at no additional cost to Owner.

1.2 QUALITY ASSURANCE:

- A. Qualifications of Bidders:
 - 1. General: The entire elevator installation shall be manufactured, installed and maintained by an acceptable manufacturer listed or as qualified by addendum. No portion of the work shall be subcontracted unless qualified and accepted by addendum. Equipment proposed must have a history of successful operation under similar conditions for the last two (2) years.

2. Acceptable Bidders: One of the following or as approved by addendum. Those not listed must pre-qualify ten (10) days prior to bid date. Submit list of at least three (3) projects representing equivalent equipment that has been operational for at least two (2) years. Include Owner's name, person to contact and telephone number.
 - a. Mitsubishi Elevator Company.
 - b. Otis Elevator Company.
 - c. ThyssenKrupp Elevator Company.
3. Maintenance Qualifications: Performed by manufacturer installing elevator:
 - a. Show evidence of successful experience in complete maintenance of elevators.
 - b. Directly employ sufficient competent personnel within 50 miles of project to handle service.
 - c. Maintain local stock of parts adequate for replacement on permanent or emergency basis.
 - d. Respond to trouble calls within one hour.
 - e. Offer the Owner agreement for continuing maintenance after expiration of maintenance period under this contract.
4. Installer and Maintenance Qualifications: Installer must be a licensed Elevator Contractor in the State of California.
 - a. Show evidence of successful experience in complete installation and maintenance of proposed manufacturer's elevator equipment for at least two (2) years.
 - b. Directly employ sufficient competent personnel within 50 miles of project to handle construction and maintenance duties.
 - c. Maintain local stock of parts adequate for replacement on permanent or emergency basis.
 - d. Respond to trouble calls within one hour.
 - e. Offer the Owner agreement for continuing maintenance after expiration of maintenance period under this contract.

B. Requirements of Regulatory Agencies:

1. Codes: In accordance with the latest applicable edition requirements of the following and as specified:
 - a. A.D.A.: Americans with Disabilities Act.
 - b. ASME: American Society of Mechanical Engineers - A17.1; Safety Code for Elevators and Escalators.
 - c. NFPA – 70
 - d. NFPA – 72
 - e. CBC: Title 24; California Building Codes.
 - f. CCR: Titles 8; California Code of Regulations.
 - g. All local codes, which govern.
 - h. All local administrative codes, which govern
2. Permits: Arrange and pay for inspections by governing authorities and obtain all required operating permits.
3. Taxes: Pay all applicable taxes.

1.3 Definitions:

- A. Main Lobby: Ground Level unless otherwise indicated.
- B. Fire Recall Level: As directed by local fire authority.
- C. Alternate Fire Recall Level: As directed by local fire authority.
- D. Non-Proprietary: It is recognized that each manufacturers system contains components that are proprietary to the development of their systems. The Owner may wish to have the elevator system

maintained by another technically qualified service provider and by submitting a bid for this project, the manufacturer shall guarantee that for a minimum of 20 years they will provide the following:

1. Diagnostic, adjusting and monitoring tools for all components including documents, manuals, wiring diagrams and spare parts as listed in Part 3 of this specification shall be provided in each machine room, controller room or machine space as a permanent part of the installation and become the property of the Owner. Devices shall be permanent at no additional cost to Owner, shall not self-destruct, require charging or exchange. Remote monitoring devices are excluded from this requirement, however if such devices are removed all wiring shall be neatly terminated, tied within a junction box and properly marked as to its content. Service tool must be provided.
2. Manufacturer shall guarantee to support the equipment for this project with regard to notification to Owner of system corrective updates, provide and install such updates at no cost to Owner.
3. Provide contact information for their separate parts warehouse so that the Owner or designated service provider can order parts on a 24 hour basis and delivered with 48 hours.
4. Provide a list of parts of each component manufactured and stored at the warehouse and the retail cost of each at close out of the project and estimated escalation cost. The cost of these parts is what would be charged to Owner or other service provider.
5. Provide contact information for technical support so that the Owner or designated service provider can obtain technical support on a 24 hour basis to provide assistance in trouble shooting problems. Indicate hourly rate charged to Owner or designated service provider for such service.
6. In the event that a company other than Contractor maintains the elevators, and if the equipment was unable to be repaired by the maintenance company, a factory-trained technician would be required to assist (as it would if Contractor's own technician were in the same situation). If such an event was to occur, Contractor would make its factory-trained technician available for assistance upon request of the Owner within three (3) business days, based on the contractual hourly rates subject to established annual escalations.
7. The above will survive any termination of the maintenance agreement.

1.4 SUBMITTALS:

- A. Shop Drawings: Submit as required by the Owner's Representative. The Owner's Representative reserves the right to require any details of any portion of the equipment.
 1. Layouts: Plan and section of hoistways, pits and machinery spaces; include impact and static loads imposed on building structure location of hoistway ventilation and required clearances around equipment.
 2. Details: Submit details of cabs, fixtures and entrances.
 3. Data: Indicate on layouts or separate data sheets; machine spaces heat release, power requirements, and normal annual power consumption, conduit runs outside of hoistways and machine rooms, car and counterweight roller guides and door operators.
- B. Samples: Provide samples of materials and finishes exposed to public view and additional, if specifically requested, 6 inch x 6 inch panels, 12 inch lengths or full size if smaller, as applicable.
- C. Operating Instructions: Submit manufacturer's literature describing system operations and special operations as specified.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect equipment during transportation, erection and construction. Store under cover to prevent damage due to weather conditions. Replace damaged materials.

1.6 SEQUENCING AND SCHEDULING:

- A. Schedule and be responsible for coordinating related work with other trades to avoid omissions and delays in job progress.

1.7 WARRANTY:

- A. Provide special project warranty, signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator work which may develop within one (1) year from final date of completion and acceptance of the entire installation. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration and similar unusual, unexpected and unsatisfactory conditions.

1.8 ALTERNATES:

- A. Alternate No. 1; Continuing Full Maintenance Contract:

1. Submit per OEM standard maintenance agreement denoting maintenance hours per month, cost per unit per month. Hours of operation, Maintenance Control Program (MCP) chart denoting process and procedures.
2. Quote cost and submit manufacturer's proposal for full maintenance contract for a period of five (5) years after expiration of 12-month warranty maintenance provided with this new installation.
 - a. 12 Month Warranty Maintenance Cost: \$ _____
 - b. 60 Month / 5 Year Continuing Maintenance Cost (w/o) Escalations: \$ _____
3. Provide examinations, lubrication and replacements in accordance with manufacturer's standard practice. Include frequency and hours as indicated under Maintenance in Part 3 of this specification. Any work required performing repairs or answering trouble calls shall be in addition to the preventative maintenance hours.
4. Provide 24-hour emergency call back service.
 - a. Any callback associated with entrapments is at no cost to Owner; 24 hours per day.
 - b. Trouble callbacks during normal working hours are at no cost to Owner.
 - c. Non-Entrapment callbacks after hours shall be billable for the premium time portion only.

PART 2 - PRODUCTS:

2.1 DESCRIPTION OF SYSTEMS:

- A. Elevator No. PE1; Passenger Service:

- | | |
|---------------------------|----------------------------|
| 1. Type: | Hydraulic Holeless Plunger |
| 2. Capacity: | 3500 Pounds |
| 3. Speed: | 125 FPM |
| 4. Stops: | 2 at 1,2 |
| 5. Openings: | 2 In Line |
| 6. Travel: | As Shown |
| 7. Control: | SCR Soft Start |
| 8. Operation: | Simplex Operation |
| 9. Machine Location: | Adjacent |
| 10. Special Operations: | |
| a. Independent Service | |
| b. Fire Emergency Service | |

- c. Tenant Security
- d. Emergency Battery Lowering
- 11. Car Enclosure Type: Passenger Service
 - a. Platform Size 7'-0" W by 6'-2" D by 8'-0" H
 - b. Inside Clear 6'-8" W by 5'-5" D by 7'-6" H
- 12. Signals and Fixtures Design as Vandal Resistant
 - a. Car Operating Panels 1 Per Car; Swing Type
 - b. Car Position Indicator Integral with Each Car Panel
 - c. Communication Sys. Integral with Car Panel
 - d. Service Cabinet Integral with Car Panel
 - e. Hall Pushbuttons 1 Risers
 - f. In-Car Lanterns In Each Jamb In Strike Jamb
 - g. Hall Pos. Indicators Main Floor
 - h. Faceplate Finish Stainless Steel
 - i. Faceplate Fastening Tamperproof Matching Faceplate
- 13. Passenger Entrance Type Side Open, Single Speed
 - a. Size 3'-6" W by 7'-0" H
 - b. Frames
 - 1) Main Floor Stainless Steel
 - 2) Typical Floors Stainless Steel
 - c. Doors
 - 1) Main Floor Stainless Steel
 - 2) Typical Floors Stainless Steel
 - d. Sills
 - 1) Main Floor Aluminum
 - 2) Typical Floors Aluminum
- 14. Miscellaneous Items:
 - a. Disabled Access Requirements
 - b. Key Operated Hoistway Access
 - c. Card Reader Provisions
 - d. Oil Cooler
 - e. CCTV Provisions

2.2 MATERIALS:

- A. Aluminum: Alloy and temper best suited for anodizing finish specified.
- B. Bronze: CDA Alloy 280, muntz metal.
- C. Glass: Laminated Safety Glass meeting ANSI Z97.1.
- D. Nickel Silver: CDA Alloy 796, leaded nickel silver.
- E. Plywood: PS-1, A-D exterior Grade Douglas Fir, fire retardant treated.
- F. Sheet Steel: ASTM A366, uncoated, pickled, free from defects.
- G. Sound Deadener: Fire retardant; spray, roller or adhesive applied; 3/16 inch thick.
- H. Stainless Steel: ASTM A167; type 302, 304 or 316. **Type 441 is unacceptable.**

2.3 FINISHES:

- A. Exposed-to-View Surfaces. Provide as follows unless otherwise specified.
 - 1. Aluminum: Clear anodized finish.
 - 2. Sheet Steel:
 - a. Shop Prime: Degrease clean of foreign substances and apply one coat of corrosion inhibiting primer compatible with finish paint selected. Hoistway items visible to public shall be painted one additional coat of black paint.
 - b. Finish Paint: Factory applied baked enamel or powder coat; color as selected.
 - 3. Stainless Steel:
 - a. Plain: No. 4 finish unless otherwise specified.
 - 4. Touch-Up:
 - a. Prime Surfaces: Use same paint as factory for field touch-up.
 - b. Finish Painted Surfaces: Refinish whole panel with shop prime and finish paint as specified above.
- B. Non-Exposed-to-View Surfaces: Degrease and shop paint manufacturer's standard corrosion inhibiting primer.

2.4 AUTOMATIC OPERATION:

- A. General Operation of Individual Elevators:
 - 1. Provide a non-proprietary microprocessor-controlled dispatching system designed to monitor all types of traffic and sufficiently flexible so that it can be modified to accommodate changes in traffic patterns. Include hardware necessary to protect hoist motors, motor drives and door operators. Software shall control group and simplex program operations.
 - 2. The system shall continuously monitor the demand based on real time calculations to assign and reassign the elevators to handle the traffic in the most efficient manner.
 - 3. Provide "anti-nuisance service" whereby all car calls will be cancelled if the load-weighing device detects that an abnormal number of calls are registered given the number of passengers in the car. System using false call answering to accomplish this is not acceptable.
 - 4. Serial Link Communications: Provide a distributed processing network consisting of localized processors located in machine rooms, car stations, hall stations and top of car to allow system to make fast decisions based on data shared by the processor involved in the different operations of the elevators. For group dispatch operations, all elevators in the group shall be capable of acting as a group common dispatcher as the need arises.
 - 5. Fault Diagnostic System: Provide Owner with all hardware such as on-board LED. Diagnostics, hand held device or laptop computer, as standard with manufacturer, and supporting software documentation. Diagnostic system shall be capable of determining faults most difficult to find.
- B. Simplex Selective Collective Operation: Provide a microprocessor-based control system to perform functions of elevator motion, car operation dispatching and door control.
 - 1. Arrange for Simplex Selective Collective automatic operation. Operate elevators from a single riser of landing buttons and from operating device in car.
 - 2. Momentary pressure of one or more car or landing buttons, other than those for landing at which car is standing, starts car, and causes car to stop at first landing for which a car or landing call is registered corresponding to direction in which car is traveling. Stops made in order in which landings are reached, irrespective of sequence in which calls are registered.
 - 3. Double door operation not permitted. If an up traveling car has a passenger for an intermediate floor and a down call is registered at that floor, with no calls above car, it travels to floor, opens door to let passenger out, then lights down direction arrow in hall lantern and accepts waiting passenger without closing and reopening doors.

2.5 SPECIAL OPERATIONS:

- A. Inspection Operation: Provide key-operated hoistway access device and car top operating device. Key switches shall be mounted in doorframes with only ferrule exposed at terminal landings. Incorporate access switches in hall button stations for freight elevators.
- B. Independent Service: Independent service operation shall be provided so that, by means of a switch located in the car service cabinet, the car can be removed from automatic operation and be operated by an attendant. The attendant shall have full control of the starting, stopping and direction of car travel. The car shall respond to car buttons only. The hall signals for the car on independent service shall not operate.
- C. Operation Under Fire or Other Emergency Conditions: Provide special emergency service to comply with ASME A17.1, CCR Title 8, and local codes having jurisdiction. Provide Phase 1 recall switch at Main Floor Elevator Lobby. Key switches at main floor shall be integrated in hall button station with engraved instructions.

2.6 DOOR OPERATION:

- A. Passenger Type Horizontal Sliding:
 - 1. Door Operator: Provide heavy-duty master type operators with AC motor. Provide closed-loop door operators.
 - a. Provide door performance times as specified under "Design Criteria".
 - b. Car and hoistway doors shall open and close simultaneously, quietly and smoothly; door movement shall be cushioned at both limits of travel. Door operation shall not cause car enclosures to move.
 - c. Door hold open times shall be readily and independently adjustable when car stops for a car or hall call. Main floor door hold times shall be adjustable independent of other floors.
 - d. Hangers and Tracks: Sheave type with two-point suspension. Steel sheaves with flanged groove and resilient sound-absorbing tires. Minimum 2-1/2 inch diameter for hoistway, 3 inch for car. Provide manufacturer's heavy-duty tracks and ball or roller bearings with adjustable up thrusts.
 - e. Door restrictor: Provide door restrictor device compatible with new door equipment.
- B. Door Protection; Passenger Type:
 - 1. Electronic Scanning Type:
 - a. Provide a Smart 3D door protective system, which does not rely on physical contact with a person or object to inhibit door movement or initiate door reversal.
 - b. The system shall be able to detect a 2-inch diameter rod introduced at any position within the door movement and between the height of 2 inches and 63 inches above sill level.
 - c. Detection of intrusion into the protected area shall cause the doors, if fully open, to be held in the open position and, if closing, to reverse to fully open position.
 - d. If doors are prevented from closing for an adjustable period of 15 to 45 seconds or upon activation of Fire Emergency Service, they shall proceed to close at reduced speed and a loud buzzer shall sound. Door closing force shall not exceed 2-1/2 ft.-lbs. when door re-opening device is not in operation.
 - e. For side-opening doors, the detector for the strike jamb side shall be recessed, flush with strike jamb.
- C. Interlocks: Equip each hoistway door with a tamper-proof interlock, which shall prevent operation of the car until doors are locked in the close position as defined by the Code. Interlock shall prevent opening of doors at landing from corridor side unless car is at rest at landing, is traveling through leveling zone or, hoistway access switch is used. Interlocks shall lock the two door sections together.

2.7 SIGNALS AND OPERATING FIXTURES:

- A. General: Provide signals and fixtures as shown and specified. Location and arrangement of fixtures shall comply with disabled access requirements.
1. Buttons: Operation of car or hall button shall cause button to illuminate. Response of car to car or hall call shall cause corresponding button to extinguish.
 - a. Passenger Elevator Buttons: Provide fully illuminated buttons minimum 1 inch diameter mechanical buttons Buttons shall be raised 1/8 inch from surrounding surface with square shoulders. Operation of car or hall button shall cause button to illuminate.
 2. Switches: Toggle type typically or key operated where noted.
 3. Faceplates: Provide of material and finish as scheduled; 1/8 inch minimum thickness with sharp edges relieved.
 4. Fastenings: Provide as scheduled.
 5. Cabinets: Provide with pulls, concealed hinges and doors mounted flush with hairline joints to adjacent surface.
 6. Arrangement: Arrangement of fixtures shall generally conform to that specified, but components may be rearranged, if desired, subject to Owner's Representative's approval.
 7. Engraving: Of size indicated; color backfill with epoxy paint in contrasting color as selected.
 8. Lamps: Miniature LED type.
 9. Audible Chimes: Electronic adjustable audible chimes; bell type gong not acceptable.
 10. Provide floor passing signal of the adjustable electronic audible chime type.
 11. Provide Audible Indicator's (CA: 11B – 407. 4.8.2.1: The signal shall be an automatic annunciators which announces the floor at which the car is about to stop. Signal Level (CA: 11B – 407.4.8.2.2 shall be 10Db minimum above the ambient, but shall not exceed 80dB, measured at the annunciator, the annunciator shall have a frequency of 300Hz minimum to 3000 Hz maximum.
 12. Tactile Markings: Provide raised Braille and alpha characters, numerals or symbols adjacent to operating buttons and devices used by the public according to local codes. Indications may be engraved directly on faceplates or separate plates flush mounted with hairline joints and concealed mechanical fasteners. Plates shall be of same size and shape as buttons or integral "fishtail" type.
- B. Car Operating Panels:
1. General: Provide buttons identified to conform to floors served and the following:
 - a. Locate top operating button at 48 inches above floor; maximum 54 inches when required depending on floors served.
 - b. Locate emergency stop and illuminated alarm button in bottom row at 35 inches above floor. Wire emergency stop to ring alarm bell.
 - c. Provide door operating buttons located above emergency stop and alarm of same design as car button.
 - d. Engrave main panel with capacity, number of passengers and elevator number per code at the top of the panel. Engrave auxiliary panel with NO SMOKING in 1/2-inch letters. All other signage required by local codes shall be engraved as directed by Owner's representative. Where required engrave any other required signage on the cover of the service cabinet door.
 - e. Provide fire emergency panel above floor buttons containing phase II fire key switch, call cancel button stop switch, door open, door close buttons, audible/visual signals and instructions.
 - f. Make provisions for card readers on main panel.
 2. Swing Type: Integrate cabinets, buttons and engraving into swing front return panels without applied faceplate. Entire front return shall swing on concealed hinges with concealed locking means for servicing.

- C. Car Position Indicators:
 - 1. Provide car position indicators with indications corresponding to floor designations with matching direction arrows and floor passing chimes or verbal annunciator which announces the floor at which the car is about to stop. Provide manufacturers standard designation for elevators with express zones.
 - a. Digital Type: Provide direct readout indicator with minimum one-inch high indications mounted integral with each car-operating panel.
- D. Hall Position Indicators: Provide digital type position indicators with 2" high indications corresponding to floor designations located in lobby as directed by Owner's Representative.
- E. Service Cabinet: Provide cabinet door with a lock and concealed hinge as an integral part of car operating panel mounted with flush hairline joints. Cabinet door shall be provided with a flush glazed window of required size to hold elevator-operating permit. Service cabinet shall contain the following:
 - 1. Independent service switch.
 - 2. Two-speed ventilation switch. HIGH/OFF/LOW
 - 3. Light switch OFF/ON or dimmer as applicable.
 - 4. Inspection switch, key operated.
 - 5. Duplex GFI convenience outlet.
 - 6. Constant pressure test switch for emergency car lighting.
 - 7. Card reader over-ride switch, key operated.
 - 8. One Two blank knock outs.
- F. Passenger Emergency Communication Speaker Phone: Provide a complete communication system in compliance with A.D.A. regulations and local codes consisting of a combination speaker/microphone, amplifier, automatic dialer with 4 number rollover capability and matching car station push button with telephone symbol to activate system and call-acknowledgement and failure lights. Mount speaker behind a pattern of holes as selected as an integral part of car operating panel. Wire to machine room and program automatic dialer as directed by Owner.
 - 1. Provide a complete communication system in compliance with A.D.A. regulations and local codes consisting of a combination speaker/microphone, amplifier, automatic dialer with 4 number rollover capability and matching car station push button with telephone symbol to activate system and call-acknowledgement and failure lights. Mount speaker behind a pattern of holes as selected as an integral part of car operating panel. Wire to machine room and program automatic dialer as directed by Owner.
 - 2. Emergency elevator communication systems for the deaf, hard of hearing and speech impaired. An emergency two-way communication system shall be provided that:
 - a. Is a visual and text-based and a video-based 24/7 live interactive system.
 - b. Is fully accessible by the deaf, hard of hearing and speech impaired, and shall include voice-only options for hearing individuals.
 - c. Has the ability to communicate with emergency personnel utilizing existing video conferencing technology, chat/text software or other approved technology.
- G. Hall Button Fixtures: Each fixture shall contain buttons, which light to indicate hall call registration and extinguish when call is answered.
 - 1. Engrave "Fire Exiting Pictograph per CBC 3002.3, provide engraved Phase I "Fireman's Operating Instructions" on Main recall hall pushbutton faceplate.
- H. In Car Lanterns: Manufacturer's standard vandal resistant car riding lantern mounted at a maximum height above floor. Lens shall be flush with faceplate or face of jamb. Lantern illuminates and chimes as doors open. Provide single chime for up direction and double chime for down direction.

I. Medical emergency elevator:

1. Conform to current CBC Title 24 code requirements.
2. The identification symbol (Star of Life) shall be fabricated from material and finish matching hall button stations and mounted with concealed mechanical fasteners. Submit samples.
3. Local jurisdictional authority shall designate the medical emergency elevator.

2.8 WIRING:

- A. General: Provide all necessary wiring with 15% or a minimum of six spares between cars and controllers and to all remote control stations. Furnish shielded wires in cables for all communication systems card readers digital display devices and speakers. Include two additional pairs of shielded spares for each car.
- B. Traveling Cables: Use minimum number of traveling cables with flame retarding and moisture resisting covers. Include shielded wires and spares as noted above. Cord thoroughly and protect cables from rubbing against hoistways or car items. Provide with steel cable core and properly anchored to relieve strain on individual conductors.
- C. Work Light and Convenience Outlet: Provide on top of car with plastic lamp guard.
- D. Stop Switch: Provide in each pit and on top of car.
- E. Alarm Gong: Six-inch size, 110 volt. Provide on top of each car to be actuated by corresponding alarm button or emergency stop switch.
- F. Auxiliary Disconnect Switches: Provide as required in remote controller rooms or at remote equipment not in view of mainline switches; include all wiring and conduit.
- G. Coaxial or Camera Circuit: Provide for closed circuit television camera in elevators. Run from elevator car to machine room.

2.9 CAR ENCLOSURES:

- A. General: Fabricate finish work smooth and free from warps, buckles, squeaks and rattles; joints lightproof. Car shall be sound isolated from car frame. Apply sound deadener on outside of car shell. No visible fastenings, except as indicated.
- B. Passenger Cars; Elevator No.
 1. Fontana Steel Shell: Fabricate walls of 14 -gauge only sheet steel from floor to canopy. Canopy 12 gauge only reinforced. Paint shell in color as selected by Owner's Representative.
 2. Emergency Exit: Top of car per code.
 3. Ventilation:
 - a. Hydraulic Elevators Only: Low Air Flow Minimum two-speed squirrel cage exhaust fan: Low Speed 175 CFM with maximum 40.2 dBA sound level; High Speed 323 CFM with maximum 57.6 dBA sound level. Provide sound isolation mounting on canopy. Provide concealed vents at base and ceiling as required by code
 4. Car Doors: Fabricate from 16-gauge sheet steel on front and back of each panel sufficiently reinforced with steel to insure rigidity. Provide two guides per panel located one inch from each end. Provide full-length neoprene astragals. Finish car side with satin finish stainless steel and return finish 1/2 inch around edge of doors. Door strength and locking means shall comply with code where hoistway fascia is not provided directly in front of car doors.
 5. Protective Pads: Provide one set of heavy quilted protection pads for each group of elevators. Pads shall cover all walls with cut-out sections for car operating panels. Provide pads with rubber-coated 'J' type hooks sewn into top of pad for mounting on top of removable panels where panels are provided, otherwise pad buttons matching other metal finishes within the car shall be provided.
 6. Front Return Panels: Provide full integral swing type fixed type front return panels fabricated from 14 gauge stainless steel.

7. Interior Panels: Provide removable panels of 3/4-inch particleboard core with balance sheet; align joints with ceiling grid. Face and edge with plastic laminate as selected by Owner's Representative.
 8. Base and Metal Trim: Provide base below removable panels, vertical joints between panels and other metal fabricated from stainless steel.
 9. Ceiling and Lighting: Provide a suspended ceiling fabricated from stainless steel. Provide six (6) equally spaced LED type down lights in ceiling with dimmer switch controls located in service cabinet.
 - a. Provide Motion Sensor: Upon 10 seconds of no activity or motion within elevator cab interior sensor shall render the cab lights inoperative. Upon movement of car doors or any additional movement within elevator cab or elevator components, sensor shall activate car lighting in normal mode.
 10. Support Rails: CA: 11B – 407.4.10: Support rails shall be provided on at least one wall of the car.
 - a. CA: 11B – 407.4.10.1: Clearances between support rails and adjacent surfaces shall be 1 ½ in. minimum with top of support rail at 31 in. to 33 in. maximum above the floor of the car. The ends of the support rail shall be 6 in. maximum from adjacent walls.
 - b. CA: 11B – 407.4.10.3: Allowable stresses shall not be exceeded for materials used when a vertical or horizontal force of 250 lbs. is applied to any point on the support, fasteners, mounting devices or supporting structure.
 - c. Rails shall be 1-1/2" cylindrical with ends returned to wall panel in stainless steel #4, with matching brackets. Securely attached to car shell with concealed fasteners.
 11. Sills: Provide extruded aluminum threshold plate. Mount with concealed mechanical fasteners. Allow for installation of finish flooring.
 12. Finish Flooring: Tile as selected by Owner's Representative from manufacturer's standard line. Installation per this section. Allow ¾ inch.
- C. Emergency Lighting; All Elevators: Provide an emergency car lighting unit mounted on top of car, battery driven and self-rechargeable. Upon outage of normal power the unit shall, within 5 seconds, light two lamps as part of normal car lighting or separate lights mounted above drop ceiling. The unit shall have sufficient capacity to keep the lights in continuous operation for four hours and also the alarm bell for one hour. Provide a readily accessible means for testing the unit in service cabinet. Light fixtures mounted in car front returns or operating panels are not acceptable.
- 2.10 HOISTWAY ENTRANCES; PASSENGER TYPE:
- A. General: Fabricate finish work smooth with flush surfaces and free from warps and buckles. Entrance assemblies shall bear 1-1/2 hour U.L. rating. Provide entrances of size and type as scheduled.
 - B. Struts and Closer Angles: As required for entrance installation and door closer mechanism. Use full-length struts. Hanger headers, minimum 3/16 inch material extending from strut to strut.
 - C. Dust and Hanger Covers: Provide as required of minimum 16-gauge sheet steel. Provide hanger cover plates extending full length of door track. Paint black.
 - D. Fascia, Toe and Head Guards: Minimum 16 gauge sheet steel; reinforce fascia. Paint black.
 - E. Sills: Extruded sills with non-slip surfaces and grooves suitable for guides. Extend strut to strut and mount without exposed screws. Provide all support angles and levelers for a complete installation. Sill material as scheduled.
 - F. Frames: Fabricate from 14-gauge material with side jambs in one continuous piece from sill to head section.
 1. Standard bolted frame will be acceptable. Material and finish of frames as scheduled.
 - G. Doors: Fabricate from 16-gauge steel sandwich construction. Material shall be sufficiently reinforced with steel to insure rigidity and sound deadened. Provide two guides and one fire tab per panel, which will remain engaged in sill if guiding member is destroyed. Provide full-length neoprene astragals on

leading edge and non-vision wings of material and finish to match doors. There shall be no keyholes in the door unless required by governing authority. Corridor side of door panel material and finish as scheduled. Return finish a minimum of 1/2 inch around edges of door without binder angles.

- H. Tactile Markings: Provide raised Braille and alpha characters, numerals or symbols similar to those for car stations of size required by governing authority. Locate on each entrance jamb at 60 inches above floor indicating floor designation. Material and finish of plates shall have contrasting background and mounting means similar to those on car panels.

2.11 HYDRAULIC ELEVATOR EQUIPMENT:

A. Design Criteria:

1. Performance:

- a. Contract Speed: Maximum twenty percent (20%) speed variation under any loading condition in either direction.
- b. Motion Time: From start to stop of elevators motion as measured in both directions for a typical 12'-0" one floor run under any loading condition. Initiate movement of car within 1.5 second after make-up of hoistway door interlock.

1) 125 FPM: 9.1 seconds

c. Door Open Times:

1) 3'-6" Side Open: 2.3 seconds

- d. Door Close Times: Minimum, without exceeding kinetic energy and closing force, allowed by code.

- e. Door Dwell Times: Comply with A.D.A. formula and provide separate adjustable timers with initial minimum settings as follows:

1) Main Lobby Hall Call: 5.0 seconds

2) Upper Lobby Hall Call: 5.0 seconds

3) Car Call: 5.0 seconds

4) Interruption of Door Protective Device: Reduce dwell to 1 second after all ADA requirements have been met.

- f. Leveling: Within 3/8 inch under any loading condition. Level into floor at all times, do not overrun floor and level back.

- g. Hydraulic Pressure: Hydraulic components shall be factory tested for 600 PSI. Maximum operating pressure shall be 425 PSI.

- h. Operating Qualities: Owner's representative will judge riding qualities of cars and enforce the following requirements. Make all necessary adjustments.

- i. Starting and stopping shall be smooth and comfortable. Slowdown, stopping and leveling shall be without jars or bumps.

1) Vertical Acceleration: Maximum 1.54 ft. per second squared. Maximum jerk 3 ft. per second cubed.

2) Horizontal Acceleration: Maximum 10 mg peak-to-peak measured at full speed for full travel in both directions.

- j. Full Speed Riding: Free from vibration and sway.

2. Vibration and Sound Control: Manufacturer/Installer shall provide whatever means are needed to accomplish the following based on the designed structure for the project.

- a. Vibration: Elevator equipment shall be sound isolated from beams and building structure to prevent objectionable noise and vibration transmission to occupied building spaces. The vibration measured from the operation of an elevator shall be less than human perceptibility within any occupied living space, working space or space that is being used

by patrons of museums, libraries, theaters, etc. The vibration level shall be defined as indicated in ANSI S3.29 and shall be measured in only the vertical direction.

- b. Airborne Noise: Maximum acoustical output level. The sound level in any living space, working space or space that is being used by patrons of museums, libraries, theaters, etc. shall be 30 dBA or less. The measurement shall be performed on fast and shall be the Lmax over the duration of the operation.

B. Guide Rails:

1. Size: Standard steel tees with backs machined for splice plates. Extend rails full depth of pits. Do not bottom on pit floor. Minimum weight shall be 15 pounds per foot. Formed guide rails are not acceptable.
2. Installation: Drawings indicate basic hoistway framing and special supports for rail brackets. Guide rails and brackets at the point of attachment to building structure shall have zero deflection and all code deflection requirements are at the point of building structure. Guide rails shall be sized or reinforced to span a distance of 14'-0". The Elevator Contractor shall provide all additional supports and/or rail backing required. Install plumb within 1/16 inch. File joints smooth.

C. Guide Shoes:

1. Roller Guides: Passenger/Service Elevators. Roller type with rubber composition tires, minimum 3/4 inch wide and adjustable spring loaded to provide continuous contact with rail surfaces. Nominal roller diameters shall be 6 inches.
- 2.

D. Buffers: Spring or polyurethane pancake type mounted on cylinder support channels with required blocking and supports.

E. Car Frame and Platform:

1. Passenger Elevators: Manufacturer's standard steel members, steel frame with steel or double wood floor.
2. Service/Passenger Elevators: Freight type construction with heavy channels front and rear, metal stringers with steel or double layered wood floor. Design for Class A freight loading.

F. Top of car handrails:

1. Install top of car guard rail complying with OSHA specifications. Must be able to withstand a 200-pound load in any direction, must be 42" -45" high from floor to top of rail. Posts must not exceed 8-foot centers and must have a mid-rail. The mid-rail must be at least 1" x 6". The top rail and posts must be at least 2" x 4" and must have a 4" high toe board strong enough to stop tools and materials from sliding or rolling over the edge. The material must be good, not defective, and not have splinters. May use 1½" steel pipe or 2" x 2" x 3/8" angle for posts, top, and mid-rail. Other materials of equal or greater strength may be substituted. The guard rail design must have Professional Engineer certification.

G. Platen Isolation: Provide minimum 3/4-inch thick steel plates between top of plunger and car frame with one inch rubber or neoprene isolation material between.

H. Holeless Installation: Provide twin-post holeless type hydraulic elevators utilizing conventional single stage cylinder/plunger units on each side of elevator car adjacent to guide rails. Inverted or telescopic cylinder/plunger units will not be accepted.

I. Cylinder: Steel pipe, factory tested for 600-pounds/square inch working pressure. Sandblast or wire brush outside of cylinder to remove rust and scale. Paint with heavy coat of epoxy or mastic. Work shall be done in shop and repaired in field if coating is damaged.

J. Plunger: Use seamless steel pipe or tubing, minimum Schedule 80. Plunger shall be no more than 0.010 inch out of round and straight within 1/16 inch. Protect during shipping and installation to avoid damage. If plunger is gouged, scarred or shows visible tool marks, it shall be replaced. Finish shall

be 20 micro inches or finer. Plunger top shall be isolated from car frame. Plungers with follower guides are not acceptable.

- K. Packing: Provide packing, which inhibits leaking of oil with drip ring.
- L. Scavenger Pump: Provide electrically operated scavenger pump with storage reservoir and float activated or other automatic means to return oil to system. Provide 1/2 inch copper tubing for oil return line.
- M. Oil: Provide Chevron OC turbine oil or approved equal, 150 SSU at 100 degrees F. temperature
- N. Piping: Minimum Schedule 80 steel pipe suitable for 600 pounds pressure. No hoses shall be used in any part of piping.
 - 1. Provide sound isolating couplings in oil line between jack and pumping plant. Support piping using vibration isolating mounts or hangers with integral felt or neoprene at least 1/4 inch thick. Use threaded or welded joints throughout except at the connections to power unit and cylinder unit. Use no more than two Victaulic type connections in the machine room and two in the pit area.
 - 2. Overhead and Exposed Piping: Provide drip deflectors at pipe joints where pipes run above ceiling areas to prevent damage to these areas in case of joint leakage.
 - 3. Underground Piping: Protect with extruded high density polyethylene coating having a thickness of 25 to 60 mills applied with a minimum 8 mill thickness of modified rubber adhesive material all as manufactured by Plexco or equal. Install piping on three-inch bed of clean, dry sand and backfill with additional three inches of sand.
 - 4. Testing: Before enclosing pipe system, close ends, fill with fluid, establish 600 PSI pressure and allow standing for 24 hours. Make corrective repairs to leaks or pressure drop.
- O. Pit Valves: Provide in each elevator pit a gate valve to shut off oil between cylinder and pumping plant.
 - 1. Provide a pressure type line rupture safety valve to shut off oil between cylinder head and pit valve. Activation of safety valve shall not void operation of lowering valve.
- P. Pumping Plant:
 - 1. General: Self-contained unit with sound reducing cabinet and sound isolated base.
 - 2. Pump: Belt driven or submersible. Maximum speed 3600 RPM. Maximum pressure 425 pounds per square inch.
 - 3. Tank: Capacity equal to plunger displacement plus 25%. Provide strainers, oil level sight gauge and device to maintain uniform oil temperature.
 - 4. Valves: Integral type. Provide conveniently located manual lowering valve accessible without removing pumping plant enclosure panels.
 - 5. Motor: Maximum speed 1800 RPM for belt driven and 3600 RPM for submersible. Provide minimum 120 start heavy-duty motor, continuous rated, 50 degrees C. temperature rise, Class A insulation or 70 degrees C. rise for Class B insulation.
 - 6. Controller: Integral, floor or wall mounted as applicable to space conditions. Include door-operating relays combined with controller. Provide SCR solid-state soft start starting. Provide three (3) manual reset overload relays, one in each line and reverse phase relay. Provide externally mounted permanently identified interface junction boxes on controller cabinets for termination of communication circuits.
 - 7. Muffler: Blowout proof type between pumping plant and cylinder.
 - 8. Tanks located in the pit are not permitted.
- Q. Oil Cooling System: Provide manufacturers standard oil cooling system.
- R. Hydraulic Elevator Protective Circuit: In the event the car should stall due to low oil in the system or, if for other cause the car fails to reach the top landing within a predetermined time while traveling "up", a special circuit shall be provided which shall automatically return the car to the bottom landing

and open the doors for 10 seconds after which the elevator will close doors and completely shut down. Recycling the mainline switch shall restore Service.

- S. Hydraulic Elevator Battery Emergency Lowering Operation: Provide a battery driven unit which will initiate operation of the Protective Circuit and lower elevator to bottom landing in the event of a power failure. Service shall be restored automatically upon restoration of normal power supply. Arrange with an exposed method of testing. Arrange circuitry so that, if the mainline switch is open when the power transfer takes place, the elevator will not respond to the operation of the protective circuit. Provide a double pole-isolating switch on the battery unit to disconnect the battery output.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Bidding Documents: Bidders shall examine architectural, structural, electrical and mechanical plans and specifications. Any discrepancies which affect the elevator work or conditions adverse to the bidder's equipment shall be brought to Owner's Representative's attention at least seven (7) days prior to the bid date. If no discrepancies are presented, changes required to accommodate bidder's equipment become the responsibility and cost of the Elevator Contractor.

3.2 PREPARATION:

- A. Field Measurements: Field-verify dimensions before proceeding with the work. Coordinate related work by other trades. Verify the following to be acceptable for installation of elevators.
- B. Hoistway has been correctly sized and otherwise properly prepared.
 - 1. Equipment supports are satisfactory.
 - 2. Electrical rough-ins are correct.
 - 3. Do not begin installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION:

- A. General: Install per manufacturer's requirements, those of regulatory agencies and as specified.
- B. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustments, inspection, maintenance and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturer.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe workable dimensions at each landing.
- F. Erect guide rails plumb and parallel with maximum deviation of 1/16 inch. Anchorage of guide rails shall not compromise waterproofing. Do not bottom rails on pit floor.
- G. Graphics: Provide graphics visible to public as selected by Owner's Representative.
- H. Manufacturer's Nameplates: Manufacturer's nameplates, trademarks or logos not permitted on surfaces visible to public.
- I. Painting of machine room floor and pit floors:
 - 1. After the completion of the entire installation, the floor and walls of each machine room and pit areas shall be thoroughly cleaned down and brush painted with one coat of traffic paint having oil resistant properties. Pit floors shall be painted after the completion of the waterproofing. Owner's Representative will advise the color.

2. Painting shall be performed either during normal working hours or after hours at no additional cost to the Owner.

3.4 TEMPORARY ELEVATOR USE DURING CONSTRUCTION:

- A. General: Should the General Contractor require the use of any elevator during construction, Contractor shall make arrangements directly with the Elevator Contractor, coordinate temporary facilities and pay all costs associated with the protection, operation and use of elevators.
- B. Maintenance: Elevators shall be maintained on a regular basis during the temporary construction use. A minimum of two hours per week per elevator shall be spent on examination, lubrication, adjusting and cleaning the elevator equipment.
- C. Damage: The Owner is entitled to receive new elevator equipment upon final acceptance of the entire project. The Owner's representative will thoroughly examine all elevator equipment upon completion of temporary use and provide a punch-list outlining items that must be repaired or replaced to ensure the equipment is in new condition. Final acceptance and payment will not be made until all items have been satisfactorily completed.
- D. Schedule: Sufficient time must be allowed to prepare and adjust temporary elevators so that the entire elevator installation is ready for final acceptance.

3.5 TEMPORARY ACCEPTANCE AND USE BY OWNER:

- A. When an elevator is near completion and declared ready for service, before completion of other elevators, Owner agrees to accept elevator and place it into automatic service.
- B. The elevator must be tested and inspected by regulatory agencies and a permit to operate issued.
- C. A walk-through examination will be performed in the presence of Owner's Representative, General Contractor and Elevator Contractor to determine present condition of elevator.
- D. The Owner agrees to sign or cause the General Contractor to sign a temporary acceptance form that is mutually agreeable to all parties.
- E. During this temporary acceptance period, the Owner agrees to pay or cause the General Contractor to pay an agreed amount per day per elevator for regular maintenance. The cost for this maintenance per elevator, per day, shall be stated in the Elevator Contractor's bid.
- F. The guarantee and full maintenance period will be effective upon final acceptance of the entire installation.

3.6 FIELD QUALITY CONTROL:

- A. Regulatory Agencies Inspection: Upon completion of elevators, Contractor shall provide instruments, weights and personnel to conduct test required by regulatory agencies. The Contractor shall submit a complete report describing the results of the tests.
- B. Examination and Testing: When installation is ready for final acceptance, notify and assist Owner's Representative in making a walk-through review of entire installation to assure workmanship and equipment complies with contract documents. Provide equipment to perform the following tests:
- C. One-hour heat and run test with full load in car.
 1. Perform for one car of each duty.
 - a. Stop car at each floor in each direction.
 - b. Provide well-shielded thermometers for motor and verify that temperatures do not exceed 50 degrees Centigrade above ambient. Infrared Temperature thermometers are acceptable.
 - c. Performance and leveling tests shall be made before and after heat and run test.
 - d. Check and verify operation of all safety features and special operations.
 2. Demonstrate and verify to the Owner's Representative the following:

- a. Measure horizontal acceleration for a full speed, full rise up and down run.
 - b. Measure acoustical output levels in machine room, lobbies and cars for a full speed, full rise up and down run.
 - D. Correction: Make corrections to defects or discrepancies at no cost to Owner. Should discrepancies be such that re-examination and retesting is required, the Elevator Contractor shall pay for all costs including those of Owner's representative fees.
 - E. Final Acceptance: Final acceptance of the installation will be made only after all corrections are complete, final submittals and certificates received and the Owner is satisfied and the installation is complete in all respects. Final payment will not be made until the above is completed.
 - F. Instructions: Instruct Owner's personnel in proper use of each system during a minimum of one hour training session on the proper use of each system. This training session will be conducted onsite at the owner's convenience.
- 3.7 MAINTENANCE:
- A. General: Provide complete continuing maintenance on entire elevator equipment during regular working hours on regular working days for a period of 12 months after filing Notice of Completion.
 - B. Examination: Include systematic examination, adjustment, and lubrication of elevator equipment whenever required and replacement of defective parts with parts of same manufacture as required for proper operation. Contractor not responsible for repairs to car enclosures, door panels, frames, sills or platform flooring resulting from normal usage or misuse, accidents and negligence for which Contractor is not responsible. Examinations shall be performed expending a minimum of the following per unit per visit performing preventative maintenance service.
 - 1. Hydraulic Elevators: 1 hour per unit per month.
 - C. Performance Standards:
 - 1. Maintain the performance standard set forth in this specification and maintain correct operation of the dispatching system.
 - 2. Maintain smooth starting and stopping, smooth riding qualities and accurate leveling at all times.
 - D. Callbacks: In event of failures, provide 24-hour callback service at no additional cost to Owner.
 - E. Elevator Shutdowns: Should any elevator become inoperative, repair within 24 hours of notification of such failure. Breakdown of major components shall be completed and service restored within 72 hours.
 - 1. Failure to comply with above, Owner may order the work done by other contractors at the Contractor's expense.
 - 2. Devices repaired or replaced by others shall, nevertheless, be provided with maintenance by the Contractor who shall become completely responsible for correct operation of such devices for lifetime of this contract.
 - F. Maintenance Materials:
 - 1. Expendable Parts: The Elevator Contractor shall provide in the technicians service vehicle at least one machine room on project premises containing the following expendable parts required for prompt replacement. Parts used for routine maintenance shall be replenished and stored in machine room to ensure an adequate supply is available.
 - a. Two field replaceable resistors of each type installed.
 - b. One set hanger sheaves for car and hoistway doors.
 - c. Two relays and relay bases of each type installed.
 - d. Twelve lamps of each type installed.
 - e. Car and hall buttons with identical graphics installed; two for manufacturer's standard buttons, one of each type for special buttons.
 - f. Six fuses of each type installed.

- g. Any other parts required for prompt replacement.
 - h. Lubricants and cleaners of all types used for maintenance.
2. Replacement Parts: Keep the following parts in a warehouse within 50 miles of the project premises.
- a. One door operator motor of each type used.
 - b. Transformers of each type installed.
 - c. Two complete door interlocks.
 - d. One complete motor starter of each size installed.
 - e. Parts for door protective devices.
 - f. One set of packing for each size cylinder.
 - g. Such other parts as are needed to insure prompt replacement in event of elevator shutdown such as spare control boards for computer-operated systems.
- G. Maintenance Data: After completion and prior to final acceptance, submit three sets of complete and accurate maintenance data specific for each elevator. Final payment will not be made until received.
- H. Maintenance Manuals: Describe proper use and maintenance of equipment, lubrication points, types of lubricants used and frequency of lubricant application, manufacturer's literature describing system maintenance and troubleshooting as specified.
- 1. Owner's Manuals: Describe operation of each feature, i.e. Independent Service, Security Operation, Guard Station Equipment, etc...that is specifically used by the owner or end user. Include details of what to do and what not to do with the elevator equipment In Case of Emergency, Seismic, Fire, Evacuation etc....,
 - 2. Parts Catalogs: Complete listing of all parts of equipment and components used in the installation.
 - 3. Wiring Diagrams: One set mounted in machine room and one electronic version on CD or thumb drive delivered to Owner. Wiring diagrams shall be as built, specific for this installation, and reference identification on drawings shall match points identified on terminals of controllers.
 - 4. Maintenance Tool and Software Manuals: Provide maintenance tools and supporting software documentation required for the complete maintenance of the entire system including diagnostics and adjusting. Maintenance tool may be hand held or built into control system and shall be of the type not requiring recharging or reprogramming nor of the automatic destruct type. The tool and supporting software may be programmed to operate only with this project's identification serial numbering. If control system is of the type that the software is field up loadable, both a copy of the control software and the parameters shall be clearly marked and submitted to the owner on CD.
- I. Quotation: Base bid shall include cost of maintenance and materials as described above.

END OF SECTION

Office Passenger Elevator		
1	Designation	PE1
2	Number of Elevators	One(1) Passenger Elevator
3	Operation	Simplex
4	Type	Holeless Hydraulic
5	Contract Speed	125 fpm; 0.64 m/s;
6	Rated Capacity	3500 lbs; 1588 kg;
7	Class of Loading	Class A
8	Hoistway Size (W x D)	8' - 8" W x 7' - 0" D;
		2642 mm W x 2134 mm D;
9	Levels Served	Refer to Vertical Layout herein
10	Door Type	Side Opening
11	Door Size	3' - 6" W x 7' - 0" H; 1067 mm W x 2134 mm H
12	Door Rough Opening	5' - 0" W x 7' - 10" H; 1524 mm W x 2388 mm H
13	Clear Cab Size	6' - 8" W x 5' - 5" D x 7' - 6" H;
		2032 mm x 1651 mm x 2286 mm;
14	Entrances	Front Opening Only
15	Minimum Floor Height	8' - 6"; 2591 mm
16	Vertical Clearance	* Note 1: Measured from the highest level served to the underside of the top of hoistway
17	Pit Depth	5' - 0"; 1524 mm
18	Pit Access	Pit ladder at lowest level served.
19	Machine Room	
	Room Location	Located adjacent to hoistway at Lowest Level
	(W x D x H)	8' - 0" W x 7' - 0" D x 7' - 6" H (minimum)
		2438 mm W x 2134 mm D x 2286 mm H (minimum)
20	Vibration Isolation	Yes
21	Stretcher Accessible	Yes

22	Firefighters Emergency Oper'n	Yes Phase 1 & Phase 2			
23	Fire Service Access Elevator	No			
24	Battery Lowering Operation	Yes			
25	Security	Yes One (1) in-car card reader per operating panel, recess mounted			
		One (1) in-car security camera			
26	Cab Finishes	To be selected by Architect from standard OEM finishes			
27	Cab Light Dimming	Yes			
28	Construction Use	No			
29	LCD Monitor	No			
30	Entrance Frame/Door Panel	Type	Standard		
		Finish	Brushed stainless steel #4 on Main Floor		
			Prime coat at all other levels		
31	Hall Pushbuttons	Qty	One (1) hall station per floor		
		Finish	Brushed stainless steel #4		
32	Sill Finish	Hall Sill	Finish: Aluminum		
		Car Sill	Finish: Aluminum		
33	Lanterns	Qty/Type	Two (2) in-car lanterns per elevator entrance		
		Finish	Brushed stainless steel #4		
34	Position Indicators	Qty/Type	One (1) in-car per COP One (1) per entrance on Main Floor		
		Finish	Brushed stainless steel #4		
35	Car Operating Panel	Qty	One (1) per elevator		
		Type	Illuminated vandal-resistant mechanical buttons, complying with applicable CBC and accessibility requirements		
		Size	Minimum 1 in diameter		
		Projection	Raised 1/8 in from surrounding surface with square shoulders		
		Finish	Brushed stainless steel #4		
36	Car Call Buttons Illumination	Primary	To be selected by Architect from OEM selection		
		Secondary	To be selected by Architect from OEM selection		
37	Emergency Communication	Hands-Free (Voice only)			
38	Weather Resistance	Not required			
39	Heat Exchanger Required	Yes			
40	Power Supply	480 V / 3 Phase			
41	Motor Size (Est.)	40 hp; 30 kW			
42	Pit Loads (Est. Per Elevator)	Car Buffer			
		24600 lbs; 109 kN			
43	Machine Room Heat Load (Est.)	22000 BTU/h; 6 kW			
44	Performance Times	Door Open	Door Close	Flight Time	Floor Height Basis
		2.7 s	3.9 s	19.7 s	13 ' - 6 " ; 4115 mm
45	Maximum Acceleration	4.92 ft/s²; 1.50 m/s²;			
46	Maximum Jerk	6.56 ft/s³; 2.00 m/s³;			

Group / Bldg	Office Passenger Elevator
Designation	PE1
Entrance	Front
	Overhead
2	■ (AL)
1	■ (DL) (MR)
	Pit

Notes: DL = Designated recall level for Firefighters' Emergency Operation
AL = Alternate recall level for Firefighters' Emergency Operation
MR = Machine Room Location

GENERAL REQUIREMENTS FOR ELEVATORS

THE FOLLOWING ITEMS MUST BE PERFORMED OR PROVIDED AT NO COST TO ELEVATOR CONTRACTOR BY THE OWNER OR GENERAL CONTRACTOR OR THEIR AGENTS IN ACCORDANCE WITH GOVERNING CODES. THE PRICE AND INSTALLATION SCHEDULE OF ELEVATOR CONTRACTOR IS BASED ON THESE JOB-SITE CONDITIONS EXISTING AT THE BEGINNING AND DURING THE INSTALLATION OF THE ELEVATOR EQUIPMENT. ALL WORK MUST BE PERFORMED PER THE APPLICABLE NATIONAL AND OR LOCAL CODES.

ARCHITECTURAL REQUIREMENTS

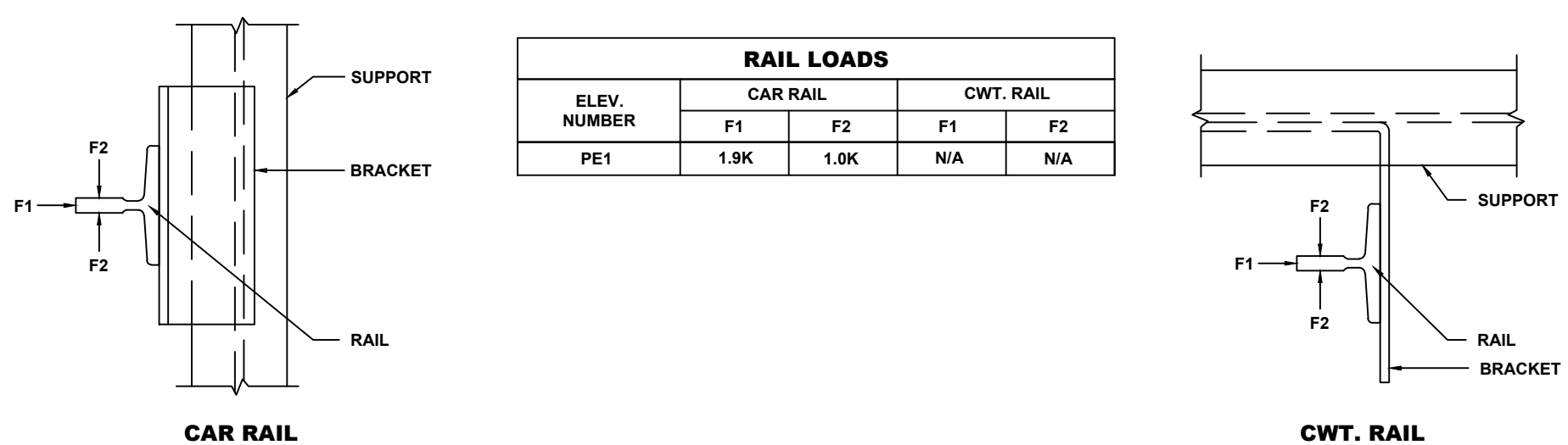
- BEFORE. PROVIDE CLEAR PUNCH HOSTWAYS WITH VARIATIONS NOT EXCEEDING ONE (1) FOR FULL HEIGHT, FIRE RATED CONSTRUCTION PER GOVERNING CODES. RECOMMEND THAT INSIDE HOSTWAY WALLS BE FLUSH, WITHOUT PROJECTIONS. AT SIDE AND REAR WALLS AND AT FRONT WALLS WHERE ENTRANCES DO NOT OCCUR.
1. **PROJECTIONS:** BEAMS, FLOOR SLABS OR OTHER BUILDING CONSTRUCTION SHALL NOT PROJECT MORE THAN TWO INCHES INSIDE THE GENERAL LINE OF THE HOSTWAY UNLESS THE TOP SURFACE OF PROJECTION IS KEPT AT AN ANGLE OF NOT LESS THAN 72° WITH THE WALL.
2. **SMOKE DETECTORS IN HOSTWAYS:** (CALIFORNIA ONLY) SMOKE DETECTORS INSTALLED IN ELEVATOR HOSTWAYS SHALL BE ACCESSIBLE FOR SERVICING FROM OUTSIDE OF HOSTWAY.
3. **SCREENS BETWEEN HOSTWAYS:** (CALIFORNIA ONLY SIDE CWT): WHEN TWO OR MORE ELEVATORS ARE INSTALLED WITHIN THE SAME HOSTWAY AND ONE OF THE ELEVATORS HAS A SIDE COUNTERWEIGHT ADJACENT TO THE OTHER ELEVATOR THEY SHALL BE FULLY SEPARATED BY A MATERIAL COMPLYING WITH THE FOLLOWING:
- a. WHERE UNPERFORATED STEEL IS USED, IT SHALL BE EQUAL TO OR STRONGER THAN 0.0437" THICK STEEL.
 - b. WHERE WIRE SCREEN OR PERFORATED STEEL IS USED IT SHALL BE EQUAL, TO OR STRONGER THAN 0.0915 INCH DIAMETER METAL GRILL.
 - c. THE MATERIAL SHALL REJECT A BALL 1" IN DIAMETER.
 - d. BE SO SUPPORTED AND BRACED THAT WHEN SUBJECTED TO A PRESSURE OF 100 LB/SF APPLIED HORIZONTALLY AT ANY POINT, THE DEFLECTION SHALL NOT EXCEED 1".
4. **EXPRESS ZONES:** WHERE EXPRESS ZONES OCCUR WITH LOW AND HIGH RISE GROUPS OR WITH ELEVATORS HAVING REAR OPENINGS, THE HOSTWAY WALL, WITHIN THE EXPRESS ZONE (WHERE THE EXPRESS ZONE IS NOT KEPT AT AN ANGLE OF NOT LESS THAN 72° WITH THE WALL) SHALL BE TURNED OUT TO ELIMINATE THE NEED FOR TURNING OUT THE WALL, OR HAVING THE ELEVATOR CONTRACTOR PROVIDE METAL FASCIA THE FULL HEIGHT OF EXPRESS ZONE. THE BEAM POCKET BELOW THE FLOOR SLAB MUST ALSO BE FLUSH WITH THE INSIDE LINE OF THE HOSTWAY WALL, WHEN THE EXPRESS ZONE IS NOT KEPT AT AN ANGLE OF NOT LESS THAN 72° WITH THE WALL.
5. **HOSTWAY EMERGENCY ACCESS DOORS IN BUILD HOSTWAYS:** (NOT IN CALIFORNIA) WHERE A SINGLE ELEVATOR IS INSTALLED IN A SINGLE HOSTWAY WITH EXPRESS ZONES, PROVIDE A HOSTWAY EMERGENCY ACCESS DOOR IN THE BUILD PORTION OF THE HOSTWAY EVERY THIRD FLOOR BUT NOT MORE THAN 38" FROM THE SILL. THE DOOR SHALL BE FIRE RATED TO MEET THE HOSTWAY RATING, BE A MINIMUM OF 2'-4" WIDE X 6'-0" HIGH AND HAVE SELF CLOSING AND SELF LOCKING HARDWARE. THE DOOR SHALL BE UNLOCKED FROM THE LANDING SIDE ONLY THROUGH THE USE OF A KEY OR THE LOCK KEY. THE LOCK KEY SHALL BE KEPT IN THE HOSTWAY LOBBY OR LOBBY COINER WHEN IN LOCKED POSITION ONLY AND THE KEY SHALL NOT BE USED FOR ANY OTHER PURPOSE IN THE BUILD. PROVIDE A SIGN ON THE DOOR N-2" HIGH WITH LARGE LETTERS "DANGER, ELEVATOR HARDWARE". A HINGED BARRIER INDEPENDENT OF THE DOOR SHALL BE INSTALLED HORIZONTALLY TO THE DOOR ENTRANCE.
6. **FLUSH CONSTRUCTION:** (IF A SINGLE ELEVATOR IN A HOSTWAY OVER SIZE HOSTWAY FOR AIR MOVEMENT, NO SINGLE CAR IN 700 FPM OR OVER UNLESS YOU CAN GET GENEROUS HOSTWAY SPACE OF 1'-6" ON EACH SIDE AND REAR OF CAR FROM STANDARD DIMENSIONS, THE FASTER THE MORE SPACE) FOR HIGH-SPEED ELEVATOR INSTALLATION (OVER 700 FPM) IT IS STRONGLY RECOMMENDED THAT THE HOSTWAYS BE CONSTRUCTED WITH FLUSH SURFACES MINIMIZING ANY PROJECTIONS, RECESSES OR POCKETS TO ENHANCE THE QUALITY OF THE ELEVATOR RIDE.
7. **GLASS ENCLOSED HOSTWAYS:** GLASS IN HOSTWAYS MUST BE LAMINATED SAFETY GLASS MEETING ANSI Z97.1 REQUIREMENTS. EACH PIECE OF GLASS REQUIRING GLAZING SHOULD LOGICALLY INDICATE THAT IT COMPLIES WITH THE ANSI Z97.1 REQUIREMENT FOR LAMINATED SAFETY GLASS AND THAT THE LOGO BE VISIBLE FROM INSIDE THE ELEVATOR HOSTWAY. THE ELEVATED GLASS SHALL NOT PROJECT INTO HOSTWAY MORE THAN 3" FROM INSIDE FACE OF GLASS. SHOULD MOLDS OR LEDGES PROJECT MORE THAN 2" FROM FACE OF GLASS, THE TOP SURFACE OF THE LEDGE MUST BE FLUSH WITH THE FACE OF THE GLASS.
8. **EXTERIOR ENVIRONMENTS:** WHERE ELEVATOR ENTRANCES OCCUR ON EXTERIOR SPACES, PROVIDE AN ENCLOSED ELEVATOR LOBBY WITH CONTROLLED AIR OR AN EXTENDED CANOPY OVER THE ENTRANCE TO EXTERIOR PROTECTION FROM DIRECT AND IN-DIRECT SUN EXPOSURE, BLOWING RAIN AND SLOPE EACH LANDING AWAY FROM ENTRANCE TO PREVENT OCCASIONAL WATER FLOW FROM THE ELEVATOR ENTRANCE.
9. **MACHINE ROOM / CONTROLLER ROOM:** PROVIDE 2 HOUR FIRE RATED CONSTRUCTION PER GOVERNING CODE WITH A MINIMUM 7/8" TO 9/8" CLEAR HEADROOM. RECOMMEND THAT EXPOSED FIREPROOFING BE TREATED TO PREVENT FLAKING AND CONTAMINATION OF ELEVATOR ELECTRICAL COMPONENTS.
10. **ARRANGEMENT:** THE MACHINE ROOM FOR THE ELEVATOR EQUIPMENT SHALL BE ARRANGED SO THAT PASSAGE THROUGH THE MACHINE ROOM IS NOT NECESSARY TO GAIN ACCESS TO OTHER EQUIPMENT OR OTHER PARTS OF THE BUILDING, OR FOR THE REMOVAL OF NON-ELEVATOR RELATED EQUIPMENT THROUGH THE ELEVATOR MACHINE ROOM.
11. **SOUND CONTROL:** OBTAIN RECOMMENDATIONS FROM ACOUSTIC CONSULTANT. WHERE EQUIPMENT ROOMS ARE ADJACENT TO TENANT OR PUBLIC SPACES SPECIAL ATTENTION SHOULD BE GIVEN TO SOUND CONTROL OF THE ROOM. AS A MINIMUM, WITH DRYWALL CONSTRUCTION INCLUDE ACoustic INSULATION IN WALLS. FOR HYDRAULIC ELEVATOR EQUIPMENT ROOMS, IN ADDITION TO ACOUSTIC WALL CONSTRUCTION, IT IS RECOMMENDED SOUND BOARD BE INSTALLED ON ALL WALLS.
12. **ACCESS TO MACHINE ROOMS / CONTROLLER ROOMS:** A SAFE AND CONVENIENT MEANS OF ACCESS SHALL BE PROVIDED TO MACHINE ROOMS. WHERE MACHINE ROOMS ARE LOCATED ON THE LOBBY, THE ACCESS SHALL BE 2'-0" WIDE MINIMUM AND ADOPTED TO LUMINOUSLY ILLUMINATED. WHERE MACHINE ROOMS ARE LOCATED ON THE ROOF, A STAIR OR 8'-0" SHIPS LADDER SHALL BE PROVIDED FOR ACCESS DOW TO THE DECK OF THE MACHINE ROOM.
13. **MACHINE ROOM / CONTROLLER ROOM ACCESS DOORS:** PROVIDE ACCESS DOOR 3'-6" WIDE X 7'-0" HIGH, SELF-CLOSING, SELF-LOCKING AND OPENABLE FROM INSIDE WITHOUT A KEY.
14. **FOREIGN EQUIPMENT:** DO NOT LOCATE ANY PIPES, CONDUITS, DUCTS OR OTHER EQUIPMENT IN MACHINE ROOM THAT IS NOT NECESSARY FOR THE PROPER OPERATION OF ELEVATOR EQUIPMENT.
15. **FIRE EXTINGUISHER:** PROVIDE ABC TYPE FIRE EXTINGUISHER IN EACH ELEVATOR MACHINE ROOM.
16. **HOSTING BEAM:** PROVIDE HOSTING BEAM AT TOP OF HOSTWAY OR AT CEILING OF MACHINE ROOM OVER ELEVATOR HOSTWAY. COORDINATE WITH THE ELEVATOR MANUFACTURER FOR THE STRUCTURAL REQUIREMENTS OF THE HOSTING BEAM. THIS BEAM CAN BE TEMPORARY AND REMOVED AT THE END OF CONSTRUCTION IF ADDITIONAL SPACE IS REQUIRED TO MEET CODES REQUIRED OVERHEAD CLEARANCES WITHIN HOSTWAY.
17. **MACHINE ROOM/CONTROLLER ROOM:** PROVIDE NATURAL OR MECHANICAL MEANS TO MEET THE AMBIENT TEMPERATURE MAINTAINED BETWEEN 55° AND 90° WITH AN ACCEPTABLE LEVEL OF HUMIDITY OF 50% OR LESS.
18. **BLOCK-OUTS AND CHASIS:** PROVIDE, AS REQUIRED BY ELEVATOR CONTRACTOR, FOR SIGNAL FIXTURES, CONDUITS, PIPE RUNS AND OTHER ELEVATOR EQUIPMENT.
19. **PITS:**
- a. ACCESS LADDERS FROM LOWEST ELEVATOR LANDING LOBBY DECK: PROVIDE A STEEL LADDER, CONSTRUCTED OF PIT FLOOR TO 4'-0" ABOVE LOWEST LANDING. MINIMUM SIXTEEN INCHES WIDE WITH RUNGS 12" OC AND A MINIMUM (ASME) 1/2" TPOE SPACE (CALIFORNIA) 7/8" TPOE SPACE. WHERE PITS ARE DEEPER THAN 13'-9" AND NO ACCESS IS PROVIDED FROM A FLOOR BELOW THE LOWEST LANDING OF PIT ACCESS, INTERMEDIATE FLOORING SHALL BE PROVIDED CONSISTING OF GRATING OR STEEL PLATE WITH AN ACCESS DOOR AND ADDITIONAL LADDER TO GAIN ACCESS TO THE LOWEST LEVEL OF THE PIT.
 - b. GUARDS BETWEEN ADJACENT PITS: CALIFORNIA ONLY: SCREEN ENCLOSED, MINIMUM 6'-0" HIGH FROM PIT FLOOR WITH OPENINGS SIZE TO REJECT A 2" DIAMETER BALL.
 - c. LADDER GUARDS BETWEEN ADJACENT PITS: CALIFORNIA ONLY: WHERE ACCESS LADDERS ARE LOCATED AT SCREEN ENCLOSED BETWEEN ADJACENT PITS, EXTEND ENCLOSED 6'-0" ABOVE TOP TPOE OF LADDER AND 12" EACH SIDE OF SIDE RAILS OF LADDER.
 - d. DEEP WALK IN PITS: ACCESS LADDERS ARE PERMITTED WHEN THE PIT FLOOR IS MORE THAN 10'-0" IN DEPTH FROM THE SILL OF THE ACCESS DOOR, EXCEPT WHERE THERE IS NO BUILDING FLOOR BELOW THE PIT. IN THIS SITUATION THE DEPTH OF THE PIT SHALL BE GREATER BUT NOT MORE THAN 10'-0" FOR WALK IN PITS AT PIT LEVEL. PROVIDE FIRE RATED ACCESS DOORS WITH VISION PANEL, SIZE TO REJECT A BALL 6" IN DIAMETER THE DOOR SHALL PROVIDE AN OPENING THAT IS A MINIMUM 30" WIDE X 72" HIGH, BE OF SELF-CLOSING, SELF-LOCKING AND OPENABLE FROM INSIDE, PIT WITHOUT A KEY. WHERE THE PIT FLOOR IS 12" OR MORE BELOW THE SILL OF THE ACCESS DOOR, A HINGED BARRIER INDEPENDENT OF THE DOOR SHALL BE INSTALLED TO THE DOOR ENTRANCE.

STRUCTURAL REQUIREMENTS

1. **SIZE:** PROVIDE A DRY PIT OF SIZE AND DEPTH SHOWN.
2. **REINFORCEMENT:** REINFORCE PIT FLOOR TO TAKE ALL LOADS INDICATED.
3. **SUMP PIT:** COORDINATE WITH MECHANICAL ENGINEER AND PROVIDE SUMP PIT 2" \times SQUARE EXTENDING 2'-0" DEEP BELOW PIT FLOOR AS SHOWN. PROVIDE REMOVABLE GRATING OR COVER FLUSH WITH PIT FLOOR.
4. **COMPENSATION TIE-DOWN BEAMS:** PROVIDE TIE-DOWN BEAMS IN PIT TOP OF SHOWS. BEAMS SHALL HAVE A MINIMUM TOP FLANGE WIDTH OF 6" AND PROJECT A MINIMUM OF FOUR INCHES ABOVE PIT FLOOR. SIZE BEAMS AND REINFORCEMENT INTO SLAB TO TAKE UP-PULL FORCES INDICATED. FINAL LOCATION OF BEAMS TO BE DETERMINED BY AND COORDINATED WITH ELEVATOR CONTRACTOR.
5. **HYDRAULIC ELEVATORS WITH IN GROUND CYLINDERS:** PROVIDE 30" SQUARE BLOCK-OUT IN PIT FLOOR FOR ACCESS TO EXCAVATE HYDRAULIC CYLINDER WELL. REMOVE SPOILS AFTER DRILLING IS COMPLETE. PROVIDE CONCRETE FILL AT PIT FLOOR BLOCK-OUT AFTER ELEVATOR CYLINDER IS INSTALLED. MAINTAIN WATERPROOFING INTEGRITY.
6. **HOISTWAY FRAMING:**
1. **CLEARANCES:** STEEL BEAMS WITH PIERFLOORING AND FLOOR SLABS SHALL NOT PROJECT INTO CLEAR HOISTWAY DIMENSION AS SHOWN. CLEAR HOISTWAY DIMENSION MUST BE MAINTAINED THE FULL HEIGHT OF THE HOISTWAY.
2. **GUIDE RAIL SUPPORTS:** PROVIDE STRUCTURAL SUPPORTS AT SIDES AND REAR OF ELEVATORS AND DIVIDER SUPPORTS BETWEEN ELEVATORS AT A MAXIMUM VERTICAL SPACING NOT TO EXCEED (FOR PASSENGER & SERVICE) 14'-0" (FOR FREIGHT) 6'-0". ALTERNATELY, CONTINUOUS VERTICAL SUPPORTS BEHIND EACH GUIDE RAIL MAY BE PROVIDED. FOR RAIL FORCES ACTING ON THESE SUPPORTS, REFER TO "RAIL FORCES AND LOADING".
3. **SILL SUPPORTS:** SUPPORT FULL WIDTH OF HOISTWAY AT EDGE OF SLAB FOR ATTACHMENT OF SILL SUPPORT ANGLES BY ELEVATOR CONTRACTOR. FOR COMPOSITE SLAB, PROVIDE ANGLE FLASHING AT EDGE OF CLEAR HOISTWAY.
4. **ROUGH OPENING:** FOR ENTRANCES INSTALLED IN CONCRETE WALLS, PROVIDE A 6" ROUGH OPENING ON EACH SIDE AND AT TOP OF CLEAR OPENING. COORDINATE WITH ELEVATOR MANUFACTURER FOR ANY SPECIAL ROUGH OPENING REQUIREMENTS.
- C. **MACHINE ROOM:**
1. **FLOORHEAD MACHINE SUPPORT FOR OVERHEAD MACHINE OR MACHINE SPACE:** PROVIDE STRUCTURAL SUPPORTS TO TAKE MACHINE WEIGHT, IMPACT AND STATIC LOADS AS INDICATED. SUPPORTS ARE NOT TO DEFLECT MORE THAN 1/1660" OF THE SUPPORT SPAN BASED ON STATIC LOADS.
2. **FLOOR:** PROVIDE CONCRETE FLOOR SLABS, REINFORCED TO TAKE DEAD LOADS OF EQUIPMENT SHOWN, A CONCENTRATED LOAD OF 300 LBS ON ANY FOUR SQUARE INCHES AND A LIVE LOAD OF NOT LESS THAN 125 LBS PER SQUARE FOOT. MACHINE ROOM FLOOR SHALL BE ABOVE OR FLUSH WITH THE TOP OF ELEVATOR MACHINE BEAMS. CONFIRM WITH ELEVATOR CONTRACTOR.
3. **MACHINE-BELOW OR ADJACENT ARRANGEMENT:** PROVIDE A CONCRETE FOUNDATION OR STRUCTURAL BEAMS AS SHOWN ON SKETCHES TO RESIST UP-PULL LOAD INDICATED. FOUNDATION TO BE MONOLITHICALLY POURED AND TIED WITH REINFORCING RODS. POURING TO BE DONE AFTER MACHINE FOUNDATION BOLTS ARE IN PLACE BY ELEVATOR CONTRACTOR.
4. **OVERHEADLY SUPPORTS:** PROVIDE STRUCTURAL SUPPORTS TO TAKE OVERHEAD SHEAVE/DEAD END HITCH BEAM REACTION, IMPACT AND STATIC LOADS AS INDICATED. SUPPORTS ARE NOT TO DEFLECT MORE THAN 1/1660" OF THE SUPPORT SPAN BASED ON STATIC LOADS. TOP OF SUPPORTS SHALL BE AS INDICATED. CONFIRM WITH ELEVATOR CONTRACTOR.
5. **HYDRAULIC ELEVATOR PIPE TRENCH:** PROVIDE 2'-0" \times 6" DEEP TRENCH BETWEEN MACHINE ROOM TO ELEVATOR HOISTWAY FOR HYDRAULIC PIPING. BACK-FILL TRENCH AFTER PIPING HAS BEEN INSTALLED. PIPING SHALL NOT CROSSOVER A SECOND JOINT.

RAIL FORCES AND LOADING

THE FOLLOWING RAIL FORCES ARE BASED ON:
SEISMIC LOADING: MAXIMUM RAIL BRACKET SUPPORT DEFLECTION CANNOT EXCEED 1/4" UNDER SEISMIC LOAD AND INDICATED IN KIIPS
NORMAL LOADING: MAXIMUM RAIL BRACKET SUPPORT DEFLECTION CANNOT EXCEED 1/8" UNDER NORMAL LOAD AND INDICATED IN POUND



ELECTRICAL REQUIREMENTS

- POWER CIRCUIT / CONTROLLER ROOM**
1. **POWER CIRCUITS:** DEDICATED THREE-PHASE POWER FEEDERS THROUGH INDIVIDUALLY LOCKABLE FUSED MAINLINE DISCONNECT SWITCH OR CIRCUIT BREAKER FOR EACH ELEVATOR WITH FEEDERS EXTENDED TO CONTROLLERS. SIZE FEEDERS TO LIMIT VOLTAGE DROP TO LESS THAN 5%. USE COPPER CONDUCTORS ONLY. PROVIDE CONTINUOUS SYSTEM GROUND CONDUCTION.
2. **HYDRAULIC ELEVATOR BATTERY LOWERING UNIT PROVISIONS:** PROVIDE (2) FORM "C" AUXILIARY CONTACTS INTEGRAL DESIGNED WITH THE THREE-PHASE DISCONNECT SWITCH TO SIGNAL THE BATTERY-LOWERING UNIT. PROVIDE TWO NO. 14 WIRES FROM DISCONNECT TO THE CONTROLLER.
3. **TRACTION ELEVATOR BATTERY RESCUE UNIT PROVISIONS:** PROVIDE (2) FORM "C" AUXILIARY CONTACTS INTEGRAL DESIGNED WITH THE THREE-PHASE DISCONNECT SWITCH TO SIGNAL THE BATTERY-LOWERING UNIT. PROVIDE TWO NO. 14 WIRES FROM DISCONNECT TO THE CONTROLLER.
4. **POWER DISCONNECTING MEANS:** WHERE SPRINKLERS ARE PROVIDED IN ELEVATOR MACHINE ROOMS AND IN HOISTWAYS LOCATED HIGHER THAN 1'-0" ABOVE THE PIT FLOOR, MEANS SHALL BE PROVIDED TO AUTOMATICALLY DISCONNECT THE THREE-PHASE MAIN LINE POWER SUPPLY TO THE AFFECTED ELEVATOR PRIOR TO THE APPLICATION OF WATER. THESE MEANS SHALL NOT BE SETTING OFF CALIBRATION OF THE STATUS OF THE MACHINE ROOM. THE ACTIVATION OF SPRINKLERS OUTSIDE OF THE HOISTWAY OR MACHINE ROOM SHALL NOT DISCONNECT THE MAIN LINE POWER SUPPLY. TO ALLOW MONITORING OF THE STATUS OF THE VOLTAGE TO THE SHUNT TRIP DEVICE, WIRING WILL BE REQUIRED FROM CONTACTS ON THE THREE-PHASE DISCONNECT TO THE BUILDING MONITORING LOCATION.
5. **CAR LIGHTING AND ACCESSORIES CIRCUITS:** 120 VAC, 3Ø, 20 AMP SINGLE-PHASE POWER WITH LOCKABLE S.P.S.T. DISCONNECT SWITCH WITH WIRE EXTENDED TO STUDS ON EACH ELEVATOR CONTROLLER ROOM. PROVIDE EMERGENCY POWER BACKUP.
6. **TELEPHONE COMMUNICATION LINES:** CONNECT TO STUDS ON EACH ELEVATOR CONTROLLER FOR PASSENGER EMERGENCY COMMUNICATION.
7. **FIREMAN'S COMMUNICATION CIRCUIT:** FOR LIFE SAFETY BUILDINGS: CONNECT TO STUDS ON EACH ELEVATOR CONTROLLER.
8. **PUBLIC ADDRESS OR LIFE SAFETY SPEAKERS:** FOR LIFE SAFETY BUILDINGS: CONNECT TO STUDS ON EACH ELEVATOR CONTROLLER.
9. **SMOKE DETECTOR CIRCUITS:** FROM DETECTOR IN ELEVATOR LOBBIES, HOISTWAYS AND MACHINE ROOMS TO CONTROLLER DESIGNATED BY FIRE EMERGENCY SERVICE CONTRACTOR. ANY SMOKE DETECTORS INSTALLED IN ELEVATOR HOISTWAYS SHALL BE ACCESSIBLE FOR SERVICING FROM OUTSIDE OF HOISTWAY.
10. **LIGHTING AND OUTLETS:** MINIMUM 19 FOOT-CANDLES AT MACHINE ROOM FLOOR. LOCATE LIGHT SWITCH WITHIN 18" OF LOCK JAMB SIDE OF ACCESS DOOR. PROVIDE GFI CONVENIENCE OUTLETS ON ALL WALLS.
11. **ROOF ACCESS LIGHTING:** PROVIDE A LIGHTED PATHWAY FROM ROOF ACCESS DOOR TO MACHINE ROOM DOOR.
12. **FIRE EXTINGUISHER:** PROVIDE AN ABC TYPE FIRE EXTINGUISHER IN EACH ELEVATOR MACHINE ROOM.
13. **EMERGENCY STANDBY POWER:** PROVIDE EMERGENCY STANDBY POWER SOURCE SIZED TO RUN LARGEST ELEVATOR IN EACH OF THE FOLLOWING GROUPS:
- | GROUP I | ELEVATOR NO. |
|-----------|--------------|
| GROUP II | ELEVATOR NO. |
| GROUP III | ELEVATOR NO. |
| GROUP IV | ELEVATOR NO. |
| GROUP V | ELEVATOR NO. |
- a. POWER SOURCE SHALL BE SIZED TO ABSORB REGENERATIVE POWER FROM ELEVATOR SYSTEMS THAT EQUAL APPROXIMATELY 25% TO 45% OF FULL LOAD RUNNING. IN GENERAL, THE TOTAL STANDBY POWER LOAD SHOULD BE NO LESSER THAN THE STEADY LOAD IMPOSED BY THE ELEVATORS ALONE.
- b. PROVIDE TIME DELAY AUTOMATIC TRANSFER SWITCH TO DISTRIBUTE STANDBY POWER THROUGH NORMAL FEEDERS OF POWER CIRCUITS. PROVIDE TWO PAIRS OF NO. 14 GAUGE WIRES FROM FORM "C" AUXILIARY CONTACTS ON TRANSFER SWITCH TO MACHINE ROOM TO OPERATE AS FOLLOWS:
- 1) ONE DRY CONTACT TO OPEN WHEN NORMAL POWER FAILS AND EMERGENCY STANDBY POWER BECOMES AVAILABLE AND TO CLOSE WHEN NORMAL POWER RETURNS TO SIGNAL ELEVATOR CONTROLLERS.
 - 2) ONE DRY CONTACT TO OPEN ON EMERGENCY POWER FAILS AND CLOSE 30 TO 60 SECONDS PRIOR TO TRANSFER BACK TO NORMAL POWER TO ALLOW ELEVATORS TO COME TO REST PRIOR TO NORMAL POWER RESUMPTION.
- c. CONNECT CAR LIGHTING, FAN AND INTERCOM SYSTEM CIRCUITS ON EMERGENCY POWER SOURCE.
14. **REGENERATIVE POWER:** WIRE WITH MANUFACTURER IF ELEVATOR SYSTEM IS PROVIDED WITH A REGENERATIVE DRIVE SYSTEM. REGENERATIVE POWER WILL BE TRANSFERRED TO BOTH NORMAL AND EMERGENCY POWER SOURCES. THIS MUST BE CONSIDERED IN ELECTRICAL SYSTEM DESIGN.
15. **COMMON CIRCUIT:** FOR ELEVATOR GROUPS OF 2 OR MORE ELEVATORS: DESIGNATED 20 AMP 120 VOLT 1-PHASE CIRCUIT THROUGH LOCKABLE S.P.S.T. FUSED DISCONNECT SWITCH WITH FEEDERS EXTENDED TO GROUP CONTROLLER PANEL DESIGNATED BY ELEVATOR CONTRACTOR FOR EACH BANK OF TWO CARS OR MORE. PROVIDE EMERGENCY POWER BACKUP.
16. **ALARM SOUNDING SYSTEM CIRCUIT:** FOR EXTERIOR OBSERVATION ELEVATORS: 220 VAC, 3Ø, 20 AMP SINGLE-PHASE POWER WITH FUSED LOCKABLE SPSST DISCONNECT SWITCH WITH WIRE EXTENDED TO CONTROLLER. PROVIDE EMERGENCY POWER BACKUP.
17. **HYDRAULIC COOL DOWN SYSTEM CIRCUIT:** PROVIDE DESIGNATED 110 VAC, 3Ø, 20 AMP SINGLE-PHASE POWER WITH FUSED LOCKABLE SPSST DISCONNECT SWITCH WITH WIRE EXTENDED TO OIL COOL DOWN UNIT.
18. **PIT LIGHT AND OUTLETS:** LOCATE LIGHT SWITCH WITHIN 18 INCHES OF LOCK JAMB SIDE OF WALK-IN ACCESS DOOR OR ADJACENT TO ACCESS LADDER BETWEEN 18" AND 36" ABOVE LOWEST LANDING. PROVIDE NEMA 4 PIGT LIGHT FIXTURES. CONTROL AND ELECTRICAL RECEPTACLES TO INCLUDE PROTECTIVE LENSES TO COVER BARE LIGHT BULBS OR FLOURESCENT TUBES. MINIMUM LIGHT LEVEL OF 10 FOOT CANDLES ANYWHERE IN PIT. PROVIDE A MINIMUM OF ONE GFCI CONVENIENCE OUTLET PER ELEVATOR. COORDINATE LOCATION OF ALL DEVICES WITH ELEVATOR CONTRACTOR.
19. **STAY POWER ACCESS ELEVATOR HOISTWAY LIGHTING:** FOR BUILDINGS WITH 120'-0" RISE TO TOP OCCUPIED FLOOR, WHEN FIREFIGHTER'S EMERGENCY OPERATION IS ACTIVE, THE ENTIRE HOISTWAY SHALL BE ILLUMINATED AT NOT LESS THAN 1 FOOT-CANDLE AS MEASURED FROM THE TOP OF THE CAR OF EACH FIRE SERVICE ACCESS ELEVATOR.
20. **OVERHEAD MACHINE OR SHAFT SPACE LIGHTING IN HOISTWAY:** PROVIDE MINIMUM 20 FOOT-CANDLES OF ILLUMINATION IN OVERHEAD MACHINE SPACES. PROVIDE LIGHT SWITCH AND GFI CONVENIENCE OUTLET AS DIRECTED BY ELEVATOR CONTRACTOR.
21. **ELEVATOR LOBBY SILL ILLUMINATION:** LOBBY LIGHTING SHALL PROVIDE A MINIMUM OF 10 FOOT-CANDLES OF ILLUMINATION AT THE ELEVATOR SILL WHEN THE ELEVATOR IS IN OPERATION.
22. **ELEVATOR CAR ILLUMINATION:** THE ELEVATOR CAR MUST BE PROVIDED WITH NOT LESS THAN 2 FOOT FIXTURES TO PROVIDE A MINIMUM OF 5 FOOT-CANDLES (PASSENGER) 2.5 FOOT CANDLES (DRIVER) OF ILLUMINATION AT THE ELEVATOR CAR FLOOR LEVEL WITH THE ELEVATOR CAR FLOOR LEVEL.
23. **CONDUIT:** PROVIDE THE FOLLOWING QUANTITIES AND SIZE OF CONDUIT WITH PULL WIRE BETWEEN HOISTWAYS AND EACH LOCATION OF REMOTE LIFE SAFETY ROOM AND GUARD'S PANEL.

NUMBER OF ELEVATORS IN BANK	NUMBER OF CONDUITS	CONDUIT SIZE
SINGLE CAR	1	2"
TWO CARS	1	2 1/2"
THREE CARS	2	2 1/2"
FOUR CARS	2	2 1/2"

24. REFER TO "ELECTRICAL / MECHANICAL LOADS" FOR HORSEPOWER, ACCELERATION AND RUNNING AMPS.

MECHANICAL REQUIREMENTS

- A. **VENTILATION OF MACHINE ROOM OR CONTROL ROOM:** PROVIDE MECHANICAL VENTILATION, HEATING OR AIR CONDITIONING IN MACHINE ROOMS OF SUFFICIENT CAPACITY TO MAINTAIN A TEMPERATURE BETWEEN 50° F. AND 90° F. CONTROLLED BY THERMOSTATS IN THE MACHINE ROOM. MAXIMUM RELATIVE HUMIDITY (NON-CONDENSING) 85%. LOCATE MECHANICAL VENTILATION OUTSIDE THE BUILDING.
- B. **HOSTWAY VENTILATION/PRESSURIZATION:** PROVIDE HOSTWAY VENTILATION OR HOSTWAY PRESSURIZATION FOR ELEVATORS SERVING MORE THAN 2 LEVELS PER COVERING BUILDING CODE. HOSTWAY VENTILATION IS TO BE PROVIDED, DO NOT VENTILATE INTO HOSTWAY. VENTILATE DIRECTLY TO OUTSIDE AIR OR THROUGH MECHANICAL DUCTS TO OUTSIDE AIR FROM TOP OF HOSTWAY ABOVE MACHINE ROOM FLOOR. TYPICALLY HOSTWAY VENTILATION IS 3 SQUARE FEET PER VOLUME OF FREE AIR VENTILATION SPACE OR 3% OF THE HOSTWAY AREA, WHICHEVER IS GREATER. LOCATE OUTSIDE AIR INTAKE AT LEAST 10 FEET FROM THE HOSTWAY AND 10 FEET FROM THE HOSTWAY VENTILATION. IF SUPPLIED, MACHINE ROOM IS TO BE PRESSURIZED WHERE THE MACHINE ROOM CONNECTS DIRECTLY TO THE HOSTWAY. HOSTWAY PRESSURIZATION SHALL NOT INTERFERE WITH THE OPERATION OF THE ELEVATOR SYSTEM AND IT IS RECOMMENDED THAT THE PRESSURIZATION BE TITLED TO ACCOMMODATE THE PRINCED RACK.
- C. **FOREIGN EQUIPMENT:** DO NOT LOCATE ANY FIRE, CONDENSERS OR OTHER NON-ELEVATOR EQUIPMENT IN ELEVATOR MACHINE ROOM OR HOSTWAYS.
- D. **FILE EXISTING:** PROVIDE AN ABC TYPE FIRE EXTINGUISHER IN EACH ELEVATOR MACHINE ROOM.
- E. **PIT DRAINAGE, SUMP PITS:** (ASME 901 - NOT CALIFORNIA) PROVIDE A PIT DRAINAGE SYSTEM IN EACH ELEVATOR PIT CAPABLE OF DISCHARGING 3000 GALLONS PER HOUR PER ELEVATOR. DRAINAGE SYSTEM CANNOT BE DIRECTLY CONNECTED TO A SEWER. DRAINAGE SHALL BE IN A DRAIN OR PERMANENT AUTOMATIC ACTUATED SUMP PITS INSTALLED IN THE SUMP PIT. WHERE SUMP PITS ARE INSTALLED IT SHALL BE PROVIDED WITH A COVER FLUSH WITH THE PIT FLOOR. AS AN ALTERNATE TO CONNECTING TO THE OIL INTERCEPTOR, FLOOR DRAINS AND SUMP PITS MAY BE DISCHARGED INTO A SEWER AS REQUIRED BY LOCAL AUTHORITIES AND CITY CODE.
- F. **MECHANICAL DUCTS:** REFER TO "ELECTRICAL / MECHANICAL DUCTS" FOR AVERAGE ELEVATOR EQUIPMENT HEAT RELEASE IN MACHINE ROOMS.

ELECTRICAL / MECHANICAL LOADS

DUE TO THE EVER CHANGING STATE-OF-THE-ART OF ELEVATOR EQUIPMENT PROVIDED BY THE VARIOUS ELEVATOR COMPANIES, IT IS DIFFICULT TO DETERMINE EXACTLY WHAT TYPE OF EQUIPMENT WILL BE USED ON EACH PROJECT.

ADDITIONALLY, EACH MANUFACTURER, BECAUSE OF THEIR EQUIPMENT WEIGHTS AND DESIGN EFFICIENCIES, WILL HAVE DIFFERENT HORSEPOWER RATINGS AND CURRENT CHARACTERISTICS. THE FOLLOWING LOADS ARE BASED ON AN AVERAGE AND MAY VARY FROM THE SUCCESSFUL MANUFACTURER'S ACTUAL LOADS. THIS INFORMATION MUST BE CONFIRMED AFTER THE ELEVATOR CONTRACT IS AWARDED.

BASED ON 480 VAC, 3 PH, 60 HZ POWER SUPPLY							
ELEVATOR NUMBER	CAPACITY (POUNDS)	SPEED (FPM)	MOTOR HP RATING (AC)	STARTING AMPS FULL LOAD UP (AMPS)	RUNNING AMPS FULL LOAD UP (AMPS)	HEAT RELEASE (BTU/HR) PER MACHINE	HEAT RELEASE (BTU/HR) PER CONTROLLER
PE1	3500	125	40	110	44	15,000 TOTAL	

*PLEASE NOTE POWER VOLTAGE

This information is for coordination purposes only and is provided to assist the Architect, Structural, Electrical and Mechanical Engineers with the design of related facilities required to accommodate the vertical transportation systems for this project.

This data is generally found in the "Work By Others" sections of the elevator specifications and is NOT provided by the Elevator Contractor. It is extremely important that each discipline, coordinate and incorporate this information into their design in order to properly accommodate the vertical transportation system.

The information provided herein is based on a wide selection of equipment supplied by major elevator contractors with the intent to accommodate "a worse case condition". There may be some differences between this information and the actual requirements of the specific elevator contractor for this project. This information should be verified during the shop drawing submittal stage.

Should there be any questions or additional information needed to assist any member of the design team, we are available to assist in any way we can.

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SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

1.2 RELATED REQUIREMENTS

- A. Section 220523 - General-Duty Valves for Plumbing Piping.
- B. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- C. Section 220719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- C. FM (AG) - FM Approval Guide; Current Edition.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.

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- C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- D. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

- A. Manufacturers:
 - 1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.
 - 2. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Modular Mechanical Sleeve-Seal:
 - 1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
 - 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
 - 3. Size and select seal component materials in accordance with service requirements.
 - 4. Glass-reinforced plastic pressure end plates.
- C. Sealing Compounds:
 - 1. Provide packing and sealing compound to fill pipe to sleeve thickness.
 - 2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.
- D. Pipe Sleeve Material:
 - 1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 - 2. Masonry Structures: Sheet metal or fiber.
- E. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.
- F. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch (76.2 mm) thick.
- G. Pipeline-Casing Seals:
 - 1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- E. Manufactured Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 - 5. Tighten bolting for a water-tight seal.
 - 6. Install in accordance with manufacturer's recommendations.
- F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION 220517

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.
- F. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).
- G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017 (Reapproved 2025).
- H. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- I. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- K. NSF 61 - Drinking Water System Components - Health Effects; 2024.

1.2 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.
 - 3. Bronze swing check valves.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.
PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
 - 2. Handwheel: For valves other than quarter-turn types.
 - 3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.
 - 4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.
- E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Solder Joint: With sockets according to ASME B16.18.
 - 3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

- A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. Kitz Corporation.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig (2757.90 kPa).

- c. Body Design: One piece.
- d. Body Material: Forged brass.
- e. Ends: Threaded.
- f. Seats: PTFE or TFE.
- g. Stem: Brass.
- h. Ball: Chrome-plated brass.
- i. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. DynaQuip Controls.
 - d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
 - e. Hammond Valve.
 - f. Jamesbury; a subsidiary of Metso Automation.
 - g. Jomar International, LTD.
 - h. Kitz Corporation.
 - i. Legend Valve.
 - j. Marwin Valve; a division of Richards Industries.
 - k. Milwaukee Valve Company.
 - l. NIBCO INC.
 - m. Red-White Valve Corporation.
 - n. RuB Inc.
- 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1034.21 kPa).
 - c. CWP Rating: 600 psig (4136.86 kPa).
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

C. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. Hammond Valve.
 - b. Jamesbury; a subsidiary of Metso Automation.
 - c. Legend Valve.
 - d. Marwin Valve; a division of Richards Industries.
 - e. Milwaukee Valve Company.
- 2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig (1034.21 kPa).
- c. CWP Rating: 600 psig (4136.86 kPa).
- d. Body Design: Two piece.
- e. Body Material: Forged brass.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Brass.
- i. Ball: Chrome-plated brass.
- j. Port: Regular.

2.3 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. NIBCO INC.
- 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig (2757.90 kPa).
 - c. Body Design: One piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE or TFE.
 - g. Stem: Bronze.
 - h. Ball: Chrome-plated brass.
 - i. Port: Reduced.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Crane Co.; Crane Valve Group; Crane Valves.
 - d. Hammond Valve.
 - e. Lance Valves; a division of Advanced Thermal Systems, Inc.
 - f. Legend Valve.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Red-White Valve Corporation.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-110.

- b. SWP Rating: 150 psig (1034.21 kPa).
- c. CWP Rating: 600 psig (4136.86 kPa).
- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Bronze.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

C. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. DynaQuip Controls.
 - f. Hammond Valve.
 - g. Lance Valves; a division of Advanced Thermal Systems, Inc.
 - h. Milwaukee Valve Company.
 - i. NIBCO INC.
- 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1034.21 kPa).
 - c. CWP Rating: 600 psig (4136.86 kPa).
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Regular.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.

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- h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - l. Zy-Tech Global Industries, Inc.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig (1378.95 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.
- B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - j. ???Insert manufacturer's name???
 - 2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig (1378.95 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.
- C. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig (1378.95 kPa).
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.

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- g. Gasket: Asbestos free.
- h. Closure Control: Factory-installed, exterior lever and spring.

D. Class 125, Iron Swing Check Valves with Lever- and Weight-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig (1378.95 kPa).
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.
 - h. Closure Control: Factory-installed, exterior lever and weight.

E. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - l. Zy-Tech Global Industries, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig (1378.95 kPa).
 - c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.

- h. Handwheel: Malleable iron

F. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - k. Zy-Tech Global Industries, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig (1378.95 kPa).
 - c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:

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1. Shutoff Service: Ball valves.
 - B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
 - C. Select valves, except wafer types, with the following end connections:
 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
- END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASME B31.9 - Building Services Piping; 2025.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).
- D. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- E. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2022.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- H. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024, with Errata (2025).

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe positioning systems.
 - 6. Equipment supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment support, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

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1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following: include Product Data for components:
 1. Trapeze pipe hangers.
 2. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:

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1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C533, Type I calcium silicate with 100-psig, ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches (50.8 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricated from ASTM A36/A36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hangers or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (101.6 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturers. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to the manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic 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.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches (304.8 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4: 12 inches (304.8 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6: 18 inches (457.2 mm) long and 0.06 inch (1.52 mm) thick.

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- d. NPS 8 to NPS 14: 24 inches (609.6 mm) long and 0.075 inch (1.9 mm) thick.
- e. NPS 16 to NPS 24: 24 inches (609.6 mm) long and 0.105 inch (2.67 mm) thick.
- 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
- 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment support.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercutting or overlapping.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (38 mm).

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint with a brush or spray to provide a minimum dry film thickness of 2.0 mils (0.0508 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches (101.6 mm) of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches (101.6 mm) of insulation.
 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (152.4 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

- 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 - N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
 - O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 - 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 - 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 - P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
 - Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
 - R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.
- END OF SECTION 220529

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SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.
- E. Ceiling tacks.

1.2 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Schedules:
 - 1. Submit plumbing component identification schedule listing equipment, piping, and valves.
 - 2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
 - 3. Valve Data Format: Include id-number, location, function, and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Nameplates:
 - 1. Heat exchangers, water heaters, and other heat transfer products.

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2. Control panels, transducers, and other related control equipment products.
3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:

1. Piping: 3/4 inch (20 mm) diameter and smaller.
2. Manual operated and automated control valves.
3. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.2 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
3. Seton Identification Products; _____: www.seton.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: Laminated piece with up to three lines of text.

1. Letter Color: White.
2. Letter Height: 1/4 inch (6 mm).
3. Background Color: Black.
4. Nameplate Material:
 - a. Flexible: Vinyl with adhesive backing per ASTM D709.
 - b. Metal: Brass with center-side holes for screw fastening.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving; _____: www.advancedgraphicengraving.com/#sle.
2. Brady Corporation; _____: www.bradycorp.com/#sle.
3. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
4. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
5. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
6. Seton Identification Products; _____: www.seton.com/#sle.

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7. Substitutions: See Section 016000 - Product Requirements.
- B. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.
- C. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.
- D. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.4 STENCILS

2.5 PIPE MARKERS

- A. Manufacturers:
 1. Brady Corporation; _____: www.bradycorp.com/#sle.
 2. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
 3. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
 4. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
 5. Seton Identification Products; _____: www.seton.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- D. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- E. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct burial service.
- F. Identification Scheme, ASME A13.1:
 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 2. Secondary: Color scheme per fluid service.
 - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

2.6 CEILING TACKS

- A. Manufacturers:
 1. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.

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B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

C. Color code as follows:

1. Plumbing Equipment: Yellow.

2. Plumbing Valves: Green.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Apply stencil painted identification in compliance with Section 099123 requirements. Identify unit with assigned id-number and area being served using pipe marking rules.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

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- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER INSULATION

- A. Manufacturers:

1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville Corporation; _____: www.jm.com/#sle.
3. Knauf Insulation: www.knaufinsulation.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

- B. Insulation: ASTM C547 and ASTM C795; rigid, preformed pipe insulation, noncombustible.

1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum Service Temperature: 850 degrees F (454 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

- C. Insulation: ASTM C547 and ASTM C795; semi-rigid, v-grooved, noncombustible, end grain adhered to jacket.

1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum Service Temperature: 650 degrees F (343 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).

- E. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

- F. Vapor Barrier Lap Adhesive: Compatible with insulation.

- G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

- H. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.

2. Blanket: 1.0 pcf (16 kg/cu m) density.
 3. Weave: 5 by 5.
- I. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- J. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- L. Insulating Cement: ASTM C449.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 3. Connection: Waterproof vapor barrier adhesive.

2.4 JACKETING AND ACCESSORIES

- A. PVC Plastic Jacket:
1. Manufacturers:
 - a. Johns Manville Corporation; _____: www.jm.com/#sle.
 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch (0.25 mm).
 - e. Connections: Brush on welding adhesive.
- B. ABS Plastic Jacket:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - b. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - c. Moisture Vapor Permeability: 0.012 perm inch (0.018 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 30 mil, 0.03 inch (0.75 mm).

- e. Connections: Brush on welding adhesive.
- C. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
- D. Aluminum Jacket:
 - 1. Thickness: 0.016 inch (0.40 mm) sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 4. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:

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1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.
 - J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
 - K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
 - L. Buried Piping: Wrap all Copper pipe and fittings below slab or grade with 8 mil Polyethylene wrap (Poly Wrap) in accordance with ANSI/AWWA Standard C105/A21.5-82

3.2 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All Sizes.
2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: Per Section 120.3 of the California Energy Code.

END OF SECTION 220719

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet (1500 mm) of building.
- D. Domestic water piping, above grade.
- E. Storm drainage piping, buried within 5 feet (1500 mm) of building.
- F. Storm drainage piping, above grade.
- G. Natural gas piping, buried within 5 feet (1500 mm) of building.
- H. Natural gas piping, above grade.
- I. Pipe flanges, unions, and couplings.
- J. Pipe hangers and supports.
- K. Pipe sleeve-seal systems.
- L. Ball valves.
- M. Butterfly valves.
- N. Balancing valves.
- O. Flow-balancing valves.
- P. Pressure reducing valves.
- Q. Pressure relief valves.
- R. Pressure-temperature valves.
- S. Strainers.

1.2 RELATED REQUIREMENTS

- A. Section 220719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

- A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2023.

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- B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2025).
- C. ANSI Z223.1 - National Fuel Gas Code; 2024.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- G. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
- H. ASME B31.1 - Power Piping; 2024.
- I. ASME B31.9 - Building Services Piping; 2025.
- J. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.
- K. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- L. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- M. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
- N. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
- O. ASTM B32 - Standard Specification for Solder Metal; 2020.
- P. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- Q. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- R. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
- S. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- T. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2026.
- U. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- W. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2026.

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- X. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.
- Y. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2024.
- Z. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- AA. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2024.
- BB. AWWA C606 - Grooved and Shouldered Joints; 2022.
- CC. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- DD. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- EE. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- FF. MSS SP-67 - Butterfly Valves; 2022.
- GG. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- HH. NSF 372 - Drinking Water System Components - Lead Content; 2024.
- II. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.
- JJ. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

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2.2 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.3 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.

2.5 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.

B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.

1. Manufacturers:
 - a. Uponor, Inc; _____: www.uponorengineering.com/#sle.
2. PPI TR-4 Pressure Design Basis:
3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
4. Joints: ASTM F1960 cold-expansion fittings.

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2.6 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.7 STORM DRAINAGE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.8 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: ASME B31.1, welded.
 - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
- B. Flexible Gas Piping:
 - 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
 - 2. Fittings: Provided by piping system manufacturer.

2.9 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.10 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):

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1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 1. Dimensions and Testing: In accordance with AWWA C606.
 2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.
 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- C. No-Hub Couplings:
 1. Testing: In accordance with ASTM C1277 and CISPI 310.
 2. Gasket Material: Neoprene complying with ASTM C564.
 3. Band Material: Stainless steel.
 4. Eyelet Material: Stainless steel.

2.11 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
- C. Plumbing Piping - Water:
 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.

2.12 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance to service requirements.
4. Glass reinforced plastic pressure end plates.

2.13 BALL VALVES

- A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.14 BUTTERFLY VALVES

- A. Construction 1-1/2 inch (40 mm, DN) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches (150 mm, DN) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.15 BALANCING VALVES

- A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.16 FLOW-BALANCING VALVES

- A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.17 PRESSURE REDUCING VALVES

A. 2 inch (50 mm, DN) and Smaller:

1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
2. Pressure Reducing Pilot-Operator:
 - a. Operating Range: 5 to 50 psi (0.35 to 35 Bar).
 - b. Connected into brass or bronze pilot piping and fittings.
 - c. Fixed flow restrictor, pressure gauges, and isolation valves.

B. 2 inch (50 mm, DN) and Larger:

1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
2. Pressure Reducing Pilot-Operator:
 - a. Operating Range: 5 to 50 psi (0.35 to 35 Bar).
 - b. Connected into brass or bronze pilot piping and fittings.
 - c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

2.18 PRESSURE RELIEF VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.19 STRAINERS

A. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):

1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Wrap all Cast Iron and Copper pipe and fittings below slab or grade with 8 mil Polyethylene wrap (Poly Wrap) in accordance with ANSI/AWWA Standard C105/A21.5-82.
- C.
- D. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

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- E. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- F. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
- G. Pipe Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 - 5. Tighten bolting for a watertight seal.
 - 6. Install in accordance with manufacturer's recommendations.

3.2 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 5/8 inch (15 mm).

END OF SECTION 221005

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SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor Drains; 2022.
- B. ASTM B32 - Standard Specification for Solder Metal; 2020.
- C. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2025.

1.2 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Roof flashing assemblies.
 - 4. Miscellaneous sanitary drainage piping specialties.
 - 5. Flashing materials.
 - 6. Grease interceptors.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS

2.1 CLEANOUTS

- A. Cast-Iron Floor Cleanouts FCO:
 - 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:

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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 the product indicated on Drawings 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 heavy-duty, adjustable housing cleanout.
 5. Size: Same as connected branch.
 6. Type: Heavy-duty, adjustable housing.
 7. Body or Ferrule: Cast iron.
 8. Clamping Device: Required
 9. Outlet Connection: Inside call.
 10. Closure: Brass plug with straight threads and gasket.
 11. Adjustable Housing Material: Cast iron.
- B. Cast-Iron Wall Cleanouts WCO:
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 the product indicated on Drawings 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.

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, provide the product indicated on Drawings 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: Sanitary drain.
6. Outlet: Bottom.
7. Top Shape: Round

2.3 FLASHING MATERIALS

- A. Lead Sheet: ASTM B749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
 1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
 2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
 3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.
- B. Fasteners: Metal compatible with material and substrate being fastened.
- C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- D. Solder: ASTM B32, lead-free alloy.
- E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.4 GREASE INTERCEPTORS

A. Grease Interceptors

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 the product indicated on Drawings or a comparable product by one of the following:
 - a. Applied Chemical Technology, Incorporated.
 - b. Josam Company; Josam Div.
 - c. MIFAB, Inc.
 - d. Rockford Sanitary Systems, Inc.
 - e. Schier Products Company.
 - 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; Light Commercial Operation.
 - j. Zurn Plumbing Products Group; Specification Drainage Operation.
 - k. Ashland Trap Distribution Co.
 - l. Bio-Microbics, Inc.
 - m. Canplas LLC.
 - n. Schier Products Company.
 - o. Zurn Plumbing Products Group; Light Commercial Operation.
4. Standard: ASME A112.14.3 for intercepting and retaining fats, oils, and greases from food-preparation wastewater.
5. Grease Retention Capacity: 1200 gal
6. Inlet and Outlet Size: 4"

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 backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

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1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 2. Locate each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet (1524 cm) for piping NPS 4 (DN 100) and smaller and 100 feet (3048 cm) for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- F. 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 29.53 inch (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 59.06 inch (1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches 59.06 inch (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) 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 drains, unless otherwise indicated.
- G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- H. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- I. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- J. 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.
- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.

- N. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
 - 1. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
 - 2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
- O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

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.
- C. Grease Interceptors: Connect inlet and outlet to unit and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

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. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
- 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 (254 mm), and skirt or flange extending at least 8 inches (203.2 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (203.2 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (203.2 mm) 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.

3.4 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during the remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
 - B. Place plugs in ends of uncompleted piping at end of each day or when work stops.
- END OF SECTION 221319

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SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ANSI Z21.10.3 - Gas-Fired Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2019 (Reaffirmed 2024).
- B. ANSI Z21.18/CSA 6.3 - Gas Appliance Pressure Regulators; 2019 (Reaffirmed 2024).
- C. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2025).
- D. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- E. ASME B1.20.7 - Hose Coupling Screw Threads (Inch); 1991 (Reaffirmed 2024).
- F. NFPA 54 - National Fuel Gas Code; 2024.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NSF 5 - Water Heaters, Hot Water Supply Boilers, and Heat Recovery Equipment; 2024.
- I. NSF 61 - Drinking Water System Components - Health Effects; 2024.

1.2 SUMMARY

- A. Section Includes:
 - 1. Commercial, atmospheric, gas-fired, storage, domestic-water heaters.
 - 2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified"

1.4 SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.

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- C. Product certificates.
- D. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Operation and maintenance data.
- H. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA 90.1 Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. ASME Compliance:
 - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 - 2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Two years.
 - b. Compression Tanks: Five years.

PART 2 PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

- A. Commercial, Atmospheric, Gas-Fired, Storage, Domestic-Water Heaters:

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Water Heaters.
 - b. Bock Water Heaters, Inc.
 - c. Bradford White Corporation.
 - d. GSW Water Heating.
 - e. HESco Industries, Inc.
 - f. Lochinvar Corporation.
 - g. PVI Industries, LLC.
 - h. RECO USA.
 - i. Rheem Manufacturing Company.
 - j. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
 - k. State Industries.
3. Standard: ANSI Z21.10.3/CSA 4.3.
4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround the entire storage tank except for connections and controls.
 - e. Jacket: Steel with enameled finish.
 - f. Burner: For use with atmospheric, gas-fired, domestic-water heaters and natural-gas fuel.
 - g. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 199, electric, automatic, gas-ignition system.
 - h. Temperature Control: Adjustable thermostat.
 - i. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
 - j. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
5. Special Requirements: NSF 5 construction.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

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

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. AMTROL Inc.
 - b. Flexcon Industries.
 - c. Honeywell International Inc.
 - d. Pentair Pump Group (The); Myers.
 - e. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
 - f. State Industries.
 - g. Taco, Inc.
3. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
4. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
5. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig (1034.21 kPa).
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- F. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 1/2-psig pressure rating as required to match gas supply.
- G. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- H. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- I. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

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- J. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.
- K. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimensions that will support the bottom of domestic-water heater a minimum of 18 inches (457.2 mm) above the floor.
- L. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters and storage tanks to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base.
 - 1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
 - 2. Maintain manufacturer's recommended clearances.
 - 3. Arrange units so controls and devices that require servicing are accessible.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 8. Anchor domestic-water heaters to substrate.

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- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping.
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
 - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 - 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
- D. Install commercial domestic-water heaters with seismic-restraint devices.
- E. Install combination temperature-and-pressure relief valves in the top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains.
- H. Install thermometer on outlet piping of domestic-water heaters.
- I. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- J. Fill domestic-water heaters with water.
- K. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Division 22 Section "Domestic Water Piping."
- B. Comply with requirements for gas piping.
- C. Drawings indicate general arrangement of piping, fittings, and specialties.

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- D. Where installing piping adjacent to fuel-fired, domestic-water heaters allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safety. Replace damaged and malfunctioning controls and equipment.

- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.

- C. Prepare test and inspection reports.

END OF SECTION 223400

SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Faucets.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture support.
6. Disposers.
7. Water closets.
8. Urinals.
9. Lavatories.
10. Individual showers.
11. Kitchen sinks.
12. Service sinks.
13. Drinking Fountain

1.2 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. FRP: Fiberglass-reinforced plastic.
- D. PMMA: Polymethyl methacrylate (acrylic) plastic.
- E. PVC: Polyvinyl chloride plastic.
- F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 REFERENCE STANDARDS

- A. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- C. ASME A112.18.2 - Plumbing Waste Fittings; 2020 (Reaffirmed 2025).
- D. ASME A112.18.6 - Flexible Water Connectors; 2017 (Reaffirmed 2021).
- E. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2024.
- F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- G. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- H. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- I. ASME B1.20.7 - Hose Coupling Screw Threads (Inch); 1991 (Reaffirmed 2024).
- J. ASSE 1001 - Performance Requirements for Atmospheric Type Vacuum Breakers; 2021.
- K. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- L. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.
- M. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).
- N. ASTM F446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 2019 (Reapproved 2023).
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Q. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- R. UL 499 - Electric Heating Appliances; Current Edition, Including All Revisions.
- S. UL 1951 - Standard for Safety Electric Plumbing Accessories; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 - 2. Plastic Laundry Trays: ANSI Z124.6.
 - 3. Plastic Shower Enclosures: ANSI Z124.2.
 - 4. Plastic Sinks: ANSI Z124.6.
 - 5. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 - 6. Slip-Resistant Bathing Surfaces: ASTM F 462.
 - 7. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 - 8. Stainless-Steel Residential Sinks: ASME A112.19.3.
 - 9. Vitreous-China Fixtures: ASME A112.19.2M.
 - 10. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
 - 11. Water-Closet, Flushometer Tank Trim: ASSE 1037.
 - 12. Drinking Fountain: ASME A112.19.1/CSA B45.2
- G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.

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3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 4. Faucets: ASME A112.18.1.
 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 8. NSF Potable-Water Materials: NSF 61.
 9. Pipe Threads: ASME B1.20.1.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Supply Fittings: ASME A112.18.1.
 12. Brass Waste Fittings: ASME A112.18.2.
- H. Comply with the following applicable standards and other requirements specified for shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F 444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Dishwasher Air-Gap Fittings: ASSE 1021.
 4. Manual-Operation Flushometers: ASSE 1037.

5. Plastic Tubular Fittings: ASTM F 409.
 6. Brass Waste Fittings: ASME A112.18.2.
 7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Dishwasher Air-Gap Fittings: ASSE 1021.
 3. Flexible Water Connectors: ASME A112.18.6.
 4. Grab Bars: ASTM F446.
 5. Hose-Coupling Threads: ASME B1.20.7.
 6. Hot-Water Dispensers: ASSE 1023 and UL 499.
 7. Off-Floor Fixture Supports: ASME A112.6.1M.
 8. Pipe Threads: ASME B1.20.1.
 9. Plastic Toilet Seats: ANSI Z124.5.
 10. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 EXECUTION

2.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to roughing-in drawings.

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- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- L. Install toilet seats on water closets.
- M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- P. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- Q. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- R. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- S. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- T. Set showers in leveling bed of cement grout.
- U. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

2.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

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- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

2.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

2.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

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SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe-sleeve seals.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 230553 - Identification for HVAC Piping and Equipment: Piping identification.
- C. Section 230719 - HVAC Piping Insulation.

1.3 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.4 SUBMITTALS

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

PART 2 PRODUCTS

2.1 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
- C. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.
- D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
1. Galvanized steel pipe or black iron pipe with asphalt coating.
 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Clearances:
1. Provide allowance for insulated piping.
 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
 3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

- A. Manufacturers:
1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.
 2. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.
 3. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Modular Mechanical Sleeve-Seal:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
 3. Size and select seal component materials in accordance with service requirements.
 4. Glass-reinforced plastic pressure end plates.
- C. Sealing Compounds:
1. Provide packing and sealing compound to fill pipe to sleeve thickness.
 2. Combined packing and seal compound is to match partition fire-resistance hourly rating.
- D. Pipe Sleeve Material:
1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 2. Masonry Structures: Sheet metal or fiber.
- E. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

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F. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch (76.2 mm) thick.

G. Pipeline-Casing Seals:

1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

PART 3 EXECUTION

3.1 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

E. Structural Considerations:

1. Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
 - a. Pack solid using mineral fiber in compliance with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.

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4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 5. Tighten bolting for a water-tight seal.
 6. Install in accordance with manufacturer's recommendations.
- H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- END OF SECTION 230517

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment components.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2025.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.
- H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- K. FM (AG) - FM Approval Guide; Current Edition.
- L. MFMA-4 - Metal Framing Standards Publication; 2004.

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- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.4 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Prefabricated Trapeze-Framed Metal Strut Systems:
 - 1. Manufacturers:
 - a. ABB Installation Products; ____: electrification.us.abb.com/#sle.
 - b. B-Line, a brand of Eaton Corporation; ____: www.eaton.com/#sle.

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- c. Custom Strut and Roll Forming, LLC; ____: www.customstrut.com/#sle.
 - d. Elgen Manufacturing Company, Inc; ____: www.elgenmfg.com/#sle.
 - e. Gripple, Inc; Fast Track - Standard: www.gripple.com/#sle.
 - f. Unistrut, a brand of Atkore International Inc; ____: www.unistrut.com/#sle.
 - g. Substitutions: See Section 016000 - Product Requirements.
 2. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
 3. Strut Channel or Bracket Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
 5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- C. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm) diameter.
 - c. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Steel Cable:
1. Manufacturers:
 - a. Ductmate Industries, Inc, a DMI Company; Clutcher Cable Hanging System: www.ductmate.com/#sle.
 - b. Elgen Manufacturing Company, Inc; ____: www.elgenmfg.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- E. Cable Hanging System Kits:
1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation; ____: www.eaton.com/#sle.
 - b. Ductmate Industries, Inc; ____: ductmate.com/#sle.
 - c. Gripple, Inc; ____: www.gripple.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
 2. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb (54.4 kg).
- F. Thermal Insulated Pipe Supports:
1. Manufacturers:
 - a. Buckaroos, Inc; ____: www.buckaroos.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. General Requirements:

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- a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
 - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
 - c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
 - d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
3. PVC Jacket:
- a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - c. Thickness: 60 mil (1.524 mm).

G. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up To 122 degrees F (50 degrees C):
 - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
 - b. Support From Below: MSS SP-58 Types 35 through 38.

H. Beam Clamps:

1. Manufacturers:
 - a. FNW; 7201: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
2. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
3. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
4. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
5. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
6. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
7. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
8. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
9. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

I. Riser Clamps:

1. Manufacturers:
 - a. FNW; 7020: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
3. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
5. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
6. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

J. U-Bolts:

1. Manufacturers:
 - a. FNW; 7610: www.fnw.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
2. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.

K. Strut Clamps:

1. Manufacturers:
 - a. FNW; 7815: www.fnw.com/#sle.
 - b. Gripple Inc; GCS: www.gripple.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
2. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

L. Insulation Clamps:

1. Manufacturers:
 - a. FNW; 7897: www.fnw.com/#sle.
2. Two bolt-type clamps designed for installation under insulation.
3. Material: Carbon steel with epoxy copper or zinc finish.

M. Pipe Hangers:

1. Split Ring Hangers:
 - a. Manufacturers:
 - 1) FNW; 7001: www.fnw.com/#sle.
 - b. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
 - c. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
 - d. Provide hanger rod and nuts of the same type and material for a given pipe run.

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- e. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
 - 2. Band Hangers, Adjustable:
 - a. Manufacturers:
 - 1) Gripple, Inc; Universal Clamp (Threaded): www.gripple.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
 - b. MSS SP-58 Type 7 or 9, Zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
 - 3. Swivel Ring Hangers, Adjustable:
 - a. Manufacturers:
 - 1) FNW; 7010: www.fnw.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
 - b. MSS SP-58 Type 10, epoxy-painted, zinc-colored.
 - c. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
 - d. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
 - 4. Clevis Hangers, Adjustable:
 - a. Manufacturers:
 - 1) FNW; 7005: www.fnw.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- N. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
- 1. Manufacturers:
 - a. Anvil International; H-Block: www.anvilintl.com/#sle.
 - b. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.
 - c. Erico International Corporation, a brand of Pentair; _____: www.erico.com/#sle.
 - d. Green Link, Inc; _____: www.greenlinkengineering.com/#sle.
 - e. PHP Systems/Design; _____: www.phpsd.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
 - 2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 - 4. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
- O. Pipe Shields for Insulated Piping:
- 1. Manufacturers:
 - a. Anvil International; _____: www.anvilintl.com/#sle.
 - b. FNW; 7750: www.fnw.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2. General Construction and Requirements:

- a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
- b. Shields Material: UV-resistant polypropylene with glass fill.
- c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
- d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
- e. Maximum Service Temperature: 178 degrees F (81 degrees C).
- f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

P. Anchors and Fasteners:

1. Manufacturers - Mechanical Anchors:

- a. FNW; 7502: www.fnw.com/#sle.
- b. Hilti, Inc; _____: www.us.hilti.com/#sle.
- c. ITW Red Head, a division of Illinois Tool Works, Inc; _____: www.itwredhead.com/#sle.
- d. Powers Fasteners, Inc; _____: www.powers.com/#sle.
- e. Simpson Strong-Tie Company Inc; _____: www.strongtie.com/#sle.
- f. Substitutions: See Section 016000 - Product Requirements.

2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

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3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.
- END OF SECTION 230529

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Stencils.
- E. Pipe markers.
- F. Ceiling tacks.

1.2 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Control Panels: Nameplates.
- C. Dampers: Ceiling tacks, where located above lay-in ceiling.
- D. Ductwork: Nameplates.

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- E. Piping: Tags.
- F. Thermostats: Nameplates.
- G. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A. Manufacturers:

1. Advanced Graphic Engraving, LLC; _____: www.advancedgraphicengraving.com/#sle.
2. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
3. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
4. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
5. Seton Identification Products, a Tricor Direct Company; _____: www.seton.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Letter Color: White.

C. Letter Height: 1/4 inch (6 mm).

D. Background Color: Black.

E. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving; _____: www.advancedgraphicengraving.com/#sle.
2. Brady Corporation; _____: www.bradycorp.com/#sle.
3. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
4. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
5. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
6. Seton Identification Products, a Tricor Company; _____: www.seton.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 ADHESIVE-BACKED DUCT MARKERS

A. Manufacturers:

1. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
2. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
3. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.

C. Style: Individual Label.

D. Color: Yellow/Black.

2.5 STENCILS

A. Manufacturers:

1. Brady Corporation; _____: www.bradycorp.com/#sle.
2. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
3. Insite Solutions, LLC; _____: www.stop-painting.com/#sle.
4. Seton Identification Products, a Tricor Company; _____: www.seton.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.

C. Stencil Paint: As specified in Section 099123, semi-gloss enamel, colors complying with ASME A13.1.

2.6 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation; _____: www.bradycorp.com/#sle.

2. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.
 3. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
 4. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- E. Color code as follows:
1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

2.7 CEILING TACKS

- A. Manufacturers:
1. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- C. Color code as follows:
1. HVAC Equipment: Yellow.
 2. Fire Dampers and Smoke Dampers: Red.
 3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Label Mechanical Equipment with Drawings Designation or unique equipment number, and the area served.
- C. Apply stencil painting in accordance with Section 099123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

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- F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- G. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
- H. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.
- J. Install labels on each fire, smoke, or combination fire/smoke damper access door.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.
- C. Install labels on each fire, smoke, or combination fire/smoke damper access door.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Refrigerant Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.

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2. Condensate Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

3.4 DUCT LABEL INSTALLATION

- A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:
 1. Blue background with white lettering: For supply ducts.
 2. Green background with white lettering: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 3. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 1. Valve-Tag Size and Shape:
 - a. 2 inches, round.
 2. Valve-Tag Color: Yellow.
 3. Letter Color: White

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

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SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - b. Variable-air-volume systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.4 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.
 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC NEBB or TABB.
 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC NEBB or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Construction Manager.

- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

PART 2 EXECUTION

2.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- K. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- M. Examine system pumps to ensure absence of entrained air in the suction piping.

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- N. Examine operating safety interlocks and controls on HVAC equipment.
- O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

2.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2, "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

2.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

2.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 6. Obtain approval from Mechanical Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

2.6 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.

- C. Record compressor data.

2.7 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.

2.8 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

2.9 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.
 - 2. Fan curves.
 - 3. Manufacturers' test data.
 - 4. Field test reports prepared by system and equipment installers.
 - 5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB contractor.

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3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.

2.10 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 078400 - Firestopping.
- C. Section 099123 - Interior Painting: Painting insulation jackets.
- D. Section 230553 - Identification for HVAC Piping and Equipment.
- E. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.3 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- C. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2025.
- F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- H. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2016 (Reapproved 2021).
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

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- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville; _____: www.jm.com/#sle.
3. Knauf Insulation; Performance+ Duct Wrap: www.knaufinsulation.com/#sle.
4. Manson Insulation, a company of Knauf Insulation; Alley Wrap B: www.imanson.com/#sle.
5. Owens Corning Corporation; _____: www.ocbuildingspec.com/#sle.
6. _____.
7. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
2. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville; _____: www.jm.com/#sle.
3. Knauf Insulation; Earthwool Insulation Board: www.knaufinsulation.com/#sle.
4. Manson Insulation, a company of Knauf Insulation; AK Board: www.imanson.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible.

1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F (232 degrees C).
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Maximum Density: 8.0 pcf (128 kg/cu m).

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4 POLYISOCYANURATE RIGID FOAM

A. Manufacturer:

1. Johns Mansville: www.jm.com
2. Substitutions: See Section 01 60 00 - Product Requirements

B. Insulation: ASTM C 1289, Type 1, Class 1, Foil-faced, rigid foam insulation product

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1. Construction: Foam bonded on both sides in the manufacturing process to foil facers.
2. Foam: Closed Cell polyisocyanurate, CFC-, and HFC-free.
3. Service Temperature: -100 degrees F to 250 degrees F.
 - a. Physical Properties: Thermal resistance, 1 inch ASTM C 518: 6.0 degrees F per square foot per hour per BTU.
 - b. Compressive Strength, ASTM D 1621: 16 psi or greater.
 - c. Flexural Strength, ASTM C 203: 40 psi or greater.
 - d. Water Absorption, ASTM C 209: 0.1 Percent by volume.
 - e. Water Vapor Permeance, ASTM E 96, 0.05 perms.
 - f. Surface Burning Characteristics, ASTM E84, foam core 25 or less flame spread, 450 or less smoke developed.

2.5 JACKETING AND ACCESSORIES

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
 1. Lagging Adhesive:
 - a. Manufacturers:
 - 1) Design Polymeric; DP 3050 Water Based, Premium Quality, Lagging Adhesive, and Vapor Retarder: www.designpoly.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).
- C. Aluminum Jacket:
 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 2. Thickness: 0.016 inch (0.40 mm) sheet.
 3. Finish: Smooth.
 4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
 6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

2.6 DUCT LINER

- A. Manufacturers:
 1. Aeroflex USA; AEROFLEX Breathe-EZ: www.aeroflexusa.com/#sle.
 2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.

3. CertainTeed Corporation; _____: www.certainteed.com/#sle.
4. Ductmate Industries, Inc, a DMI Company; _____: www.ductmate.com/#sle.
5. Johns Manville; _____: www.jm.com/#sle.
6. Knauf Insulation; Performance+ Duct Liner: www.knaufinsulation.com/#sle.
7. Owens Corning Corporation; QuietR Rotary Duct Insulation:
www.ocbuildingspec.com/#sle.
8. Substitutions: See Section 016000 - Product Requirements.

B. Note: Choose the liner type - Elastomeric Foam, Glass Fiber, or Phenolic Foam.

C. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.

1. Fungal Resistance: No growth when tested according to ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
3. Service Temperature: Up to 250 degrees F (121 degrees C).
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.
5. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch (13 mm) Thickness: 0.30.
 - b. 1 inch (25 mm) Thickness: 0.45.
 - c. 1-1/2 inches (40 mm) Thickness: 0.60.
 - d. 2 inch (50 mm) Thickness: 0.70.

D. Adhesive: Waterproof, fire-retardant type, ASTM C916.

E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:

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1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated Ducts Conveying Air Above Ambient Temperature:

1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor) ((below 3 meters above finished floor)): Finish with canvas jacket sized for finish painting.

F. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings:

B. Exhaust Ducts Exposed to Outdoor Air:

C. Outside Air Intake Ducts:

D. Plenums (Cooling System):

E. Ventilation Equipment Casings:

F. Supply Ducts:

G. Return and Relief Ducts in Mechanical Rooms:

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 078400 - Firestopping.
- C. Section 232300 - Refrigerant Piping: Placement of inserts.

1.3 REFERENCE STANDARDS

- A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- G. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.
- H. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- I. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.
- J. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

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- K. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- M. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum Five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, RIGID

A. Manufacturers:

1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville Corporation; _____: www.jm.com/#sle.
3. Knauf Insulation; Earthwool Pipe Insulation: www.knaufinsulation.com/#sle.
4. Manson Insulation, a company of Knauf Insulation; Alley-K Pipe Insulation: www.imanson.com/#sle.
5. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
6. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum Service Temperature: 850 degrees F (454 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.

1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum Service Temperature: 650 degrees F (343 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

E. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/(Pa s m)).

F. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

G. Vapor Barrier Lap Adhesive: Compatible with insulation.

H. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
2. Blanket: 1.0 pcf (16 kg/cu m) density.
3. Weave: 5 by 5.

I. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

J. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
2. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 180 degrees F (82 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.4 JACKETING AND ACCESSORIES

A. Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.016 inch (0.40 mm) sheet.
3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.

6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

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3. Insert location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
- L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV-resistant finish for flexible elastomeric cellular insulation without jacketing.

3.3 SCHEDULE

A. Cooling Systems:

1. Refrigerant Suction: Flexible Elasto
2. Refrigerant Hot Gas: Flexible Elastomeric, 1-1/2" thick

END OF SECTION 230719

SECTION 232300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Pressure regulators.
- H. Pressure relief valves.
- I. Filter-driers.
- J. Solenoid valves.
- K. Expansion valves.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 099123 - Interior Painting.
- D. Section 230719 - HVAC Piping Insulation.
- E. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
- B. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.
- C. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers; 2013 (Reapproved 2014).
- D. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.

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- E. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- F. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).
- G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2024.
- I. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- J. ASME B31.9 - Building Services Piping; 2025.
- K. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025, with Errata.
- L. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- O. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- P. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.
- Q. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- S. ICC (IMC)-2018 - International Mechanical Code; 2018.
- T. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- U. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.
- V. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Valves:
 - 1. Use service valves on suction and discharge of compressors.
 - 2. Use gauge taps at compressor inlet and outlet.
 - 3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
 - 4. Use check valves on compressor discharge.
 - 5. Use check valves on condenser liquid lines on multiple condenser systems.
- D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- E. Strainers:
 - 1. Use line size strainer upstream of each automatic valve.
 - 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
 - 3. On steel piping systems, use strainer in suction line.
 - 4. Use shut-off valve on each side of strainer.
- F. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- G. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
 - 2. Use a filter-drier on suction line just ahead of compressor.
 - 3. Use sealed filter-driers in lines smaller than 1/2 inch (13 mm) outside diameter.
 - 4. Use sealed filter-driers in low temperature systems.

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5. Use sealed filter-driers in systems utilizing hermetic compressors.
6. Use replaceable core filter-driers in lines of 1/2 inch (13 mm) outside diameter or greater.
7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
8. Use filter-driers for each solenoid valve.

H. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

2.2 REGULATORY REQUIREMENTS

- A. Comply with ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- C. Welders Certification: In accordance with ASME BPVC-IX.
- D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.3 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 1. Fittings: ASME B16.22 wrought copper.
 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
 3. Push-to-Connect Fittings: Complying with UL 207.
 - a. Manufacturers:
 - 1) Parker Hannifin - Sporlan Division; ZoomLock PUSH: www.parker.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
 4. Mechanical Press Fittings: Double-pressed type complying with UL 207 and ICC (IMC)-2018.
 - a. Manufacturers:
 - 1) RLS, LLC; RLS Cu (Copper): www.rlspressfittings.com/#sle.
 - 2) Parker Hannifin - Sporlan Division; ZoomLock MAX: www.parker.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.
- B. Copper Tube to 7/8-inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
 1. Fittings: ASME B16.26 cast copper.

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2. Joints: Flared.
 3. Push-to-Connect Fittings: Complying with UL 207.
 - a. Manufacturers:
 - 1) Parker Hannifin - Sporlan Division; ZoomLock PUSH: www.parker.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
 4. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.
 - a. Manufacturers:
 - 1) FNW; Copper Press: www.fnw.com/#sle.
 - 2) RLS, LLC; RLS Cu (Copper): www.rlspressfittings.com/#sle.
 - 3) Parker Hannifin - Sporlan Division; ZoomLock MAX: www.parker.com/#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.
- C. Pipe Supports and Anchors:
1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 5. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
 6. Vertical Support: Steel riser clamp.
 7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
 11. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, requiring attachment to the roof structure with support fixtures as specified; and as follows:
 - a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

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- e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

2.4 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.5 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.6 VALVES

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Henry Technologies; _____: www.henrytech.com/#sle.
3. Flomatic Valves; _____: www.flomatic.com/#sle.
4. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).

C. Packed Angle Valves:

1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).

D. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 300 degrees F (149 degrees C).

E. Service Valves:

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1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi (3450 kPa).

2.7 STRAINERS

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

B. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi (2960 kPa).

2.8 CHECK VALVES

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Parker Hannifin; _____: www.parker.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

B. Globe Type:

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F (149 degrees C) and maximum working pressure of 425 psi (2930 kPa).

C. Straight Through Type:

1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 200 degrees F (93 degrees C).

2.9 PRESSURE REGULATORS

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Parker Hannifin; _____: www.parker.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

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- B. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi (0 to 550 kPa) range, for maximum working pressure of 450 psi (3100 kPa).

2.10 PRESSURE RELIEF VALVES

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Henry Technologies; _____: www.henrytech.com/#sle.
3. Sherwood Valve/Harsco Corporation; _____: www.sherwoodvalve.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

- B. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi (1620 kPa).

2.11 FILTER-DRIERS

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.
2. Parker Hannifin - Sporlan Division; Catch-All; _____: www.parker.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.

1. Replaceable Core Type: Steel shell with removable cap.
2. Sealed Type: Copper shell.
3. Connections: As specified for applicable pipe type.

2.12 SOLENOID VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.
2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

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- B. Valve: AHRI 760 (I-P), pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, soldered, or threaded ends; for maximum working pressure of 500 psi (3450 kPa).
- C. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.13 EXPANSION VALVES

- A. Manufacturers:
 - 1. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Angle or Straight Through Type: AHRI 760 (I-P); design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with nonreplaceable capillary tube and remote sensing bulb and remote bulb well.
- C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F (6 degrees C) superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.
 2. Support horizontal piping as indicated.
 3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 7. Provide copper plated hangers and supports for copper piping.
- H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- I. Provide clearance for installation of insulation and access to valves and fittings.
- J. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 083100.
- K. Flood piping system with nitrogen when brazing.
- L. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- M. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. See Section 099123.
- N. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

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- P. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- Q. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- R. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- S. Fully charge completed system with refrigerant after testing.
- T. Provide electrical connection to solenoid valves. See Section 260583.

3.3 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test to no leakage.

3.4 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).
 - 2. 1-1/8 inch (29 mm) OD: Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6.3 mm).

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2025b.
- D. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- E. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.
- H. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- I. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- J. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- M. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- N. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section Includes:
 - 1. Rectangular ducts and fittings.
 - 2. Round ducts and fittings.

3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7. SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
 2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
 3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 2. Factory- and shop-fabricated ducts and fittings.
 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 4. Elevation of top of ducts.

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5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports and seismic restraints.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.

E. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

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- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger Than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A1008/A1008M, with oiled, matte finish for exposed ducts.

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- D. Stainless-Steel Sheets: Comply with ASTM A480/A480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches (914.4 mm) or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.
 - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Insulation Pins and Washers:
 - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches (101.6 mm) from corners and at intervals not exceeding 12 inches (304.8 mm) transversely; at 3 inches (76.2 mm) from transverse joints and at intervals not exceeding 18 inches (457.2 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:

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1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches (101.6 mm).
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

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6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Cooper B-Line, Inc.; a division of Cooper Industries.
 2. Ductmate Industries, Inc.

3. Hilti Corp.
 4. Kinetics Noise Control.
 5. Loos & Co.; Cableware Division.
 6. Mason Industries.
 7. TOLCO; a brand of NIBCO INC.
 8. Unistrut Corporation; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

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- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25.4 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD

EXHAUST DUCT

- A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 10 feet (304.8 cm) in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches (38 mm) from bottom of duct.

- C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (101.6 mm) thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (101.6 mm) thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (609.6 mm) of each elbow and within 48 inches (1219.2 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (487.68 cm).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
1. Space lateral supports a maximum of 40 feet (1219.2 cm) o.c., and longitudinal supports a maximum of 80 feet (2438.4 cm) o.c.
 2. Brace a change of direction longer than 12 feet (365.76 cm).
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during

drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.7 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 DUCT CLEANING

- A. Clean duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 1. Air outlets and inlets (registers, grilles, and diffusers).

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2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Backdraft dampers - fabric.
- C. Combination fire and smoke dampers.
- D. Combination fire and smoke dampers - corridor dampers.
- E. Duct access doors.
- F. Duct test holes.
- G. Fire dampers.
- H. Flexible duct connectors.
- I. Smoke dampers.
- J. Volume control dampers.
- K. Miscellaneous Products:
 - 1. Damper position switch.
 - 2. Internal strut end plugs.
 - 3. Duct opening closure film.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 233100 - HVAC Ducts and Casings.
- C. Section 253513 - Integrated Automation Actuators and Operators: Damper operators.
- D. Section 253516 - Integrated Automation Sensors and Transmitters: Damper position switch.
- E. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

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- C. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- F. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- G. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- H. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- I. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- D. Project Record Drawings: Record actual locations of access doors and test holes.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 BACKDRAFT DAMPERS - METAL

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc, a brand of Mestek, Inc; _____: www.louvers-dampers.com/#sle.
 - 2. Nailor Industries, Inc; _____: www.nailor.com/#sle.

3. Pottorff; ____: www.pottorff.com/#sle.
 4. Ruskin Company; ____: www.ruskin.com/#sle.
 5. United Enertech; ____: www.unitedenertech.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.2 BACKDRAFT DAMPERS - FABRIC

- A. Fabric Backdraft Dampers: Factory-fabricated.
1. Blades: Neoprene coated fabric material.
 2. Birdscreen: 1/2 inch (12 mm) nominal mesh of galvanized steel or aluminum.
 3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers:
1. Nailor Industries, Inc; ____: www.nailor.com/#sle.
 2. Pottorff; ____: www.pottorff.com/#sle.
 3. Ruskin Company; ____: www.ruskin.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.
- D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- E. Operators: UL listed and labeled; spring-return, electric-type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.
- F. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
- G. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 COMBINATION FIRE AND SMOKE DAMPERS - CORRIDOR DAMPERS

A. Manufacturers:

1. Ruskin Company; _____: www.ruskin.com/#sle.

B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

D. Operators: UL listed and labeled; spring-return, electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

E. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.

F. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.5 DUCT ACCESS DOORS

A. Manufacturers:

1. Acudor Products Inc, a Division of Nelson Industrial Inc; _____: www.acudor.com/#sle.

2. Ductmate Industries, Inc, a DMI Company; _____: www.ductmate.com/#sle.

3. Elgen Manufacturing Company, Inc; _____: www.elgenmfg.com/#sle.

4. Lloyd Industries, Inc; _____: www.firedamper.com/#sle.

5. Nailor Industries, Inc; _____: www.nailor.com/#sle.

6. SEMCO LLC; _____: www.semcohvac.com/#sle.

7. The Williams Brothers Corporation of America; _____: www.wbdoors.com/#sle.

8. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch (25 mm) thick insulation with sheet metal cover.

1. Less Than 12 inches (300 mm) Square: Secure with sash locks.

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2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.
3. Up to 24 by 48 inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.
5. Compression Latch:
6. Hinge:

2.6 DUCT TEST HOLES

- A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.
 1. Manufacturers:
 - a. Carlisle HVAC Products; Dynair Test Port with Red Cap with O-Ring Seal: www.carlislehvac.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.7 FIRE DAMPERS

- A. Manufacturers:
 1. Nailor Industries, Inc; _____: www.nailor.com/#sle.
 2. Pottorff; _____: www.pottorff.com/#sle.
 3. Ruskin Company; _____: www.ruskin.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling (Radiation) Dampers: Galvanized steel, 22-gauge, 0.0299-inch (0.76 mm) frame and 16-gauge, 0.0598-inch (1.52 mm) flap, two layers of 0.125-inch (3.2 mm) thick ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
 1. Rated for three hour service in compliance with UL 555C.
 2. Manufacturers:
 - a. Pottorff; _____: www.pottorff.com/#sle.
 - b. Ruskin Company; _____: www.ruskin.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- D. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.
- E. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.8 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:

1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehvac.com/#sle.
2. Ductmate Industries, Inc, a DMI Company; ____: www.ductmate.com/#sle.
3. Elgen Manufacturing Company, Inc; ____: www.elgenmfg.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.

D. Maximum Installed Length: 14 inch (356 mm).

2.9 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

B. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by pneumatic actuator.

C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.10 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. AireTechnologies, Inc, a DMI Company; ____: www.airetechnologies.com/#sle.
2. Louvers & Dampers, Inc, a brand of Mestek, Inc; ____: www.louvers-dampers.com/#sle.
3. Elgen Manufacturing Company, Inc; ____: www.elgenmfg.com/#sle.
4. MKT Metal Manufacturing; ____: www.mktduct.com/#sle.
5. Nailor Industries, Inc; ____: www.nailor.com/#sle.
6. NCA, a brand of Metal Industries Inc; ____: www.ncamfg.com/#sle.
7. Pottorff; ____: www.pottorff.com/#sle.
8. Ruskin Company; ____: www.ruskin.com/#sle.
9. United Enertech; ____: www.unitedenertech.com/#sle.
10. Substitutions: See Section 016000 - Product Requirements.

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- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers:
 - 1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
 - 2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.
- D. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches (200 by 1825 mm). Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
 - 1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.
- E. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
 - 1. Manufacturers:
 - a. Carlisle HVAC Products; Dynair End Bearing Leak Resistant Sets: www.carlislehvac.com/#sle.
 - b. Elgen Manufacturing Company, Inc; Snap-In Bushing: www.elgenmfg.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.11 MISCELLANEOUS PRODUCTS

- A. Damper Operators: Provide electric operators; see Section 253513.
- B. Damper position switch; see Section 253516.
- C. Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.
- D. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
 - 1. Thickness: 2 mils (0.6 mm).
 - 2. High tack water based adhesive.
 - 3. UV stable light blue color.
 - 4. Elongation Before Break: 325 percent, minimum.
 - 5. Manufacturers:
 - a. Carlisle HVAC Products; Dynair Duct Protection Film: www.carlislehvac.com/#sle.
 - b. Elgen Manufacturing Company, Inc; Shrink Wrap with PSA: www.elgenmfg.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at vertical fire dampers, vertical combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 by 8 inch (200 by 200 mm) size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch (100 by 100 mm) size access door for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.
- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof exhausters.
- B. Roof ventilators.
- C. Kitchen hood upblast roof exhausters.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2025.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.
- E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.
- G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- I. UL 705 - Power Ventilators; Current Edition, Including All Revisions.
- J. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 FIELD CONDITIONS

- A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Greenheck Fan Corporation: www.greenheck.com/#sle.
- B. Loren Cook Company: www.lorencook.com/#sle.
- C. PennBarry, Division of Air System Components: www.pennbarry.com/#sle.
- D. Captiveaire, www.Captiveaire.com.
- E. Substitutions: See Section 016000 - Product Requirements.

2.2 POWER VENTILATORS - GENERAL

- A. Manufacturers:
 - 1. Carnes, a division of Carnes Company Inc; _____: www.carnes.com/#sle.
 - 2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
 - 3. PennBarry, Division of Air System Components; _____: www.pennbarry.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Static and Dynamically Balanced: Comply with AMCA 204.
- C. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- D. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- E. Fabrication: Comply with AMCA 99.
- F. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.
- G. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

- H. Enclosed Safety Switches: Comply with NEMA EN 10250.
- I. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.3 ROOF EXHAUSTERS

- A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch (13 mm) mesh, 0.62 inch (1.6 mm) thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Roof Curb: 12 inch (300 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.
- C. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.
- D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
- F. Performance Ratings: As indicated on drawings.

2.4 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

- A. Manufacturers:
 - 1. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
 - 2. PennBarry, Division of Air System Components; _____: www.pennbarry.com/#sle.
 - 3. Captiveaire, www.Captiveaire.com_____.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Direct Drive Fan:
 - 1. Fan Wheel:
 - a. Type: Non-overloading, backward inclined centrifugal.
 - b. Material: Aluminum, statically and dynamically balanced.
 - 2. Housing:
 - a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.

C. Shafts and Bearings:

1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.

D. Drive Assembly:

1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

E. Disconnect Switches:

1. Factory mounted and wired.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory-applied gray unless otherwise indicated.
4. Positive electrical shutoff.
5. Wired from fan motor to junction box installed within motor compartment.

F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

G. Options/Accessories:

1. Roof Curb Extension: Vented curb extension where required for compliance with minimum clearances required by NFPA 96.
2. Hinge Kit:
 - a. Aluminum hinges.

H. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION 233423

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Diffusers:
- B. Registers/grilles:
 - 1. Ceiling-mounted, exhaust and return register/grilles.
 - 2. Ceiling-mounted, supply register/grilles.
- C. Louvers:
- D. Goosenecks.

1.2 REFERENCE STANDARDS

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.
- B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Price Industries; _____: www.priceindustries.com/#sle.
- B. Titus, a brand of Air Distribution Technologies; _____: www.titus-hvac.com/#sle.
- C. Tuttle and Bailey; _____: www.tuttleandbailey.com/#sle.
- D. Shoemaker; www.rectorseal.com/solution-shoemaker-manufacturing_____.
- E. Substitutions: See Section 016000 - Product Requirements.

2.2 CEILING SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, four-way deflection.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.
- C. Construction: Made of steel extrusions with factory enamel finish.
- D. Color: As selected by Architect from manufacturer's standard range.

2.3 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.
- C. Construction: Made of steel extrusions with factory enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.

2.4 LOUVERS

- A. Manufacturers:
 - 1. NCA, a brand of Metal Industries Inc; _____: www.ncamfg.com/#sle.
 - 2. Ruskin Company; _____: www.ruskin.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Type: 4 inch (100 mm) deep frame with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch (13 mm) square mesh screen over intake or exhaust end.
- C. Fabrication: 16 gauge, 0.0598 inch (1.52 mm) thick galvanized steel thick galvanized steel welded assembly, with factory prime coat finish.

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D. Color: As indicated on the drawings.

E. Mounting: Furnish with interior flat flange for installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black, see Section 099123.

END OF SECTION 233700

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 PRODUCTS

2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes.
 - d. Hart & Cooley Inc.
 - e. Krueger.
 - f. METALAIRE, Inc.

- g. Nailor Industries Inc.
- h. Price Industries.
- i. Titus.
- j. Tuttle & Bailey.

B. Perforated Diffuser:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Air Research Diffuser Products, Inc.
 - b. A-J Manufacturing Co., Inc.
 - c. Anemostat Products; a Mestek company.
 - d. Carnes.
 - e. Hart & Cooley Inc.
 - f. Krueger.
 - g. METALAIRE, Inc.
 - h. Nailor Industries Inc.
 - i. Price Industries.
 - j. Titus.
 - k. Tuttle & Bailey.
 - l. Warren Technology.

C. Louver Face Diffuser:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes.
 - d. METALAIRE, Inc.
 - e. Nailor Industries Inc.
 - f. Price Industries.
 - g. Titus.
 - h. Tuttle & Bailey.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

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SECTION 237416 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Packaged, small-capacity, rooftop air-conditioning units.
- B. Packaged, intermediate-capacity, rooftop air-conditioning units.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Materials and installation of field fabricated roof mounting curbs.
- B. Section 076200 - Sheet Metal Flashing and Trim.
- C. Section 077200 - Roof Accessories: Placement and installation of factory fabricated roof mounting curbs.
- D. Section 230548 - Vibration and Seismic Controls for HVAC.
- E. Section 230913 - Instrumentation and Control Devices for HVAC: Installation of thermostats and other control components.
- F. Section 234000 - HVAC Air Cleaning Devices.
- G. Section 260583 - Wiring Connections: Installation and wiring of thermostats and other control components; wiring from unit terminal strip to remote panel.
- H. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

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- C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place and ready for immediate installation of units.

1.7 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Carrier Corporation; _____: www.commercial.carrier.com/#sle.
- B. Substitutions: See Section 016000 - Product Requirements.

2.2 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

- A. General: Heat Pump Roof mounted units that are 6 tons and smaller in capacity.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
- D. Electrical Characteristics: See Mechanical Plans

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- E. Disconnect Switch: Unit Mounted (NEMA-3R) fused disconnect furnished and installed by electrical contractor.

2.3 PACKAGED, INTERMEDIATE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

- A. Manufacturers:
- B. General: Heat Pump Roof mounted units that are 7.5 tons to 25 tons in capacity.
- C. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- D. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
- E. Electrical Characteristics: See Mechanical Plans
- F. Disconnect Switch: Unit Mounted (NEMA-3R) fused disconnect furnished and installed by electrical contractor.

2.4 PERFORMANCE REQUIREMENTS

- A. Heat Pump Heating: See Mechanical Plans
- B. Cooling Capacity: See Mechanical Plans
- C. Supply Air: See Mechanical Plans
- D. Scheduled Performance: See Mechanical Plans

2.5 CASING

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver-operated flush, cam type fasteners. Structural members to be minimum 18 gauge, 0.0478 inch (1.21 mm), with access doors or panels of minimum 20 gauge, 0.0359 inch (0.91 mm).

2.6 FANS

- A. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted. Provide with high efficiency motor or direct drive as indicated.

2.7 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

2.8 CONDENSER COIL

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.
- C. Provide refrigerant pressure switches to cycle condenser fans.

2.9 COMPRESSORS

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.
- B. Five minute timed off circuit to delay compressor start.
- C. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

2.10 AIR FILTERS:

- A. 2-inch (50 mm) thick, glass fiber disposable media in metal frames.
- B. See Section 234000.

2.11 OPERATING CONTROLS

- A. Provide low voltage, adjustable room thermostat to control burner operation, compressor and condenser fan, and supply fan to maintain temperature setting.
 - 1. Include system selector switch heat-off-cool and auto-on fan control switch.
 - 2. Locate thermostat in room as indicated on drawings.
- B. Provide remote-mounted auto-on fan control switch.

2.12 OPERATING CONTROLS - SINGLE ZONE UNITS

- A. Electric solid state microcomputer-based room thermostat, located as indicated in service area with remote sensor located as indicated in service area with remote sensor.
- B. Room thermostat to incorporate:
 - 1. Automatic switching from heating to cooling.
 - 2. Preferential rate control to minimize overshoot and deviation from setpoint.
 - 3. Set up for four separate temperatures per day.

4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
5. Short cycle protection.
6. Programming based on weekdays, Saturday and Sunday.
7. Switch selection features including imperial or metric display, 12- or 24-hour clock, keyboard disable, remote sensor, fan on-auto.

C. Room thermostat display to include:

1. Actual room temperature.
2. Programmed temperature.
3. Programmed time.
4. Duration of timed override.
5. Time of day.
6. Day of week.
7. System model indication: heating, cooling, auto, off, fan auto, fan on.
8. Stage heating or cooling operation.

2.13 ROOF CURBS

- A. Roof Mounting Curb: 14 inches (350 mm) high, galvanized steel, channel frame with gaskets, nailer strips.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as required by manufacturer.
- B. Verify that proper power supply is available.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.3 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.4 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals for additional submittals.
- B. See Section 017900 - Demonstration and Training for additional requirements.

3.5 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Provide service and maintenance of packaged rooftop units for one year from Date of Substantial Completion.
- D. Provide routine maintenance service with a two-month interval as maximum time period between calls.
- E. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.
- F. After each service call, submit copy of service call work order or report that includes description of work performed.

3.6 SCHEDULES

- A. Packaged Rooftop Air Conditioning Units: See Mechanical Plans

END OF SECTION 237416

SECTION 237433 - DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof-mounted DOAS.
- B. Controls.

1.2 RELATED REQUIREMENTS

- A. Section 230513 - Common Motor Requirements for HVAC Equipment.
- B. Section 230548 - Vibration and Seismic Controls for HVAC.
- C. Section 230934 - Variable-Frequency Motor Controllers for HVAC.
- D. Section 233300 - Air Duct Accessories: Flexible duct connections.
- E. Section 253500 - Integrated Automation Instrumentation and Terminal Devices for HVAC.
- F. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. ASHRAE Std 90.2 - High-Performance Energy Design of Residential Buildings; 2024, with Addendum (2026).
- G. NEMA MG 00001 - Motors and Generators; 2024.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- J. UL (DIR) - Online Certifications Directory; Current Edition.

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- K. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturers warranty for compressor/condenser unit.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. CaptiveAire Systems; _____: www.captiveaire.com/#sle.
- B. Substitutions: See Section 016000 - Product Requirements.

2.2 ROOF-MOUNTED DOAS

- A. Packaged Unit:
 - 1. Casing and Components:
 - a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
 - b. 18 gauge, 0.0478 inch (1.21 mm) steel panels reinforced with structural angles and channels to ensure rigidity.
 - c. Provide bolted access panels to access each sections from either side of unit.
 - d. Provide hinged door with lockable handle for serviceable sections.
 - e. Drain Pan: Galvanized steel with corrosion-resistant coating.
 - 2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
 - 3. Regulatory Requirements: AHRI 270 (SI/I-P) rated, NFPA 70, and UL (DIR) listed.

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4. Insulation: Minimum 1/2 inch (13 mm) thick acoustic duct liner for lining cabinet interior.
5. External Surface Finish: Heat resistant baked enamel.
6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
7. Outside Air Damper with Rain Hood and Screen:

B. Filter Section:

1. Filter: Removable, 4 inches (100 mm) thick combined MERV-8 and MERV-14.

C. Heating Section:

1. Electrical:
 - a. Finned tube heating elements easily accessible with automatic reset thermal cut-out, built-in silicone-controlled rectifier (SCR) interface, galvanized steel frame with airflow proving switch, load fuse, manual reset switch, pilot-duty toggle switches, step-down controls transformer, service lights, service GFCI receptacle, and thermal cut-out switch.
 - b. Controls: Start supply fan before electric elements are energized and continue operating until air temperature reaches minimum setting, with switch for continuous fan operation. Integrate or coordinate controls with unit controller.

D. Cooling Section:

1. Air-Source Heat Pump:
 - a. Packaged air-source heat pump with integrated or coordinated controls.
 - b. Compressor Section:
 - 1) Hermetically sealed, direct-driven single-stage scroll or dual-stage scroll type with centrifugal type oil pumps.
 - 2) Motor: Suction gas-cooled with voltage utilization range of plus/minus 10 percent of unit nameplate voltage.
 - 3) Internal spring isolation and sound muffling to minimize vibration transmission and noise.
 - 4) External high-and low-pressure switches.
 - c. Refrigerant Load Control: Provide hot-gas bypass and hot-gas reheat coil.
 - d. Evaporator Section: Internally finned aluminum, copper, or cupro-nickel tubes mechanically bonded to aluminum plate fins.

E. Fan Section:

1. Provide direct or plenum mounted variable-speed fan motors; see Section 230513.
2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
3. Factory program for both soft start and constant flow output over static pressure range.
4. Provide preinstalled neutral wire protection when required to support specified fan type.
5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.

6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
 7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 230934.
 8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.
- F. Unit Controls:
1. Thermostat:
 - a. Field mounted and wired, tied into prewired control-interface terminals.
 - b. Programmable Thermostat:
 - 1) Electro-mechanical type with key- or pushbutton-operated display.
 - 2) Programmable occupied/unoccupied weekly and holiday schedule.
 2. Local Control Panel: Interface to include on-off-auto switch, summer-winter switch, heat-off-cool switch, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.
 3. Interlocked Functions:
 - a. Unit to start when exhaust fan is running.
 - b. Low and High Limit Controls: Maintain supply air temperature between set points and shut fan down if temperatures are exceeded. Include manual reset switch.
- G. Electrical: 208 VAC, 3-phase, 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.
- H. Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.
- C. Install unit on vibration isolator pad or roof curb; see Section 230548.
- D. Provide flexible duct connections on inlet and outlet from unit; see Section 233300.
- E. Connect drain pan outlet to nearest building drain system piping.
- F. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.

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3.2 MAINTENANCE

A. Provide service and maintenance of units for one year from Date of Substantial Completion.
END OF SECTION 237433

SECTION 238126.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Air cooled condensing units.
- C. Indoor air handling (fan and coil) units for ductless systems.
- D. Controls.

1.2 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping: Includes indoor coil condensate drain.
- B. Section 223000 - Plumbing Equipment: Cooling condensate removal pumps.
- C. Section 230913 - Instrumentation and Control Devices for HVAC: Thermostats, humidistats, time clocks.
- D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.3 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

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- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Carrier Corporation; _____: www.carrier.com/#sle.
- B. Substitutions: See Section 016000 - Product Requirements.

2.2 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating: None.
 - 2. Cooling: Outdoor electric condensing unit with evaporator coils in multiple ductless indoor units ("mini-split").
 - 3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Mechanical Plans
- C. Electrical Characteristics: See Mechanical Plans
 - 1. Disconnect Switch: Unit mounted (NEMA-3R) fused disconnect furnished and installed by electrical contractor.

2.3 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
 - 1. Location: High-wall.
 - 2. Fan: Line-flow fan direct driven by a single motor.
 - 3. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturer: System manufacturer.

2.4 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
 - 3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
- B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.
- C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- D. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- E. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.

2.5 ACCESSORY EQUIPMENT

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
 - 1. Automatic switching from heating to cooling.
 - 2. Preferential rate control to minimize overshoot and deviation from setpoint.
 - 3. Thermostat Display:
 - a. Actual room temperature.
 - b. Programmed temperature.
 - c. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.

3.3 SCHEDULE

- A. Split-System: See Mechanical Plan

END OF SECTION 238126.13

BUILDING AND SITE IMPROVEMENTS WESTEND NAVIGATION CENTER

SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.2 SUMMARY

- A. Section Includes:

- 1. Supplemental requirements applicable to Work specified in Division 26.

1.3 REFERENCES

- A. Definitions:

- 1. Basic Impulse Insulation Level: Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
 - 2. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
 - 3. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
 - 4. Designated Seismic System: A system component that requires design in accordance with ASCE/SEI 7, Ch. 13 and for which the Component Importance Factor is greater than 1.0.
 - 5. Direct Buried: Installed underground without encasement in concrete or other protective material.
 - 6. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
 - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
 - b. Concrete Box: A box intended for use in poured concrete.
 - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
 - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.

- e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
 - f. Device Box: A box with provisions for mounting a wiring device directly to the box.
 - g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
 - h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
 - i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
 - j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
 - k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
 - l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
 - m. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
 - n. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
 - o. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
 - p. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
7. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
8. Jacket: A continuous nonmetallic outer covering for conductors or cables.
9. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
10. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
11. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
12. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.

13. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
14. Sheath: A continuous metallic covering for conductors or cables.
15. UL Category Control Number: An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
16. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
 - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
 - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
 - c. Extra-Low Voltage: Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
 - d. Low Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
 - e. Medium Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
 - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

1.4 ACTION SUBMITTALS

- A. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Coordination Drawings for Large Equipment Indoor Installations:
 1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
 2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:

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- a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
 - b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.
 - c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.
 3. Reflected ceiling plans for entry floor and floor where equipment is located, drawn to scale, on which the following items shown and coordinated with each other, based on input from installers of the items involved:
 - a. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways .
 - b. Location of lighting fixtures, sprinkler piping and sprinklers, ducts and diffusers, and other obstructions, indicating available overhead clearance.
 - c. Dimensioned working clearances and dedicated areas above and around electrical equipment where foreign systems and equipment are prohibited.
- C. Coordination Drawings for Large Equipment Outdoor Installations:
1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
 - a. Fences and walls, dimensioned concrete bases, outlines of equipment, conduit entries, and grounding and bonding locations.
 - b. Indicate clear dimensions for fence gates and wall openings.
 - c. Indicate depth and type of ground cover, and locations of trees, shrubbery, and other obstructions in access path.
 - d. Indicate clear height below tree branches, overhead lines, bridges, and other overhead obstructions in access path, or where cranes and hoists will be needed to handle large electrical equipment.
 - e. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways and seismic bracing.
 - f. Dimensioned working clearances and dedicated areas around electrical equipment.
- D. Coordination Drawings for Duct Banks: Signed and sealed by qualified professional engineer.
1. Show duct profiles and coordination with other utilities and underground structures.
 2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

1.5 FIELD CONDITIONS

- A. Service Conditions for Electrical Power Equipment: Specified electrical power equipment must be suitable for operation under service conditions specified as usual service conditions in applicable NEMA PB series, IEEE C37 series, and IEEE C57 series standards.

PART 2 PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
 - 1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.
 - 2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
 - 3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Contractor shall inspect site to verify the following:
 - a. Pathways for routing equipment into and out of work areas.
 - b. Pathways for installing temporary cabling from temporary distribution switchboards to interconnection points of distribution and lighting/appliance panelboards.
 - c. Methods to make temporary power connections intrinsically safe from incidental contact.

3.2 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Provide temporary dust barriers in occupied spaces.
 - a. Use plastic sheeting from floor to ceiling with temporary stud walls as required for support plastic.
 - 2. Flooring
 - a. Provide Masonite runners on floor to protect carpet and floor finishes from rolling loads.
 - b. Provide plastic or similar material on other areas of floor to protect from dust and debris.
 - c. Provide mats at entry/exit points into work areas to limit tracking of dust into non-work areas.

3.3 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

END OF SECTION 260010

SECTION 260100 - BASIC ELECTRICAL REQUIREMENTS SUMMARY

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations. Administrative and procedural requirements are included in this Section to expand the requirements specified in the General Requirements.

1.2 DEFINITIONS

- A. NEC: National Electrical Code.
- B. NFPA: National Fire Protection Association.

1.3 SUBMITTALS

- A. Submittal Schedule: Include a minimum of 14 days for review, additional time for handling and transmission, and the time required for ordering, manufacturing, fabrication, and delivery when establishing submittal dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional 14 days for handling and reviewing submittals required by those corrections.
- B. Engineer will provide two(2) reviews of all required submittals. Reviewing submittals subsequent to two(2) submittals marked revise and resubmit will be invoiced at our published hourly rate. Invoices will be sent to the submitting contractor.
- C. Submittal review time will not begin until Engineer has received notice the submittals available and complete access to the entire submittal. If the submittal is posted to web-based project software, the Engineer's designated representative must receive notification and adequate access to download a copy of the submittal in PDF format.
- D. Submittal Format: Include the information specified in Section 013300 inch (337820 mm) each submittal. Include the following:
 - 1. In the name of the file include the unique submittal number, including revision identifier. Include Specification Section number.
 - 2. All submittals must be from one Specification Section only.
 - 3. On the title page include the name of the firm or entity that prepared submittal and an indication of full or partial submittal.
 - 4. On the product data pages include the following:
 - a. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - b. Equipment or device name, or identification tag noted on plans.
 - c. Identify options selected for each item.

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- E. Submittals that do not identify the specific product and options being submitted will be returned without review. Illegible submittals will be returned without review.
- F. Submittals received after 1:00pm will be considered as received the following working day.
- G. Coordination:
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity before submitting.
 - 2. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 3. Coordinate each submittal with space available and other products installed.
- H. Shop Drawing Requirements: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Shop drawings may not contain the firm name, logo, seal, or signature of the Design Professional.
- I. Contractor's Review of Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Design Professional. Design Professional will not review submittals received from Contractor that do not have Contractor's review and approval.

1.4 QUALITY ASSURANCE

- A. Manufacturer's listed in the equipment schedules are intended to establish quality only and does not limit equal products by other manufacturers. Electrical designs are based on the requirements for the specified manufacturers listed on the equipment schedules. Conduit, disconnects, motor starters, breakers, fuses, and wire sizes are selected on basis of scheduled equipment. Increased current requirements necessitating larger wire, breakers, switches, etc., to accommodate any alternate or substitute manufacturer's equipment, other than as shown on drawings shall be provided without any increase in contract price by Contractor furnishing the equipment.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 PRODUCTS

2.1 SPECIAL TOOLS

- A. Provide four (4) new and unused tools for each special security fastener type used on the project. Deliver these tools to the Owner's representative.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify final locations for rough ins with field measurements and with the requirements of the actual equipment to be connected.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured in-place concrete and other structural components, as they are constructed.
- B. All work shall conform to the requirements of all applicable codes, ordinances and regulations including the current rules and regulations of the NEC, the NFPA, O.S.H.A. and all state and local laws, codes, and ordinances. All electrical installation work, including equipment and raceways, shall be supported and/or anchored in accordance with the International Building Code Seismic Requirements for this area.
- C. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- D. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

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- E. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- F. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Design Professional.
- G. Install systems, materials, and equipment level and plumb, parallel, and perpendicular to other building systems and components, where installed exposed in finished spaces.
- H. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Install access panel or doors where units are concealed behind finished surfaces.
- J. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 RENOVATION WORK IN EXISTING BUILDINGS

- A. Where routing new ductwork and piping through existing spaces requires the relocation of existing electrical circuitry or control circuitry, or communications, conduit and wiring, then it shall be the responsibility of the Contractor to have the circuitry, conduit and wiring re-routed and to complete the circuitry as required and as approved by the Owner.
- B. Coordinate with Owner for power shut down prior to performing work.
 - 1. Complete temporary re-routing before shutdown and re-termination of circuitry to minimize down time
 - 2. Complete permanent re-routing to the equipment or devices and coordinate with Owner prior to switchover to permanent circuitry.
- C. Costs for this work is the responsibility of the Contractor and no additions will be allowed to the Contract price.

3.4 CUTTING AND PATCHING

- A. Contractor to provide cutting of construction which is required for the installation work. Coordinate with the Owner before any cutting and obtain approval from the Owner prior to any cutting.
 - 1. Where openings for electrical work are provided under other sections of the specifications, this Contractor is responsible for locating and providing the proper dimensions for such openings.
- B. Take extreme care when cutting and perform in a manner that the strength of the structure will not be endangered. Utilize concrete saw or rotary core drill to create openings in concrete or

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masonry construction. Openings in any construction to be cut the minimum size required for the installation of the work.

1. Provide adequate protection to prevent damage to adjacent areas and to prevent dust from spreading to adjacent areas.
 2. The use of jack hammers is permitted.
- C. Where openings or holes are cut in existing construction and the cutting breaks existing electrical circuitry or control circuitry, or communications, conduit and wiring, the Contractor is to re-route the conduit and wiring to repair the damage and reconnect the circuitry. Temporary completion to be provided before the permanent re-routing and completion work is finished. Costs for this work is the responsibility of the Contractor and no additions will be allowed to the Contract price.
- D. Provide dust and moisture protection first before any cutting, patching or finishing work is started to protect adjacent construction and equipment, and to prevent dust spreading from the immediate area where work is being performed.
- E. After work is installed through openings in walls, partitions, ceilings, or floors, patch the opening around the work to match the existing construction, and provide watertight seals for the openings around conduits and around equipment. Provide fireproof and smoke tight seals through floors, walls, partitions, and ceilings.
- F. Do not cut structural members without the approval of a Structural Engineer. A Structural Engineer is to provide direction before cutting is performed.
- END OF SECTION 260100

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electrical installation requirements.

1.3 SUBMITTALS

- A. Product Data: For sleeve seals.

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (406.4 mm), thickness shall be 0.052 inch (1.32 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (406.4 mm), thickness shall be 0.138 inch (3.51 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. 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.
- 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.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

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- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50.8 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- E. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- F. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- G. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- H. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Metal-clad cable, Type MC, rated 600 V or less.
 - 3. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufactures
 - 1. Southwire
 - 2. Cerrowire
 - 3. Encore Wire
 - 4. Okonite Company (The).
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
 - 1. Type USE-2 and Type SE: Comply with UL 854.
 - 2. Type THHN and Type THWN-2] Comply with UL 83.
 - 3. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufactures
 - 1. AFC - Atkore
 - 2. Southwire
 - 3. Encore Wire
 - 4. McMaster-Carr

5. Okonite Company (The).

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit, and multi-circuit with color-coded conductors where noted on plans.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel, interlocked.

I. Liquid Tight Metal Clad.

1. Jacket: PVC applied over armor.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

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

1. 3M Electrical Products.
2. ABB, Electrification Products Division.
3. Hubbell Incorporated, Power Systems.
4. Ideal Industries, Inc.
5. Service Wire Co.

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- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Copper.
 - 2. Type: Two hole with standard barrels.
 - 3. Termination: Compression.

PART 3 EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 - 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
 - 1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway or Type USE, single conductor in raceway.
- B. Feeders (Exterior, Wet, or Damp Locations): Type XHHW-2, single conductors in raceway, PVC Jacketed Metal-clad cable, Type LFMC for less than 8ft or for seismic movement.
- C. Feeders (Concealed in Ceilings, Walls, Partitions, and Crawlspace): Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC for less than 8ft or for seismic movement.
- D. Coordinate "Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground" Paragraph below with Section 260543 "Underground Ducts and Raceways for Electrical Systems."
- E. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway, Underground feeder cable, Type UF.
- F. Feeders in Interior Cable Tray: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC.
- G. Interior Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
 - 1. Metal-clad cable, Type MC may be used for the following:
 - a. Crossing seismic or expansion joints

- b. Terminating on equipment subject to vibration (maximum of 6' in length)
- H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway.
 - 1. Metal-clad cable, Type MC may be used for the following:
 - a. Crossing seismic or expansion joints
 - b. Above ceiling spaces in offices for lighting systems between fixtures and control devices;
 - c. In stud walls for receptacles only. Terminate in a junction box above the ceiling space within a maximum cable length of six (6) feet from top of the stud wall for transition to conduit.
- I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway Underground branch-circuit cable, Type UF.
- J. Exterior, Wet or Damp location Branch Circuits: Type THHN/THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway.
 - 1. PVC Jacketed Metal-clad cable, Type LFMC may be used for the following:
 - a. Crossing seismic joints or building separations
 - b. Terminating on equipment subject to vibration (maximum of 6' in length)

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

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- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (152.4 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2025.
- D. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2026.
- G. UL 96 - Lightning Protection Components; Current Edition, Including All Revisions.
- H. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.
- I. UL 891 - Switchboards; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency and testing agency's field supervisor.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
 - 1. Test wells.

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2. Ground rods.
 3. Ground rings.
 4. Grounding arrangements and connections for separately derived systems.
- B. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems based on NETA MTS
1. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 2. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. ABB, Electrification Products Division.
- C. Burndy; Hubbell Incorporated, Construction and Energy.
- D. ILSCO.
- E. Siemens Industry, Inc., Energy Management Division.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Solid Conductors: ASTM B3.
- C. Stranded Conductors: ASTM B8.
- D. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6.35 mm) in diameter.

- E. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
- F. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.59 mm) thick.
- G. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.59 mm) thick.
- H. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (101.6 mm) by 18" in cross section, with 9/32-inch holes spaced 1-1/8 inches (29 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Flexible Copper Braid: Flexible, tinned copper braid with un-plated copper ferrules with two bolt holes.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt socket set screw.
- J. Lay-in Lug Connector: Mechanical type, aluminum copper rated for direct burial terminal with set screw.
- K. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- L. Straps: Solid copper, copper lugs, rated for 600 A.
- M. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- N. Water Pipe Clamps:
 - O. Mechanical type, two pieces with stainless-steel bolts.
 - 1. Material: Die-cast zinc alloy.

2. Listed for direct burial.

P. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel (stainless steel for corrosive soil conditions, refer to soils report); 3/4 inch (19.05 mm) by 10 feet (304.8 cm).

B. Ground Plates: 1/4 inch (6.35 mm) thick, hot-dip galvanized.

PART 3 EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8AWG and smaller, and stranded conductors for No. 6AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0AWG minimum.

C. Bury at least 30 inches (762 mm) below grade.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

E. Install bus horizontally, on insulated spacers 2 inches (50.8 mm) minimum from wall, 6 inches (152.4 mm) above finished floor unless otherwise indicated.

F. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

G. Conductor Terminations and Connections:

H. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

I. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

J. Connections to Ground Rods at Test Wells: Bolted connectors.

K. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location if provided on this project. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes:
- C. For utility company infrastructure, provide grounding per utility company requirements.
- D. For non-utility infrastructure, install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (101.6 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50.8 mm) above to 6 inches (152.4 mm) below concrete. Seal floor opening with waterproof, non-shrink grout.
- E. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- F. Pad-Mounted Transformers and Switches:
- G. For utility company infrastructure, provide grounding per utility company requirements.
- H. For non-utility infrastructure, Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (152.4 mm) from the foundation.

3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

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- D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 FENCE GROUNDING

- A. Fence Grounding: Install at intervals indicated on plans.
 - 1. Gates and Other Fence Openings: Ground fence on each side of opening with flexible braid from the hinge side of the gate to the support post.
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (4572 cm) on each side of crossing.
- C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

3.7 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50.8 mm) below finished floor or final grade unless otherwise indicated.
- D. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
- F. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
- G. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
- H. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- I. Grounding and Bonding for Piping:
- J. Metal Water Service Pipe (Domestic and Fire): If metallic piping is used for water service(s), install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect

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grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

- K. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
- L. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:
- C. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
- D. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- E. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - 1. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - 2. Perform tests by fall-of-potential method according to IEEE 81.
- F. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- G. Grounding system will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports.
- I. Report measured ground resistances that exceed the following values:
- J. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- C. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025a.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- E. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- F. MFMA-4 - Metal Framing Standards Publication; 2004.
- G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- I. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- J. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
- K. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel slotted support systems.
 - 2. Conduit and cable support devices.
 - 3. Support for conductors in vertical conduit.
 - 4. Structural steel for fabricated supports and restraints.
 - 5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 ACTION SUBMITTALS

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

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

- C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M AWS D1.2/D1.2M (aluminum).

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

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1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
2. Component Importance Factor: 1.5 Per Structural drawings and calcs.
3. Refer to structural drawings and engineer for Component Amplification Factor and Component Response Modification Factor.
4. Flame Rating: Class 1.
5. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches (203.2 mm) o.c. in at least one surface.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABB, Electrification Products Division.
 - b. Allied Tube & Conduit; Atkore International.
 - c. B-line; Eaton, Electrical Sector.
 - d. Unistrut; Atkore International.
 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Material for Channel, Fittings, and Accessories: Galvanized steel Plain steel.
 4. Channel Width: Selected for applicable load criteria or as noted on plans 1-5/8 inches (41 mm) ???Insert dimension???
 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

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- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) B-line; Eaton, Electrical Sector.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA 101
 - 3. NECA 102.
 - 4. NECA 105.
 - 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies where applicable.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1 , where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch (6.35 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 % percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps single-bolt conduit clamps single-bolt conduit clamps using spring friction action for retention in support channel.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (101.6 mm) thick or greater if allowed for this project. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 Spring-tension clamps.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.
- END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

SUMMARY

1.1 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- I. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
- J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
- N. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- O. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.
- P. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- Q. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- R. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- S. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- T. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

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- U. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- W. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- X. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- Y. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Z. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- AA. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.
- BB. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- CC. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- DD. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
- EE. UL 1773 - Termination Boxes; Current Edition, Including All Revisions.
- FF. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.2 SECTION INCLUDES:

- A. Metal conduits and fittings.
- B. Nonmetallic conduits and fittings.
- C. Metal wireways and auxiliary gutters.
- D. Nonmetal wireways and auxiliary gutters.
- E. Surface raceways.
- F. Boxes, enclosures, and cabinets.
- G. Handholes and boxes for exterior underground cabling.

1.3 RELATED REQUIREMENTS:

- A. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.

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- B. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

ACTION SUBMITTALS

2.1 PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

2.2 SHOP DRAWINGS: FOR CUSTOM ENCLOSURES AND CABINETS. INCLUDE PLANS, ELEVATIONS, SECTIONS, AND ATTACHMENT DETAILS.

INFORMATIONAL SUBMITTALS

3.1 COORDINATION DRAWINGS: CONDUIT ROUTING PLANS, DRAWN TO SCALE, ON WHICH THE FOLLOWING ITEMS ARE SHOWN AND COORDINATED WITH EACH OTHER, USING INPUT FROM INSTALLERS OF ITEMS INVOLVED:

- A. Structural members in paths of conduit groups with common supports.
- B. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

3.2 SEISMIC QUALIFICATION DATA: CERTIFICATES, FOR ENCLOSURES, CABINETS, AND CONDUIT RACKS AND THEIR MOUNTING PROVISIONS, INCLUDING THOSE FOR INTERNAL COMPONENTS, FROM MANUFACTURER.

PART 1 PRODUCTS

4.1 MANUFACTURERERS

4.2 MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

- A. ABB, Electrification Products Division.
- B. Allied Tube & Conduit; Atkore International.
- C. American Fittings Corp. (AMFICO).
- D. Armorcast, Hubble.

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- E. B-line; Eaton, Electrical Sector.
- F. Calconduit; Atkore International.
- G. Cantex Inc.
- H. Concast.
- I. Crouse-Hinds; Eaton, Electrical Sector.
- J. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
- K. Electri-Flex Company.
- L. Hoffman; nVent.
- M. Hubbell Industrial Controls; Hubbell Incorporated, Commercial and Industrial.
- N. Hubbell Premise Wiring; Hubbell Incorporated, Commercial and Industrial.
- O. International Metal Hose Co.
- P. Jensen Precast.
- Q. JM Eagle; J-M Manufacturing Co., Inc.
- R. Kellems; Hubbell Incorporated, Commercial and Industrial.
- S. Killark; Hubbell Incorporated, Construction and Energy.
- T. Korkap.
- U. Leviton Manufacturing Co., Inc.
- V. Liquid Tight Connector Co.
- W. Oldcastle Infrastructure, a CRH Company.
- X. O-Z/Gedney; Emerson Electric Co., Automation Solutions, Appleton Group.
- Y. Pass & Seymour; Legrand North America, LLC.
- Z. Perma-Cote.
- AA. Plasti-Bond; Robroy Industries.
- BB. Raco Taymac Bell; Hubbell Incorporated, Commercial and Industrial.
- CC. Siemens Industry, Inc., Building Technologies Division.
- DD. Southwire Company.
- EE. Square D; Schneider Electric USA.
- FF. Western Tube; Zekelman Industries.
- GG. Wheatland Tube; Zekelman Industries.

HH. Wiegmann; Hubbell Incorporated, Commercial and Industrial.

II. Wiremold; Legrand North America, LLC.

METAL CONDUITS AND FITTINGS

5.1 METAL CONDUIT:

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Galvanized-Steel Electrical Rigid Metal Conduit (GRC): Comply with ANSI C80.1 and UL 6.
 - 1. Exterior Coating: Zinc.
 - 2. Options:
 - a. Interior Coating: Zinc.
 - b. Minimum Trade Size: 3/4".
 - c. Colors: As indicated on Drawings.
 - 3. Fittings for Type GRC Raceways:
 - a. General Characteristics: UL 514B and UL Category Control Number DWTT.
- C. Options:
 - 1. Material: Steel.
 - 2. Coupling Method: Threaded.
 - 3. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.
- D. Steel Electrical Intermediate Metal Conduit (IMC): Comply with ANSI C80.6 and UL 1242.
 - 1. Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc.
 - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - d. Colors: As indicated on Drawings.
 - 2. Fittings for Type GRC Raceways:
 - a. General Characteristics: UL 514B and UL Category Control Number DWTT.
- E. Steel Electrical Metal Tubing (EMT): Comply with ANSI C80.3 and UL 797.
 - 1. Material: Steel.
 - 2. Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc.
 - c. Minimum Trade Size: 3/4".
 - d. Colors: As indicated on Drawings.

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3. Fittings for Type EMT Raceways:
 - a. General Characteristics: UL 514B and UL Category Control Number FKAV.
 - b. Options:
 - 1) Material: Steel.
 - 2) Coupling Method: Indoor - Compression Coupling, Outdoor - Raintight compression coupling with distinctive color gland nut. Setscrew couplings are unacceptable.
 - 3) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.
- F. FMC-S: Comply with UL 1; zinc-coated steel.
 - a. Material: Steel.
 2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Colors: As indicated on Drawings.
 3. Fittings for Type FMC Raceways:
 - a. General Characteristics: UL 514B and UL Category Control Number ILNR.
- G. Steel Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket and complying with UL 360.
 1. Material: Steel.
 2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Colors: As indicated on Drawings.
 3. Fittings for Type LFMC Raceways:
 - a. General Characteristics: UL 514B and UL Category Control Number DXAS

H. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.

ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

6.1 PERFORMANCE CRITERIA:

- A. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- B. General Characteristics: UL 2419 and UL Category Control Number FOIZ.

NONMETALLIC CONDUITS AND FITTINGS

7.1 NONMETALLIC CONDUIT:

7.2 LISTING AND LABELING: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.

- A. Electrical Non-Metallic Tubbing (ENT): Comply with NEMA TC 13 and UL 1653.
 - 1. Options:
 - a. Minimum Trade Size: 3/4".
 - 2. Fittings:
 - 1) Mechanically Attached Fittings: UL 1653.
 - 2) Solvent-Attached Fittings: UL 651.
- B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
 - 1. Dimensional Specifications: Schedule 40.
 - 2. Options:
 - a. Minimum Trade Size: 3/4".
 - b. Markings: For use with maximum 90 deg C wire.
- C. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:
 - 1. Dimensional Specifications: Schedule 80.
 - 2. Options:
 - a. Minimum Trade Size: 3/4".
 - b. Markings: For use with maximum 90 deg C wire.

7.3 NONMETALLIC FITTINGS:

- A. General Characteristics: Listed and labeled for type of conduit, location, and use. UL 514B and UL Category Control Number DWTT.
- B. Options:
 - 1. Material: Steel.
 - 2. Coupling Method: Threaded.
 - 3. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.
- C. Fittings, General:

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D. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: Comply with UL 514B.

F. Solvents and Adhesives: As recommended by conduit manufacturer.

SURFACE METAL RACEWAYS AND FITTINGS

8.1 PERFORMANCE CRITERIA:

A. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. General Characteristics: UL 5 and UL Category Control Number RJBT.

8.2 SURFACE METAL RACEWAYS AND FITTINGS WITH METAL COVERS:

A. Options:

1. Galvanized steel base with snap-on covers.
2. Manufacturer's standard enamel finish in color selected by Architect.
3. Wiring Channels: Dual. Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.

METAL WIREWAYS AND AUXILIARY GUTTERS

9.1 PERFORMANCE CRITERIA:

A. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. General Characteristics: UL 870 and UL Category Control Number ZOYX.

9.2 METAL WIREWAYS AND AUXILIARY GUTTERS:

A. Additional Characteristics:

1. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
2. Finish: Manufacturer's standard enamel finish.

B. Options:

1. Degree of Protection: Type 1 Type 3R Type 4orType 12 as required by location.

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2. Wireway Covers: Outdoor -Hinged type, Indoor -Screw-cover type unless otherwise indicated.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

10.1 LISTING AND LABELING: NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.

10.2 DESCRIPTION: PVC, EXTRUDED AND FABRICATED TO REQUIRED SIZE AND SHAPE, AND HAVING SNAP-ON COVER, MECHANICALLY COUPLED CONNECTIONS, AND PLASTIC FASTENERS.

10.3 FITTINGS AND ACCESSORIES: COUPLINGS, OFFSETS, ELBOWS, EXPANSION JOINTS, ADAPTERS, HOLD-DOWN STRAPS, END CAPS, AND OTHER FITTINGS SHALL MATCH AND MATE WITH WIREWAYS AS REQUIRED FOR COMPLETE SYSTEM.

10.4 SOLVENTS AND ADHESIVES: AS RECOMMENDED BY CONDUIT MANUFACTURER.

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.

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BOXES, ENCLOSURES, AND CABINETS

11.1 GENERAL REQUIREMENTS FOR BOXES, ENCLOSURES, AND CABINETS: BOXES, ENCLOSURES, AND CABINETS INSTALLED IN WET LOCATIONS SHALL BE LISTED FOR USE IN WET LOCATIONS.

11.2 PERFORMANCE CRITERIA:

- A. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- B. General Characteristics: UL 514A and UL Category Control Number QCIT.

11.3 METALLIC OUTLET BOXES:

- A. Description: Box having pry-out openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
- B. Options:
 - 1. Material: Sheet steel or Cast metal.
 - 2. Sheet Metal Depth: Minimum 2.5 inch (63.5 mm).
 - 3. Cast-Metal Depth: Minimum 2.4 inch (60.96 mm).
 - 4. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.
 - 5. Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to 70 lb.

11.4 METALLIC DEVICE BOXES:

- A. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Description: Box with provisions for mounting wiring device directly to box, nonadjustable, rectangular unless noted otherwise.
- D. Options:

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1. Material: Sheet steel Cast metal.
2. Sheet Metal Depth: minimum 2.5 inch (63.5 mm).
3. Cast-Metal Depth: minimum 2.4 inch (60.96 mm).

11.5 METALLIC CONCRETE BOXES AND COVERS:

- A. Description: Box intended for use in poured concrete.

11.6 NONMETALLIC FLOOR BOXES:

- A. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- B. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure, rectangular unless noted otherwise.

11.7 LUMINAIRE OUTLET BOXES: NONADJUSTABLE, DESIGNED FOR ATTACHMENT OF LUMINAIRE WEIGHING 50 LB. OUTLET BOXES DESIGNED FOR ATTACHMENT OF LUMINAIRES WEIGHING MORE THAN 50 LB SHALL BE LISTED AND MARKED FOR THE MAXIMUM ALLOWABLE WEIGHT.

11.8 PADDLE FAN OUTLET BOXES: NONADJUSTABLE, DESIGNED FOR ATTACHMENT OF PADDLE FAN WEIGHING 70 LB.

- A. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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11.9 SMALL SHEET METAL PULL AND JUNCTION BOXES: NEMA OS 1.

11.10 CAST-METAL ACCESS, PULL, AND JUNCTION BOXES: COMPLY WITH NEMA FB 1 AND UL 1773, CAST ALUMINUM GALVANIZED, CAST IRON WITH GASKETED COVER.

11.11 BOX EXTENSIONS USED TO ACCOMMODATE NEW BUILDING FINISHES SHALL BE OF SAME MATERIAL AS RECESSED BOX.

11.12 DEVICE BOX DIMENSIONS: 4 INCHES (101.6 MM) SQUARE BY 2-1/8 INCHES (54 MM) DEEP 4 INCHES BY 2-1/8 INCHES (54 MM) BY 2-1/8 INCHES (54 MM) DEEP

11.13 GANGABLE BOXES ARE ALLOWED PROHIBITED.

11.14 COORDINATE "HINGED-COVER ENCLOSURES" PARAGRAPH BELOW WITH DRAWINGS IF HINGED-COVER ENCLOSURES OTHER THAN NEMA 250, TYPE 1 ARE REQUIRED, SUCH AS FOR VERY DUSTY AREAS; OR IF CONSIDERATION SHOULD BE GIVEN TO USE OF NEMA 250, TYPE 3R OR TYPE 12 ENCLOSURES.

11.15 HINGED-COVER ENCLOSURES: COMPLY WITH UL 50 AND NEMA 250, TYPE 1, TYPE 3R, OR TYPE 4 AS NOTED ON PLAN TYPE 12 ???INSERT TYPE??? WITH CONTINUOUS-HINGE COVER WITH FLUSH LATCH UNLESS OTHERWISE INDICATED.

- A. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- B. Nonmetallic Enclosures: Plastic.
- C. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

11.16 CABINETS, CUTOOT BOXES, JUNCTION BOXES, AND PULL BOXES:

- A. NEMA 250, Type 1, Type 3R, or Type 4 as noted on plans, Type 12 ???Insert type??? galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
- B. Hinged door in front cover with flush latch and concealed hinge.
- C. Key latch to match panelboards.

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- D. Metal barriers to separate wiring of different systems and voltage.
- E. Accessory feet where required for freestanding equipment.
- F. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

11.17 INDOOR SHEET METAL CABINETS:

- A. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
- B. Additional Characteristics: UL Category Control Number CYIV.
- C. Options:
 - 1. Degree of Protection: Type 1, unless noted otherwise.

11.18 INDOOR SHEET METAL CUTOUT BOXES:

- A. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
- B. Additional Characteristics: UL Category Control Number CYIV.
- C. Options:
 - 1. Degree of Protection: Type 1, unless noted otherwise.

11.19 INDOOR SHEET METAL JUNCTION AND PULL BOXES:

- A. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- B. Additional Characteristics: UL Category Control Number BGUZ.
- C. Options:
 - 1. Degree of Protection: Type 1, unless noted otherwise.

11.20 INDOOR CAST-METAL JUNCTION AND PULL BOXES:

- A. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- B. Additional Characteristics: UL Category Control Number BGUZ.
- C. Options:
 - 1. Degree of Protection: Type 1, unless noted otherwise.

11.21 OUTDOOR SHEET METAL CABINETS:

- A. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
- B. Additional Characteristics: UL Category Control Number CYIV.
 - 1. Options:
 - 2. Degree of Protection: Type 3R, unless noted otherwise.

11.22 OUTDOOR SHEET METAL CUTOUT BOXES:

- A. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
- B. Additional Characteristics: UL Category Control Number CYIV.
 - 1. Options:
 - 2. Degree of Protection: Type 3R, unless noted otherwise.

11.23 OUTDOOR SHEET METAL JUNCTION AND PULL BOXES:

- A. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- B. Additional Characteristics: UL Category Control Number BGUZ.
 - 1. Options:
 - 2. Degree of Protection: Type 3R, unless noted otherwise.

11.24 OUTDOOR CAST-METAL JUNCTION AND PULL BOXES:

- A. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- B. Additional Characteristics: UL Category Control Number BGUZ.
- C. Options:
 - 1. Degree of Protection: Type 3R, unless noted otherwise.

COVER PLATES FOR DEVICES BOXES

12.1 PERFORMANCE CRITERIA:

- A. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. General Characteristics:

1. Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
2. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

12.2 METALLIC COVER PLATES FOR DEVICE BOXES:

A. Options:

1. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
2. Wallplate Material: As indicated on architectural Drawings.

12.3 NONMETALLIC COVER PLATES FOR DEVICE BOXES:

A. Options:

1. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
2. Wallplate Material: 0.060 inch (1.52 mm) thick high-impact thermoplastic (nylon) with smooth finish and color matching wiring device .
3. Color: As indicated on architectural Drawings.

HOODS FOR OUTLET BOXES

13.1 PERFORMANCE CRITERIA:

- A. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- B. General Characteristics:
1. Reference Standards:
 - a. UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - b. Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
- C. Mounts to box using fasteners different from wiring device.

13.2 EXTRA-DUTY, WHILE-IN-USE HOODS FOR OUTLET BOXES:

- A. Additional Characteristics: Marked "Extra-Duty" in accordance with UL 514D.
- B. Options:

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1. Provides color as indicated on Architectural drawings, weatherproof, "while-in-use" cover.
2. Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

14.1 GENERAL REQUIREMENTS FOR HANDHOLES AND BOXES:

- A. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
- B. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

14.2 POLYMER-CONCRETE HANDHOLES AND BOXES WITH POLYMER-CONCRETE COVER:

MOLDED OF SAND AND AGGREGATE, BOUND TOGETHER WITH POLYMER RESIN,
AND REINFORCED WITH STEEL, FIBERGLASS, OR A COMBINATION OF THE TWO.

- A. Standard: Comply with SCTE 77.
- B. Configuration: Designed for flush burial with open closed bottom unless otherwise indicated.
- C. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
- D. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- E. Cover Legend: Molded lettering, "ELECTRIC" or as noted on plans.
- F. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

14.3 FIBERGLASS HANDHOLES AND BOXES: MOLDED OF FIBERGLASS-REINFORCED

POLYESTER RESIN, WITH FRAME AND COVERS OF POLYMER
CONCRETE REINFORCED CONCRETE.

- A. Standard: Comply with SCTE 77.
- B. Configuration: Designed for flush burial with open closed bottom unless otherwise indicated.
- C. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
- D. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

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- E. Cover Legend: Molded lettering, "ELECTRIC" or as noted on plans.
- F. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 2 EXECUTION

15.1 RACEWAY APPLICATION

15.2 OUTDOORS: APPLY RACEWAY PRODUCTS AS SPECIFIED BELOW UNLESS

OTHERWISE INDICATED:

- A. Exposed Conduit: GRC IMC RNC, Type EPC-80-PVC.
- B. Concealed Conduit, Aboveground: GRC, IMC, or EMTRNC, Type EPC-40-PVC.
- C. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC, direct buried or concrete encased as noted on plans.
- D. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or LFNC.
- E. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or Type 4 as noted on plans.

15.3 INDOORS: APPLY RACEWAY PRODUCTS AS SPECIFIED BELOW UNLESS OTHERWISE

INDICATED.

- A. Exposed, Not Subject to Physical Damage: EMT, or IMC.
- B. Exposed and Subject to Physical Damage: GRC or IMC. Raceway locations include the following:
 - 1. Loading dock.
 - 2. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - 3. Mechanical rooms.
 - 4. Warehouse.
 - 5. Gymnasiums.
- C. Concealed in Ceilings and Interior Walls and Partitions: EMT.
- D. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
- E. Damp or Wet Locations: GRC or IMC.

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- F. Spray/wash down areas – PVC Coated GRC.
- G. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel nonmetallic in institutional and commercial kitchens and damp or wet locations.

15.4 MINIMUM RACEWAY SIZE: [1/2-INCH 3/4-INCH TRADE SIZE.

15.5 RACEWAY FITTINGS: COMPATIBLE WITH RACEWAYS AND SUITABLE FOR USE AND LOCATION.

- A. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
- B. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
- C. EMT: Use setscrew compression, steel cast-metal fittings. Comply with NEMA FB 2.10.
- D. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

15.6 DO NOT INSTALL ALUMINUM CONDUITS, BOXES, OR FITTINGS IN CONTACT WITH CONCRETE OR EARTH.

15.7 INSTALL SURFACE RACEWAYS ONLY WHERE INDICATED ON DRAWINGS.

15.8 DO NOT INSTALL NONMETALLIC CONDUIT WHERE AMBIENT TEMPERATURE EXCEEDS 120 DEGREES FAHRENHEIT (48.89 DEGREES CELSIUS).

INSTALLATION

16.1 COMPLY WITH REQUIREMENTS IN SECTION 260529 "HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS" FOR HANGERS AND SUPPORTS.

16.2 COMPLY WITH NECA 1 AND NECA 101 FOR INSTALLATION REQUIREMENTS EXCEPT WHERE REQUIREMENTS ON DRAWINGS OR IN THIS ARTICLE ARE STRICTER. COMPLY WITH NECA 102 FOR ALUMINUM CONDUITS. COMPLY WITH NFPA 70 LIMITATIONS FOR TYPES OF RACEWAYS ALLOWED IN SPECIFIC OCCUPANCIES AND NUMBER OF FLOORS.

16.3 DO NOT INSTALL RACEWAYS OR ELECTRICAL ITEMS ON ANY "EXPLOSION-RELIEF" WALLS OR ROTATING EQUIPMENT.

16.4 DO NOT FASTEN CONDUITS ONTO THE BOTTOM SIDE OF A METAL DECK ROOF.

16.5 KEEP RACEWAYS AT LEAST 6 INCHES (152.4 MM) AWAY FROM PARALLEL RUNS OF FLUES AND STEAM OR HOT-WATER PIPES. INSTALL HORIZONTAL RACEWAY RUNS ABOVE WATER AND STEAM PIPING.

16.6 COMPLY WITH REQUIREMENTS IN SECTION 260529 "HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS" FOR HANGERS AND SUPPORTS.

16.7 ARRANGE STUB-UPS SO CURVED PORTIONS OF BENDS ARE NOT VISIBLE ABOVE FINISHED SLAB.

16.8 INSTALL NO MORE THAN THE EQUIVALENT OF THREE 90-DEGREE BENDS IN ANY CONDUIT RUN EXCEPT FOR CONTROL WIRING CONDUITS, FOR WHICH FEWER BENDS ARE ALLOWED. SUPPORT WITHIN 12 INCHES (304.8 MM) OF CHANGES IN DIRECTION.

16.9 MAKE BENDS IN RACEWAY USING LARGE-RADIUS PREFORMED ELLS. FIELD BENDING SHALL BE ACCORDING TO NFPA 70 MINIMUM RADII REQUIREMENTS. USE ONLY EQUIPMENT SPECIFICALLY DESIGNED FOR MATERIAL AND SIZE INVOLVED.

16.10 CONCEAL CONDUIT AND EMT WITHIN FINISHED WALLS, CEILINGS, AND FLOORS UNLESS OTHERWISE INDICATED. INSTALL CONDUITS PARALLEL OR PERPENDICULAR TO BUILDING LINES.

16.11 SUPPORT CONDUIT WITHIN 12 INCHES (304.8 MM) OF ENCLOSURES TO WHICH ATTACHED.

16.12 RACEWAYS EMBEDDED IN SLABS:

- A. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
- B. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- C. Arrange raceways to keep a minimum of 1 inch (25.4 mm) 2 inches (50.8 mm) of concrete cover in all directions.
- D. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- E. Change from ENT to RNC, Type EPC-40-PVC, GRC or IMC before rising above floor.

16.13 STUB-UPS TO ABOVE RECESSED CEILINGS:

- A. Use EMT, IMC, or RMC for raceways.
- B. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

16.14 THREADED CONDUIT JOINTS, EXPOSED TO WET, DAMP, CORROSIVE, OR OUTDOOR CONDITIONS: APPLY LISTED COMPOUND TO THREADS OF RACEWAY AND FITTINGS BEFORE MAKING UP JOINTS. FOLLOW COMPOUND MANUFACTURER'S WRITTEN INSTRUCTIONS.

16.15 COAT FIELD-CUT THREADS ON PVC-COATED RACEWAY WITH A CORROSION- PREVENTING CONDUCTIVE COMPOUND PRIOR TO ASSEMBLY.

16.16 RACEWAY TERMINATIONS AT LOCATIONS SUBJECT TO MOISTURE OR VIBRATION: USE INSULATING BUSHINGS TO PROTECT CONDUCTORS INCLUDING CONDUCTORS SMALLER THAN NO. 4 AWG.

16.17 TERMINATE THREADED CONDUITS INTO THREADED HUBS OR WITH LOCKNUTS ON INSIDE AND OUTSIDE OF BOXES OR CABINETS. INSTALL BUSHINGS ON CONDUITS UP TO 1-1/4-INCH TRADE SIZE AND INSULATED THROAT METAL BUSHINGS ON 1-1/2-INCH TRADE SIZE AND LARGER CONDUITS TERMINATED WITH LOCKNUTS. INSTALL INSULATED THROAT METAL GROUNDING BUSHINGS ON SERVICE CONDUITS.

16.18 INSTALL PULL WIRES IN EMPTY RACEWAYS. USE POLYPROPYLENE OR MONOFILAMENT PLASTIC LINE WITH NOT LESS THAN 200-LB TENSILE STRENGTH. LEAVE AT LEAST 12 INCHES (304.8 MM) OF SLACK AT EACH END OF PULL WIRE. CAP UNDERGROUND RACEWAYS DESIGNATED AS SPARE ABOVE GRADE ALONGSIDE RACEWAYS IN USE.

16.19 SURFACE RACEWAYS:

- A. Install surface raceway with a minimum 2-inch radius control at bend points.
- B. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1219.2 mm) and with no less than two supports per straight raceway section. Support

surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

16.20 INSTALL RACEWAY SEALING FITTINGS AT ACCESSIBLE LOCATIONS ACCORDING TO NFPA 70 AND FILL THEM WITH LISTED SEALING COMPOUND. FOR CONCEALED RACEWAYS, INSTALL EACH FITTING IN A FLUSH STEEL BOX WITH A BLANK COVER PLATE HAVING A FINISH SIMILAR TO THAT OF ADJACENT PLATES OR SURFACES.

16.21 INSTALL DEVICES TO SEAL RACEWAY INTERIORS AT ACCESSIBLE LOCATIONS. LOCATE SEALS SO NO FITTINGS OR BOXES ARE BETWEEN THE SEAL AND THE FOLLOWING CHANGES OF ENVIRONMENTS. SEAL THE INTERIOR OF ALL RACEWAYS AT THE FOLLOWING POINTS:

- A. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
- B. Where an underground service raceway enters a building or structure.
- C. Conduit extending from interior to exterior of building.
- D. Conduit extending into pressurized duct and equipment.
- E. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
- F. Where otherwise required by NFPA 70.

16.22 EXPANSION-JOINT FITTINGS:

- A. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet (762 cm) .
- B. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - 1. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - 2. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - 3. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - 4. Attics: 135 deg F temperature change.
- C. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch (0.01 mm) per foot of length of straight run per degree F of temperature change for PVC conduits.

- D. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- E. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

16.23 FLEXIBLE CONDUIT CONNECTIONS: COMPLY WITH NEMA RV 3. USE A MAXIMUM OF 36 INCHES (914.4 MM) 72 INCHES (1828.8 MM) OF FLEXIBLE CONDUIT FOR RECESSED AND SEMIRECESSED LUMINAIRES, EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT; AND FOR TRANSFORMERS AND MOTORS.

- A. Use LFMC in damp or wet locations subject to severe physical damage.
- B. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

16.24 MOUNT BOXES AT HEIGHTS INDICATED ON DRAWINGS. IF MOUNTING HEIGHTS OF BOXES ARE NOT INDIVIDUALLY INDICATED, GIVE PRIORITY TO ADA REQUIREMENTS. INSTALL BOXES WITH HEIGHT MEASURED TO BOTTOM OF BOX UNLESS OTHERWISE INDICATED.

16.25 RECESSED BOXES IN MASONRY WALLS: SAW-CUT OPENING FOR BOX IN CENTER OF CELL OF MASONRY BLOCK, AND INSTALL BOX FLUSH WITH SURFACE OF WALL. PREPARE BLOCK SURFACES TO PROVIDE A FLAT SURFACE FOR A RAINTIGHT CONNECTION BETWEEN THE BOX AND COVER PLATE OR THE SUPPORTED EQUIPMENT AND BOX.

16.26 HORIZONTALLY SEPARATE BOXES MOUNTED ON OPPOSITE SIDES OF WALLS SO THEY ARE NOT IN THE SAME VERTICAL CHANNEL.

16.27 LOCATE BOXES SO THAT COVER OR PLATE WILL NOT SPAN DIFFERENT BUILDING FINISHES.

16.28 SUPPORT BOXES OF THREE GANGS OR MORE FROM MORE THAN ONE SIDE BY SPANNING TWO FRAMING MEMBERS OR MOUNTING ON BRACKETS SPECIFICALLY DESIGNED FOR THE PURPOSE.

16.29 FASTEN JUNCTION AND PULL BOXES TO OR SUPPORT FROM BUILDING STRUCTURE. DO NOT SUPPORT BOXES BY CONDUITS.

16.30 SET METAL FLOOR BOXES LEVEL AND FLUSH WITH FINISHED FLOOR SURFACE.

16.31 SET NONMETALLIC FLOOR BOXES LEVEL. TRIM AFTER INSTALLATION TO FIT FLUSH WITH FINISHED FLOOR SURFACE.

INSTALLATION OF UNDERGROUND CONDUIT

17.1 DIRECT-BURIED CONDUIT:

- A. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (152.4 mm) in nominal diameter.
- B. Install backfill as specified in Section 312000 "Earth Moving."
- C. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (304.8 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
- D. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - 1. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (76.2 mm) of concrete for a minimum of 12 inches (304.8 mm) on each side of the coupling.
 - 2. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
- E. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

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INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

18.1 INSTALL HANDHOLES AND BOXES LEVEL AND PLUMB AND WITH ORIENTATION AND DEPTH COORDINATED WITH CONNECTING CONDUITS TO MINIMIZE BENDS AND DEFLECTIONS REQUIRED FOR PROPER ENTRANCES.

18.2 UNLESS OTHERWISE INDICATED, SUPPORT UNITS ON A LEVEL BED OF CRUSHED STONE OR GRAVEL, GRADED FROM 1/2-INCH SIEVE TO NO. 4 SIEVE AND COMPACTED TO SAME DENSITY AS ADJACENT UNDISTURBED EARTH.

18.3 ELEVATION: IN PAVED AREAS, SET SO COVER SURFACE WILL BE FLUSH WITH FINISHED GRADE. SET COVERS OF OTHER ENCLOSURES 1 INCH (25.4 MM) ABOVE FINISHED GRADE.

18.4 FIELD-CUT OPENINGS FOR CONDUITS ACCORDING TO ENCLOSURE MANUFACTURER'S WRITTEN INSTRUCTIONS. CUT WALL OF ENCLOSURE WITH A TOOL DESIGNED FOR MATERIAL TO BE CUT. SIZE HOLES FOR TERMINATING FITTINGS TO BE USED, AND SEAL AROUND PENETRATIONS AFTER FITTINGS ARE INSTALLED.

SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

19.1 INSTALL SLEEVES AND SLEEVE SEALS AT PENETRATIONS OF EXTERIOR FLOOR AND WALL ASSEMBLIES. COMPLY WITH REQUIREMENTS IN SECTION 260544 "SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING."

FIRESTOPPING

20.1 INSTALL FIRESTOPPING AT PENETRATIONS OF FIRE-RATED FLOOR AND WALL ASSEMBLIES. COMPLY WITH REQUIREMENTS IN SECTION 078413 "PENETRATION FIRESTOPPING."

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PROTECTION

21.1 PROTECT COATINGS, FINISHES, AND CABINETS FROM DAMAGE AND DETERIORATION.

- A. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- B. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rigid nonmetallic duct.
2. Duct accessories.
3. Precast concrete handholes.
4. Precast manholes.
5. Utility structure accessories.

B. Related Requirements:

1. Section 260533 – “Raceways And Boxes For Electrical Systems” for metallic conduit requirements, Polymer concrete handholes and boxes, and fiberglass handholes and boxes.

1.2 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
1. Two or more ducts installed in parallel, with or without additional casing materials.
 2. Multiple duct banks.

1.3 REFERENCE STANDARDS

- A. AASHTO HB - Standard Specifications for Highway Bridges; 2005, with Errata.
- B. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures; 2019.
- C. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures; 2020.
- D. ASTM C1037 - Standard Practice for Inspection of Underground Precast Concrete Utility Structures; 2016 (Reapproved 2024).
- E. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

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- F. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
- I. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Precast or Factory-Fabricated Underground Utility Structures:
 - a. Include plans, elevations, sections, details, attachments to other work, and accessories.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include reinforcement details.
 - d. Include frame and cover design and manhole chimneys.
 - e. Include ladder/step details.
 - f. Include grounding details.
 - g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
 - h. Include joint details.
 - 2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.
- B. Product Certificates: For concrete and steel used in precast concrete manholes and, as required by ASTM C858.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

PART 2 PRODUCTS

2.1 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cantex Inc.
 - 2. CertainTeed Corporation; Saint-Gobain North America.
 - 3. Condux International, Inc.
 - 4. Crown Line Plastics.
 - 5. ElecSys, Inc.
 - 6. Electri-Flex Company.
 - 7. Endot Industries Inc.
 - 8. IPEX USA LLC.
 - 9. Lamson & Sessions.
 - 10. Manhattan/CDT.
 - 11. National Pipe & Plastics.
 - 12. Spiraduct/AFC Cable Systems, Inc.
- C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.2 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Products Division.
 - b. Allied Tube & Conduit; Atkore International.

- c. Cantex Inc.
 - d. IPEX USA LLC.
 - e. PenCell Plastics.
 - f. Underground Devices, Inc.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.3 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Christy Concrete Products.
 - 2. Jensen Precast
 - 3. Oldcastle Infrastructure Inc.; CRH Americas.
 - 4. Rinker Group, Ltd.
 - 5. Riverton Concrete Products.
 - 6. Utility Concrete Products, LLC.
 - 7. Utility Vault Co.
- C. Comply with ASTM C858 for design and manufacturing processes.
- D. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
- E. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- F. Cover Legend: Molded lettering, "ELECTRIC." as indicated for each service.
- G. Configuration: Units shall be designed for flush burial and have open closed bottom unless otherwise indicated.
- H. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
- 1. Extension shall provide increased depth of 12 inches (304.8 mm).
 - 2. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
- I. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

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- J. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (304.8 mm) vertically and horizontally to accommodate alignment variations.
- K. Handholes 12 inches (304.8 mm) wide by 24 inches (609.6 mm) long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- L. The box shall be rated for incidental traffic. It shall be suitable for H-20 loading in off-street locations that are not subject to high density traffic.

2.4 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C1037.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 UNDERGROUND DUCT APPLICATION

- A. Duct for Electrical Feeders 600 V and Less: RNC Type EPC-80-PVC Type EPC-40-PVC, concrete-encased unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: RNC Type EPC-80-PVC Type EPC-40-PVC, direct-buried unless otherwise indicated.
- C. Underground Ducts Crossing Paved Paths Driveways, Roadways, and Railroads: RNC Type EPC-40 PVC, encased in reinforced concrete.
- D. Stub-ups: Concrete-encased RNC GRC PVC-coated GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10 H-20 structural load rating.

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2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 Polymer concrete, SCTE 77, Tier 15 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 Polymer concrete units, SCTE 77, Tier 8 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin/High-density plastic, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area immediately after backfilling is completed after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1219.2 mm) 12.5 feet (381 cm), both horizontally and vertically, at other locations unless otherwise indicated.
 1. Duct shall have maximum of two 90 degree bends or the total of all bends shall be no more 180 degrees between pull points.

- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (152.4 mm) o.c. for 4-inch duct, and vary proportionately for other duct sizes.
- H. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet (304.8 cm) outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Install GRC penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- I. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- J. Pulling Cord: Install 200-lbf-test nylon cord in empty ducts.
- K. Concrete-Encased Ducts and Duct Bank:
 - 1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches (152.4 mm) in nominal diameter.
 - 2. Width: Excavate trench 3 inches (76.2 mm) wider than duct on each side.
 - 3. Depth: Install so top of duct envelope is at least 24 inches (609.6 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (762 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 - 4. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 - 5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four five spacers per 20 feet (609.6 cm) of duct. Place spacers within 24 inches (609.6 mm) of duct ends. Stagger spacers approximately 6 inches (152.4 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 6. Minimum Space between Duct: 3 inches (76.2 mm) between edge of duct and exterior envelope wall, 2 inches (50.8 mm) between ducts for like services, and 4 inches (101.6 mm) between power and communications ducts.

7. Elbows: Use manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct run.
8. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
9. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
10. Concrete Cover: Install a minimum of 3 inches (76.2 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50.8 mm) between duct of like services, and 4 inches (101.6 mm) between power and communications ducts.
11. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

L. Direct-Buried Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (152.4 mm) in nominal diameter.
2. Width: Excavate trench 3 inches (76.2 mm) wider than duct on each side.
3. Depth: Install top of duct at least 36 inches (914.4 mm) below finished grade unless otherwise indicated.
4. Set elevation of bottom of duct bank below frost line.
5. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than fourfive spacers per 20 feet (609.6 cm) of duct. Place spacers within 24 inches (609.6 mm) of duct ends. Stagger spacers approximately 6 inches (152.4 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Install duct with a minimum of 3 inches (76.2 mm) between ducts for like services and 6 inches (152.4 mm) between power and communications duct.
8. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
9. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
10. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (101.6 mm) over duct and

hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

- a. Place minimum 6 inches (152.4 mm) of engineered fill above concrete encasement of duct.
- M. Underground-Line Warning Tape: Bury nonconductingconducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches (304.8 mm) above all concrete-encased duct and duct banks and approximately 12 inches below grade. Align tape parallel to and within 3 inches (76.2 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches (457.2 mm). Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES,HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Install handholes with bottom below frost line below grade.
2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25.4 mm) above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

E. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (98 mm) for manholes and 2 inches (50.8 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box

extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.

- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25.4 mm) above finished grade.
- D. Install handholes and boxes with bottom below frost line, below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi (20684.28 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: 10 inches (254 mm) wide by 12 inches (304.8 mm) deep.

3.8 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-long mandrel equal to duct size minus 1/4 inch (6.35 mm). If obstructions are indicated, remove obstructions and retest.
 - 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION 260543

BUILDING AND SITE IMPROVEMENTS WESTEND NAVIGATION CENTER

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 GENERAL

2.1 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- B. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- C. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

2.2 RELATED DOCUMENTS

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

2.3 SUMMARY

- A. Section Includes:
 - 1. Round sleeves.
 - 2. Rectangular sleeves.
 - 3. Sleeve seal systems.
 - 4. Grout.
 - 5. Pourable sealants.
 - 6. Foam sealants.

2.4 ACTION SUBMITTALS

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

PART 2 PRODUCTS

3.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral water stop.

B. Pipe Sleeves, PVC:

1. Description: ASTM D1785, Schedule 40.

C. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

3.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Description:
 - a. Material: Galvanized sheet steel.
 - b. Minimum Metal Thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (406.4 mm), thickness must be 0.052 inch (1.32 mm).
 - 2) For sleeve cross-section rectangle perimeter not less than 50 inches (1270 mm) or with one or more sides larger than 16 inches (406.4 mm), thickness must be 0.138 inch (3.51 mm).

3.3 SLEEVE SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

1. Sealing Elements: EPDM Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel Fiber-reinforced plastic or Stainless steel as noted on drawings.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

3.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
 - 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

4.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed or seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50.8 mm) above finished floor level. Install sleeves during erection of floors.
- C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for wall assemblies.
- D. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

- E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- F. Underground, Exterior-Wall and Floor Penetrations:
 - 1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Install sleeve during construction of floor or wall.
 - 2. Install steel pipe sleeves in existing walls. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

4.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with expanding foam without leaving voids.
- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

4.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

- A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- D. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
- E. ASTM A1023/A1023M - Standard Specification for Carbon Steel Wire Ropes for General Purposes; 2021.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- G. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements; 2022.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- I. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2020).
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section Includes:
 - 1. Elastomeric isolation pads.
 - 2. Restraints - rigid type.
 - 3. Restraints - cable type.
 - 4. Restraint accessories.
 - 5. Post-installed concrete anchors.

6. Concrete inserts.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load capacity for each seismic and wind-load restraint device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic and wind-load restraint component used.
3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by ICC-ES product listing, UL product listing, FM Approvals, an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.
4. Annotate to indicate application of each product submitted and compliance with requirements.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittal for Each Seismic-Restraint Device:

1. For each seismic-restraint device, including restraint - rigid and cable type, restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on Drawings, submit the following:
 - a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
 - b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
 - c. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.
 - d. Qualified Professional Engineer: All designated design submittals for seismic calculations are to be signed and sealed by the qualified professional engineer responsible for their preparation.
2. Seismic and Wind-Load Restraint Detail Drawings:
 - a. Design Analysis: To support selection and arrangement of seismic and wind-load restraints. Include calculations of combined tensile and shear loads.

- b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint details with wind-load details required for equipment mounted outdoors.
- 3. Product Listing, Preapproval, and Evaluation Documentation: By an evaluation service member of ICC-ES, UL, FM Approvals, OSHPD, or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
- 4. All delegated design submittals for seismic and wind-load-restraint detail drawings are to be signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic and wind-load bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Welding certificates.
- C. Field quality-control reports.
- D. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in ASCE/SEI 7-05, ASCE/SEI 7-10, Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.
 - 1. Provide equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction or experience data as permitted by.
 - 2. Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7-05 ASCE/SEI 7-10.
 - 3. Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by a licensed professional engineer.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, be and NRTL as defined by OSHA in 29 CFR 1910.7, and be acceptable to authorities having jurisdiction.

- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic and Wind-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing, UL product listing FM Approvals an evaluation service member of ICC-ES, or an agency acceptable to authorities having jurisdiction.
- D. Comply with NFPA 70.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic and wind-load control system.
 - 1. Seismic and Wind-Load Performance: Equipment shall withstand the effects of earthquake motions and high wind events determined in accordance with ASCE/SEI 7-05 ASCE/SEI 7-10.
- B. Seismic Design Calculations:
 - 1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-05 ASCE/SEI 7-10 including supplement No. 1 ???Insert ASCE/SEI 7 edition or other seismic calculation method required by authorities having jurisdiction. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.
 - a. Required data needed for calculations by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
- C. Consequential Damage: Provide additional seismic and wind-load restraints for suspended electrical components or anchorage of floor-, roof-, or wall-mounted electrical components as indicated in ASCE/SEI 7-05 ASCE/SEI 7-10 so that failure of a non-essential or essential electrical component will not cause failure of any other essential architectural, mechanical, or electrical building component.
- D. Fire/Smoke Resistance: Seismic-and wind-load-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.
- E. Component Supports:
 - 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.

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2. All component support attachments must comply with force and displacement resistance requirements of ASCE/SEI 7-05 Section 13.6 ASCE/SEI 7-10 Section 13.6.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mason Industries Inc.
 - b. Tech Products.
 - c. Kinetics Noise Control, Inc.
 - d. ISOTECH, Inc.
 - e. VMC Group.
2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.
6. Sandwich-Core Material: Resilient and elastomeric.
 - a. Surface Pattern: Smooth, ribbed, or waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.3 RESTRAINTS - RIGID TYPE

- #### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
 2. Caddy, a brand of nVen
 3. California Dynamics Corporation.
 4. Cooper B-Line, Inc.; a division of Cooper Industries.
 5. Hilti Inc.
 6. Loos & Co.; Seismic Earthquake Division.
 7. Mason Industries.
 8. OLCO Incorporated; a brand of NIBCO INC.
 9. Unistrut; Tyco International, Ltd.

10. Vibration Mountings & Controls, Inc.

- B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.4 RESTRAINTS - CABLE TYPE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Caddy, a brand of nVen
 2. Loos & Co.; Seismic Earthquake Division.
 3. Mason Industries.
 4. Vibration Mountings & Controls, Inc.
- B. Seismic and Wind-Load-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel ASTM A492 stainless steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket, or mechanical (Flemish eye) loop.
- C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.5 RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
 2. Caddy, a brand of nVen
 3. California Dynamics Corporation.
 4. Cooper B-Line, Inc.; a division of Cooper Industries.
 5. Hilti Inc.
 6. Loos & Co.; Seismic Earthquake Division.
 7. Mason Industries.
 8. OLCO Incorporated; a brand of NIBCO INC.
 9. Unistrut; Tyco International, Ltd.

10. Vibration Mountings & Controls, Inc.

- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections Reinforcing steel angle clamped to hanger rod. Non-metallic stiffeners are unacceptable.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.6 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Caddy, a brand of nVen
 - b. Hilti Inc.
 - c. Power Fastners
 - d. Simpson Strong Tie Co., Inc
 - 2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.
- B. Provide post-installed concrete anchors that have been prequalified for use in seismic and wind-load applications. Post-installed concrete anchors must comply with all requirements of ASCE/SEI 7-05, Ch. 13 ASCE/SEI 7-10, Ch. 13.
- 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- C. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.
- 1. Undercut expansion anchors are permitted.

2.7 CONCRETE INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Caddy, a brand of nVen
 - 2. Hilti Inc.
 - 3. Power Fastners
 - 4. Simpson Strong Tie Co., Inc
- B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.
- C. Comply with MSS SP-58.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive seismic and wind-load control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static, wind-load, and seismic loads within specified loading limits.

3.3 INSTALLATION OF SEISMIC-RESTRAINT AND WIND-LOAD CONTROL DEVICES

- A. Provide seismic restraint and wind-load control devices for systems and equipment where indicated in Equipment Schedules or Electrical Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

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1. Install all equipment and devices to withstand the effects of earthquake motions and high wind events determined in accordance with ASCE/SEI 7-05 ASCE/SEI 7-10 .
- B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- C. Installation of seismic and wind-load restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.
- D. Equipment Restraints:
 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.18 mm).
 2. Install seismic-restraint and wind-load-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:
 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.18 mm).
 2. Install seismic- restraint and wind-load-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
 3. Comply with requirements in NFPA 70 and ASCE/SEI 7-05 ASCE/SEI 7-10 ???Insert requirement???
- F. Equipment and Hanger Restraints:
 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.18 mm).
 2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction] providing required submittals for component.
- G. Install cables so they do not bend across edges of adjacent equipment or building structure.
- H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- J. Post-Installed Concrete Anchors:
 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered

during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 1. Perform tests and inspections with the assistance of a factory-authorized service representative.
 2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
 4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 5. Test no fewer than four??? of each type and size of installed anchors and fasteners selected by Architect.
 6. Test to 90 percent of rated proof load of device.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Seismic controls will be considered defective if they do not pass tests and inspections.

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E. Prepare test and inspection reports.
END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1910.145 - Accident Prevention Signs and Tags; Current Edition.
- C. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- D. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.
- E. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- F. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- G. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.
- H. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.
- I. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- L. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.
- M. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Tags.

6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Comply with NFPA 70E and requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 1. Black letters on an orange field.
 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase-and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.

2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 3. Colors for 240-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 4. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 5. Color for Neutral: White or gray.
 6. Color for Equipment Grounds: Bare copperGreen.
 7. Colors for Isolated Grounds: Green two or more yellow stripes.
- C. Warning Label Colors:
1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36XX INCHES."
 - a. "XX" will be per CEC/NEC TABLE 110.26(A)(1) and the condition in which applies to equipment to be labeled.
- E. Equipment Identification Labels:
1. Black letters on a white field.

2.3 LABELS

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ideal Industries, Inc.
 - b. Panduit Corp.
- B. Self-Adhesive Labels: Polyester Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ideal Industries, Inc.
 - b. Panduit Corp.
2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches (152.4 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inches (127 mm) for equipment.
 - c. As required by authorities having jurisdiction.

2.4 TAPES AND STENCILS

A. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ideal Industries, Inc.
 - b. Marking Services, Inc.
2. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE."
4. Tag: Type I:
 - a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - b. Width: 3 inches (76.2 mm).
 - c. Thickness: 4 mils (0.1016 mm).
 - d. Weight: 18.5 lb/1000 sq. ft..
 - e. Tensile according to ASTM D882: 30 lbf and 2500 psi (17236.90 kPa).
5. Tag: Type 2:
 - a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - b. Width: 3 inches (76.2 mm).
 - c. Overall Thickness: 5 mils (0.127 mm).

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- d. Foil Core Thickness: 0.35 mil (0.00889 mm).
- e. Weight: 28 lb/1000 sq. ft.
- f. Tensile according to ASTM D882: 70 lbf and 4600 psi (31715.90 kPa).

2.5 TAGS

A. Write-on Tags:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlton Industries, LP.
 - b. LEM Products Inc.
- 2. Polyester Tags: 0.010 inch (0.25 mm) 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment.
- 3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.6 SIGNS

A. Baked-Enamel Signs:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlton Industries, LP.
 - b. Marking Services, Inc.
- 2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
- 3. 1/4-inch grommets in corners for mounting.
- 4. Nominal Size: 7 by 10 inches (254 mm).

B. Laminated Acrylic or Melamine Plastic Signs:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work.
- 2. Engraved legend.
- 3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch (1.59 mm) thick.
 - b. For signs larger than 20 sq. in., 1/8 inch (3.18 mm) thick.
 - c. Instructional Sign: Engraved legend with black letters on white face.
 - d. Identification Sign: Engraved legend with white letters on a dark gray background.
 - e. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting Self-adhesive.

- f. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ideal Industries, Inc.
 - 2. Marking Services, Inc.
 - 3. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (4.76 mm).
 - 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi (82737.12 kPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (4.76 mm).
 - 2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi (82737.12 kPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch (4.76 mm).
 - 2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi (48263.32 kPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transferload shedding ???Insert emergency operations???.
- L. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- M. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
 2. "POWER."
 3. "UPS."
- N. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- O. Self-Adhesive Labels:
1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches (50.8 mm) high.
- P. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (152.4 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- Q. Underground Line Warning Tape:
1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (203.2 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (406.4 mm) overall.
 2. Limit use of underground-line warning tape to direct-buried cables.
- R. Write-on Tags:
1. Place in a location with high visibility and accessibility.
 2. Secure using general-purpose UV-stabilized cable ties.
- S. Baked-Enamel Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches (50.8 mm) high.
- T. Laminated Acrylic or Melamine Plastic Signs:
1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

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2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches (50.8 mm) high.
- U. Cable Ties: General purpose, for attaching tags, except as listed below:
1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels vinyl tape applied in bands.
1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
1. "EMERGENCY POWER."
 2. "POWER."
 3. "UPS."
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labelsself-adhesive wraparound labels snap-around labels to identify the phase.
1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Conductors to Be Extended in the Future: Attach write-on tags marker tape to conductors and list source.
- G. Auxiliary Electrical Systems Conductor Identification: Marker tape Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

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- H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- I. Workspace Indication: Apply floor marking tape]or to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- J. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labelsBaked-enamel warning signs.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- L. Arc Flash Warning Labeling: Self-adhesive labels.
- M. Operating Instruction Signs: Self-adhesive labels Baked-enamel warning signs Metal-backed, butyrate warning signs.
- N. Emergency Operating Instruction Signs: Self-adhesive labels Baked-enamel warning signs Metal-backed, butyrate warning signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer load shedding ???Insert emergency operations???.
- O. Equipment Identification Labels:
 - 1. Indoor Equipment: Self-adhesive labelBaked-enamel signs.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign Stenciled legend 4 inches (101.6 mm) high.

END OF SECTION 260553

SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS

1.1 SUMMARY

- A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:
 - 1. Arc-flash study input data, including completed computer program input data sheets.
 - 2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
 - 3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. For Power System Analysis Specialist.
- B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

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- D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
 - 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

PART 2 PRODUCTS

2.1 REFERENCE STANDARDS

- A. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- B. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).
- C. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

2.2 COMPUTER SOFTWARE DEVELOPERS

- A. Vendors: Utilize software from one of the following:
 - 1. SKM Systems Analysis, Inc.
 - 2. ETAP.
 - 3. EasyPower.
- B. Comply with IEEE 1584 and NFPA 70E.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory" features as listed in IEEE 399.

2.3 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary of study findings.

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- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Arc-Flash Study Output Reports:
 - 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- F. Incident Energy and Flash Protection Boundary Calculations:
 - 1. Arcing fault magnitude.
 - 2. Protective device clearing time.
 - 3. Duration of arc.
 - 4. Arc-flash boundary.
 - 5. Restricted approach boundary.
 - 6. Limited approach boundary.
 - 7. Working distance.
 - 8. Incident energy.
 - 9. Hazard risk category.
 - 10. Recommendations for arc-flash energy reduction.
- G. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.4 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.
- B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," or "DANGER, ARC-FLASH HAZARD" per analysis and shall include the following information taken directly from the arc-flash hazard analysis:
 - 1. Location designation.
 - 2. Nominal voltage.
 - 3. Protection boundaries.
 - a. Arc-flash boundary.
 - b. Restricted approach boundary.
 - c. Limited approach boundary.
 - 4. Arc flash PPE category.
 - 5. Required minimum arc rating of PPE in Cal/cm squared.
 - 6. Available incident energy.
 - 7. Working distance.
 - 8. Engineering report number, revision number, and issue date.
- C. Labels shall be machine printed, with no field-applied markings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Prior to starting the Arc-Flash Hazard Analysis obtain field data from the point of power connection as the source utilizing the minimum AFC rating at the point of connection.
 - 1. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.

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- C. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- D. Include low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.
- E. Calculate the limited, restricted, and prohibited approach boundaries for each location.
- F. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
 - 1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
- G. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:
 - 1. When the circuit breaker is in a separate enclosure.
 - 2. When the line terminals of the circuit breaker are separate from the work location.
- H. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the arc-flash hazard analysis.
 - 1. Verify completeness of data supplied on one-line diagram on Drawings. Call discrepancies to Engineer's attention.
 - 2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.

3.4 LABELING

- A. Apply one arc-flash label on the front cover of each section of the equipment for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of equipment listed below shall have an arc-flash label applied to it:
 - 1. Low-voltage switchboard.
 - 2. Switchgear.
 - 3. Low voltage transformers. Exclude transformers with high voltage side 240 V or less and less than 125 kVA.

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4. Panelboard and safety switch over 250 V.
 5. Applicable panelboard and safety switch under 250 V.
- C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.
1. Indicate arc-flash energy.
 2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

END OF SECTION 260573.19

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SECTION 260573 - SHORT CIRCUIT, COORDINATION, AND ARC-FLASH HAZARD ANALYSIS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ICEA P-45-482 - Short Circuit Performance of Metallic Shields and Sheaths on Insulated Cables; 2023.
- B. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).
- C. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- D. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.
- E. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).
- F. IEEE C57.12.00 - IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2021.
- G. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.2 SUMMARY

- A. Section includes a computer-based, arc-flash study to determine minimum interrupting capacity of circuit protective devices, determine overcurrent protective device settings for selective tripping, and determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:

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1. Short circuit, coordination, and arc-flash study input data, including completed computer program input data sheets.
2. Short circuit, coordination, and arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
- D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations,

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licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Short Circuit, Coordination, and Arc-Flash Study Certification: Short Circuit, Coordination, and Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

G. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Vendors:

1. SKM Systems Analysis, Inc
2. ETAP
3. EasyPower

B. Comply with IEEE 242, IEEE 399, IEEE 551, IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory" features as listed in IEEE 399.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.

7. Any revisions to electrical equipment required by the study.
- D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- E. Protective Device Evaluation:
 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
 3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data:
 1. One-line diagram of system being studied.
 2. Power sources available.
 3. Manufacturer, model, and interrupting rating of protective devices.
 4. Conductors.
 5. Transformer data.
- G. Short-Circuit Study Output Reports:
 1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.
 2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - 1) Based on fault-point X/R ratio.
 - 2) Based on calculated symmetrical value multiplied by 1.6.
 - 3) Based on calculated symmetrical value multiplied by 2.7.
 3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.

- b. Calculated symmetrical fault-current magnitude and angle.
- c. Fault-point X/R ratio.
- d. No AC Decrement (NACD) ratio.
- e. Equivalent impedance.
- f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
- g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

2.3 COORDINATION STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, and panelboard designations.
 - 6. Any revisions to electrical equipment required by the study.
 - 7. Study Input Data: As described in "Power System Data" Article.
- D. Protective Device Coordination Study:
 - 1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
 - a. Phase and Ground Relays:
 - 1) Device tag.
 - 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
 - 3) Recommendations on improved relaying systems, if applicable.
 - b. Circuit Breakers:
 - 1) Adjustable pickups and time delays (long time, short time, and ground).
 - 2) Adjustable time-current characteristic.
 - 3) Adjustable instantaneous pickup.
 - 4) Recommendations on improved trip systems, if applicable.
 - c. Fuses: Show current rating, voltage, and class.
- E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

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1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:
 - a. Power utility's overcurrent protective device.
 - b. Low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - c. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
 - d. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
 - e. Ground-fault protective devices.
 - f. The largest feeder circuit breaker in each motor-control center and panelboard.
5. Maintain selectivity for tripping currents caused by overloads.
6. Provide adequate time margins between device characteristics such that selective operation is achieved.
7. Comments and recommendations for system improvements.

2.4 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
 1. Protective device designations and ampere ratings.
 2. Conductor types, sizes, and lengths.
 3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Arc-Flash Study Output Reports:
 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

- a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- F. Incident Energy and Flash Protection Boundary Calculations:
1. Arcing fault magnitude.
 2. Protective device clearing time.
 3. Duration of arc.
 4. Arc-flash boundary.
 5. Restricted approach boundary.
 6. Limited approach boundary.
 7. Working distance.
 8. Incident energy.
 9. Hazard risk category.
 10. Recommendations for arc-flash energy reduction.
- G. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.5 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.
- B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD" or "DANGER, ARC-FLASH HAZARD" as determined by the analysis, and shall include the following information taken directly from the arc-flash hazard analysis:
 1. Location designation.
 2. Nominal voltage.
 3. Protection boundaries.
 - a. Arc-flash boundary.
 - b. Restricted approach boundary.
 - c. Limited approach boundary.

4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 EXECUTION

3.1 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the study.
- B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 242, IEEE 399, IEEE 551, and IEEE 1584as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.

3.2 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.
 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
- E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- F. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

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- G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- H. Include in the report identification of any protective device applied outside its capacity.

3.3 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.4 COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 - 2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
- E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- F. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- G. Motor Protection:
 - 1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
 - 2. Select protection for motors served at voltages more than 600 V according to IEEE 620.
- H. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that

equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

- I. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.
- J. Include the ac fault-current decay from induction motors and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.
- K. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- L. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 - 2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
 - 3. Include in the report identification of any protective device applied outside its capacity.

3.5 LOAD-FLOW AND VOLTAGE-DROP STUDY

- A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
 - 1. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
 - 2. Determine load flow and voltage drop based on 80 percent of the design capacity of load buses.
 - 3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.6 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

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1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis or obtain results from another source.
- C. Calculate maximum and minimum contributions of fault-current size.
 1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
 2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
- D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Include low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.
- F. Calculate the limited, restricted, and prohibited approach boundaries for each location.
- G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
 1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
- H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:
 1. When the circuit breaker is in a separate enclosure.
 2. When the line terminals of the circuit breaker are separate from the work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.8 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the arc-flash hazard analysis.

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1. Verify completeness of data supplied on one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to Architect's attention.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.

3.9 LABELING

- A. Apply one arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of equipment listed below shall have an arc-flash label applied to it:
 1. Motor-control center.
 2. Low-voltage switchboard.
 3. Switchgear.
 4. Medium-voltage switch.
 5. Medium voltage transformers
 6. Low voltage transformers. Exclude transformers with high voltage side 240 V or less and less than 125 kVA.
 7. Panelboard and safety switch over 250 V.
 8. Applicable panelboard and safety switch under 250 V.
 9. Control panel.
- C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.
 1. Indicate arc-flash energy.
 2. Indicate protection level required.

3.10 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

END OF SECTION 260573

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.
- E. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
- F. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- G. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section Includes:
 - 1. Time switches.
 - 2. Photoelectric switches.
 - 3. Standalone daylight-harvesting switching and dimming controls.
 - 4. Indoor occupancy and vacancy sensors.
 - 5. Switchbox-mounted occupancy and vacancy sensors
 - 6. Digital timer light switches.
 - 7. High-bay occupancy and vacancy sensors.
 - 8. Outdoor motion sensors.
 - 9. Lighting contactors.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
 - 2. Interconnection diagrams showing field-installed wiring.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Software and firmware operational documentation.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intermatic.
 - 2. Tork.
 - 3. Hubbell.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Contact Configuration: SPST, DPST, or as noted on plans.
 - 3. Contact Rating: 30-A inductive or resistive, 240-V ac, 20-A ballast load, 120-/240-V ac, or 15-A resistive, 277V

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4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
 5. Automatic daylight savings time changeover.
 6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.
- C. Electromechanical-Dial Time Switches: Comply with UL 917.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Contact Configuration: SPST, DPST, or as noted on plans.
 3. Contact Rating: 30-A inductive or resistive, 240-V ac, 20-A ballast load, 120-/240-V ac, or 15-A resistive, 277V
 4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
 5. Astronomic time dial.
 6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
 7. Skip-a-day mode.
 8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Intermatic.
 2. Tork.
 3. Hubbell.
 4. Same manufacturer as outdoor lighting fixtures.
- B. Description: Solid state; one set of NO dry contacts rated for 24 V dc at 1 A or 24 V ac at 1 A, to operate connected load, complying with UL 773, and compatible with either luminaire, power pack, or lighting control panelboard.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
 3. Time Delay: Thirty-second minimum, to prevent false operation.

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4. Mounting: 1/2-inch threaded male conduit.
5. Failure Mode: Luminaire stays ON.
6. Power Pack: Digital controller capable of accepting up to four RJ45 inputs with one or two outputs rated for 20-A incandescent or LEJ load at 120- and 277-V ac, for 13-A ballast or LED at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
 - a. Compatible with digital addressable lighting interface.
 - b. Plenum rated.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Wattstopper; Legrand.
 2. Greengate; Cooper Lighting.
 3. Leviton.
 4. Intermatic.
 5. Tork.
 6. Hubbell.
- B. General Requirements for Sensors:
 1. Wall or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 2. Passive infrared, Ultrasonic, or Dual technology.
 3. Integrated Separate Power pack.
 4. Hardwired or Wireless connection to switch and lighting control system.
 5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 6. Operation (Refer to Sequence of Operations for details by space type):
 7. Sensor Output for the following options:
 - a. Contacts rated to operate the connected relay, complying with UL 773A.
 - b. Sensor is powered from the power pack.
 - c. Wireless.
 8. Power: Line voltage or Integral photovoltaic collector.
 9. Power Pack: Dry contacts rated for 20-A ballast LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

10. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 12. Bypass Switch: Override the "on" function in case of sensor failure.
 13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Wall or Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
 2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet (2743.2 cm) when mounted on a 10-foot-high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq feet (1.07643 sq cm) 2000 sq feet (2.15285 sq cm) 3000 sq feet (3.22928 sq cm) when mounted 48 inches (1219.2 mm) above finished floor.
- D. Ultrasonic Type: Wall or Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (304.8 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (2743.2 cm) when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet (426.72 cm).
 6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq feet (1.07643 sq cm) 2000

sq feet (2.15285 sq cm) 3000 sq feet (3.22928 sq cm) when mounted 84 inches (2133.6 mm) above finished floor.

- E. Dual-Technology Type: Wall or Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 - 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches (304.8 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 - 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq feet (1.07643 sq cm) 2000 sq feet (2.15285 sq cm) 3000 sq feet (3.22928 sq cm) when mounted 48 inches (1219.2 mm) above finished floor.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wattstopper; Legrand.
 - 2. Greengate; Cooper Lighting.
 - 3. Leviton.
 - 4. Daintree, Current
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox, with provisions for connection to BAS.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
 - 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 - 4. Switch Rating: Not less than 800-VA ballast or LED load at 120 V, 1200-VA ballast or [LED load at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor:

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1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.2100 sq. ft.
2. Sensing Technology: PIR Dual technology - PIR and ultrasonic.
3. Switch Type: SP. SP, manual "on," automatic "off."]SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Match the circuit voltageDual voltage - 120 and 277 V.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Optional- Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Color: White unless noted otherwise.
10. Faceplate: Color matched to switch.

2.5 DIGITAL TIMER LIGHT SWITCH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Wattstopper; Legrand.
 2. Greengate; Cooper Lighting.
 3. Leviton.
 4. Intermatic.
 5. Tork.
 6. Hubbell.
- B. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, backlit LCD display, with selectable time interval in 10 20 minute increments.
 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 amps at 277-V ac for ballast or LED, and 1/4 horsepower at 120-V ac.
 2. Integral relay for connection to BAS.
 3. Voltage: Match the circuit voltage[Dual voltage - 120 and 277 V.
 4. Color: White unless otherwise noted.

5. Faceplate: Color matched to switch.

2.6 OUTDOOR MOTION SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Wattstopper; Legrand.
 2. Greengate; Cooper Lighting.
 3. Leviton.
 4. Intermatic.
 5. Tork.
 6. Hubbell.
- B. Description: Solid-state outdoor motion sensors.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
 2. PIRDual-technology (PIR and ultrasonic) type, weatherproof. Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. Comply with UL 773A.
 3. Switch Rating:
 - a. Luminaire-Mounted Sensor: 1000-W incandescent, 500-VA fluorescent/LED.
 - b. Separately Mounted Sensor: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 4. Switch Type: SP.
 5. Voltage: Match the circuit voltage [Dual voltage, 120- and 277-V type.
 6. Detector Coverage:
 - a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
 - b. Long Range: 180-degree field of view and 110-foot detection range.
 7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
 8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.

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10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" according to UL 773A.

2.7 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Square D; Siemens
 2. Rockwell Automation
- B. Description: Electrically operated and mechanically or electrically held per plans, combination-type lighting contactors with fusible switch nonfused disconnect, complying with NEMA ICS 2 and UL 508.
 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.

2.8 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 No. 22 No. 24 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 No. 16 No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- C. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

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- D. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (12.7 mm).
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's written instructions.
- C. Size conductors in accordance with lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems."
- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

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2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.6 SOFTWARE SERVICE AGREEMENT

- A. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two ???Insert number??? years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train[Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General-purpose transformers.
- B. K-factor transformers rated for nonlinear loads.

1.2 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
 - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 260916 - Electric Controls and Relays: Industrial control transformers.
- H. Section 262416 - Panelboards.
- I. Section 262713 - Electricity Metering: Instrument transformers for electrical metering.

1.3 REFERENCE STANDARDS

- A. 10 CFR 431 - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- G. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

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- H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
 1. K-factor Rated Transformers: Include K-factor ratings.
- C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
 1. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

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- G. Maintenance Data: Include recommended maintenance procedures and intervals.
- H. Project Record Documents: Record actual locations of transformers.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.8 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com/#sle.
- B. Schneider Electric: www.se.com/#sle.
- C. Siemens Industry, Inc: www.new.siemens.com/#sle.
- D. Substitutions: See Section 016000 - Product Requirements.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

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- B. Seismic Qualification: Provide transformers suitable for application under seismic design criteria in accordance with Section 260548 where required. Include certification of compliance with submittals.
- C. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet (1,000 m).
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
 - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
- D. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- E. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- F. Basic Impulse Level: 10 kV.
- G. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- H. Isolate core and coil from enclosure using vibration-absorbing mounts.
- I. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
 - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- D. Winding Taps:
 - 1. Less than 3 kVA: None.
 - 2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 - 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

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4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- F. Sound Levels: Standard sound levels complying with NEMA ST 20
- G. Mounting Provisions:
 1. Less than 15 kVA: Suitable for wall mounting.
 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 3. Larger than 75 kVA: Suitable for floor mounting.
- H. Transformer Enclosure: Comply with NEMA ST 20.
 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 1.
 - b. Outdoor locations: Type 3R.
 2. Construction: Steel.
 - a. Less than 15 kVA: Totally enclosed, non-ventilated.
 - b. 15 kVA and Larger: Ventilated.
 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 4. Provide lifting eyes or brackets.
- I. Accessories:
 1. Mounting Brackets: Provide manufacturer's standard brackets.
 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA EN 10250, type 3R assembly.

2.4 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.
- B. K-factor Rating: K-4, or higher.
- C. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- D. Coil Conductors: Continuous aluminum windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.

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- E. Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
- F. Neutral Bus: Sized to accommodate twice the rated secondary current.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20
- I. Mounting Provisions:
 - 1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 2. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 1.
 - b. Outdoor locations: Type 3R.
 - 2. Construction: Steel, ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.
- K. Accessories:
 - 1. Mounting Brackets: Provide manufacturer's standard brackets.
 - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA EN 10250, type 3R assembly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).

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- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 - 1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
 - 2. Provide required vibration isolation and/or seismic controls in accordance with Section 260548.
 - 3. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 - 4. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
 - 5. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.
- L. Identify transformers in accordance with Section 260553.

3.3 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262200

SECTION 262413 - SWITCHBOARDS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ANSI C12.1 - Electric Meters - Code for Electricity Metering; 2026.
- B. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2020).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- E. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- F. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- J. UL 891 - Switchboards; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interruption; Current Edition, Including All Revisions.
- L. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section Includes:
 - 1. Service and distribution switchboards rated 600 V and less.
 - 2. Surge protection devices.
 - 3. Disconnecting and overcurrent protective devices.
 - 4. Instrumentation.
 - 5. Control power.
 - 6. Accessory components and features.
 - 7. Identification.

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1.3 ACTION SUBMITTALS

- A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
- B. Shop Drawings: For each switchboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
 - 5. Detail utility company's metering provisions with indication of approval by utility company.
- C. Delegated Design Submittal:
 - 1. For arc-flash hazard analysis.
 - 2. For arc-flash labels.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer Testing agency.
- B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 FIELD QUALITY-CONTROL REPORTS.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1.8 FIELD CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.
- B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.
- C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified. and the unit will be fully operational after the seismic event."

2.2 SWITCHBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
 4. General Electric Company, ABB
- B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Comply with NEMA PB 2 "Deadfront Distribution Switchboards"
- E. Comply with NFPA 70 "National Electrical Code (NEC)"
- F. Comply with UL 891 "Switchboards"
- G. Comply with UL 943 "Ground Fault Circuit-Interruption"
- H. Comply with UL 1449 "Surge Protective Devices"
- I. Front-Connected, Front-Accessible Switchboards:
 1. Main Devices: Panel or Fixed, individually mounted as shown on single line diagrams.
 2. Branch Devices: Panel mounted.
 3. Sections front and rear aligned.
- J. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

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- a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- K. Indoor Enclosures: Steel, NEMA 250, Type 1 .
- L. Outdoor Enclosures: Type 3RType 3R, with interior-lighted walk-in aisle.
 - 1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 - 2. Enclosure: FlatDownward, rearward sloping roof; bolt-on rear covers rear hinged doors for each section, with provisions for padlocking.
 - 3. Doors: Personnel door at each end of aisle, minimum width of 30 inches (762 mm); opening outwards; with panic hardware and provisions for padlockingcylinder lock. At least one door shall be sized to permit the largest single switchboard section to pass through without disassembling doors, hinges, or switchboard section.
 - a. Factory-installed electric unit heater(s), wall or ceiling mounted, with integral thermostat and disconnect and with capacities to maintain switchboard interior temperature of 40 deg F with outside design temperature of 0 deg F.
 - b. Factory-installed exhaust fan with capacities to maintain switchboard interior temperature of 100 deg F with outside design temperature of 90 deg F.
 - c. Ventilating openings complete with replaceable fiberglass air filters.
 - d. Thermostat: Single stage; wired to control heat and exhaust fan.
- M. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.
- N. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- O. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- P. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- Q. Pull Box on Top of Switchboard if required:
 - 1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
 - 2. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
 - 3. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.

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4. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.
- R. Buses and Connections: Three phase, four wire unless otherwise indicated.
1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
 2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
 3. Tin-plated aluminum feeder circuit-breaker line connections.
 4. Ground Bus: 1/4-by-2-inch-1/4-by-1-inch Minimum-size required by NEC and UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical compression connectors for feeder and branch-circuit ground conductors.
 5. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
 6. Disconnect Links:
 - a. Isolate neutral bus from incoming neutral conductors.
 - b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
 7. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
- S. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 SURGE PROTECTION DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
 4. General Electric Company, ABB
- B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.
- C. Features and Accessories:
1. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

2. Indicator light display for protection status.
- D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA/250kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
 1. Line to Neutral: 1200 V for 480Y/277 V 700 V for 208Y/120 V.
 2. Line to Ground: 1200 V for 480Y/277 V 1200 V for 208Y/120 V.
 3. Line to Line: 2000 V for 480Y/277 V 1000 V for 208Y/120 V.
- F. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
 1. Line to Neutral: 700 V.
 2. Line to Ground: 700 V 1000 V.
 3. Line to Line: 1000 V.
- G. SCCR: Equal or exceed 100 kA/200 kA.
- H. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating/interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long and short time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical Compression style, suitable for number, size, trip ratings, and conductor material.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 5575 percent of rated voltage.
 - f. Key Interlock Kit when shown on plans: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- B. Insulated-Case Circuit Breaker (ICCB): 80 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.
 1. Fixed Drawout circuit-breaker mounting.
 2. Two-step, stored-energy closing.
 3. Standard Full-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Time adjustments for long- and short-time pickup.
 - c. Ground-fault pickup level, time delay, and I^2t response.
 4. Key Interlock Kit where shown on plans: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- D. Fuses are specified in Section 262813 "Fuses."
- E. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
 1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
 - a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
 - d. Megawatts: Plus or minus 1 percent.
 - e. Megavars: Plus or minus 1 percent.
 - f. Power Factor: Plus or minus 1 percent.
 - g. Frequency: Plus or minus 0.1 percent.
 - h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.

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- i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
 2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
- F. Watt-Hour Meters and Wattmeters:
1. Comply with ANSI C12.1.
 2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
 3. Suitable for connection to three- and four-wire circuits.
 4. Potential indicating lamps.
 5. Adjustments for light and full load, phase balance, and power factor.
 6. Four-dial clock register.
 7. Ratchets to prevent reverse rotation.
 8. Removable meter with drawout test plug.
 9. Semiflush mounted case with matching cover.
 10. Appropriate multiplier tag.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.
- B. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 260548.16 "Seismic Controls for Electrical Systems" or manufacturer's instructions.

2.6 IDENTIFICATION

- A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400]NEMA PB 2.1.
- B. Install switchboards and accessories according to NECA 400]NEMA PB 2.1.

- C. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
 - 1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches (50.8 mm) above concrete base after switchboard is anchored in place.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to switchboards.
 - 6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- E. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- G. Install filler plates in unused spaces of panel-mounted sections.
- H. Install overcurrent protective devices, surge protection devices, and instrumentation.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- I. Install spare-fuse cabinet.
- J. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

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- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Acceptance Testing:
 - a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
 - b. Test continuity of each circuit.
 - 2. Test ground-fault protection of equipment for service equipment per NFPA 70.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Switchboard will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.
- C. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- G. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- H. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

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

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.

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3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for SPD as installed in panelboard.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Key interlock scheme drawing and sequence of operations.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.5 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 FIELD CONDITIONS

1.8 DELIVERY, STORAGE AND HANDLING

- A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.
- B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.
- C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush or Surface-mounted as shown on plans, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Height: 84 inches (2133.6 mm) maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: As identified in plan drawings.
- G. Phase, Neutral, and Ground Buses: Tin-plated aluminum Hard-drawn copper, 98 percent conductivity.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Compression Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 - 3. Ground Lugs and Bus-Configured Terminators: Compression Mechanical type, with a lug on the bar for each pole in the panelboard.
 - 4. Feed-Through Lugs: Compression Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Compression Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- I. NRTL Label: Service Entrance Panelboard(s) shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures,

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wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

- J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
- B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1 if Service Entrance, otherwise Type 2.

2.3 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. Siemens Industry, Inc., Energy Management Division.
 - 3. Square D; Schneider Electric USA.
 - 4. General Electric Company, ABB
- B. Panelboards: NEMA PB 1, distribution type.
- C. Mains: Circuit breaker or Lugs only, refer to plan schedules.
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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

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2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
 4. General Electric Company, ABB
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only, refer to plan schedules.
- D. Branch Overcurrent Protective Devices: Plug-in Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
 4. General Electric Company, ABB
- B. MCCB: Comply with UL 489, with series-connected rating interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.

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4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Subfeed Circuit Breakers: Vertically mounted.
8. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. Lugs: Compression Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - d. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - e. Ground-Fault Protection: Integrally mounted Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - f. Shunt Trip: 120-V 24-Vtrip coil energized from separate circuit, set to trip at 55 75 percent of rated voltage.
 - g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on off on or off position.
 - h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
 1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2.6 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder metal frame with transparent protective cover.

2.7 ACCESSORY COMPONENTS AND FEATURES

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.

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- B. Install panelboards and accessories according to NECA 407 NEMA PB 1.1.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- I. Install filler plates in unused spaces.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:

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1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 99 - Health Care Facilities Code; 2024, with Errata.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- J. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- K. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard-grade receptacles, 125 V, 15 A.
 - 2. USB receptacles.
 - 3. GFCI receptacles, 125 V, 20 A.
 - 4. Toggle switches, 120/277 V, 15 A.
 - 5. Decorator-style devices, 15 A.
 - 6. Residential devices.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

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- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: AlmondWhite or as selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Essential Electrical System: Red.
 - 3. SPD Devices: Blue.
 - 4. Isolated-Ground Receptacles: OrangeAs specified above, with orange triangle on face.
- F. Wall Plate Color: For plastic covers, match device color.
- G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - 2. Leviton Manufacturing Co., Inc.
 - 3. Pass & Seymour; Legrand North America, LLC.
 - 4. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 15A AND 20 A

- A. Duplex Receptacles, 125 V, 15A and 20 A:
 - 1. Description: Two pole, three wire, and self-grounding.

2. Configuration: NEMA WD 6, Configuration 5-20R.
 3. Standards: Comply with UL 498 and FS W-C-596.
- B. Tamper-Resistant Duplex Receptacles, 125 V, 15A and 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
 2. Configuration: NEMA WD 6, Configuration 5-20R.
 3. Standards: Comply with UL 498 and FS W-C-596.
 4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.
- C. Weather-Resistant Duplex Receptacle, 125 V, 15A and 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 2. Configuration: NEMA WD 6, Configuration 5-20R.
 3. Standards: Comply with UL 498.
 4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.
- D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 15A and 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 2. Configuration: NEMA WD 6, Configuration 5-20R.
 3. Standards: Comply with UL 498.
 4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.3 USB RECEPTACLES

- A. USB Charging Receptacles:
1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
 2. USB Receptacles: Dual and, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
 3. Standards: Comply with UL 1310 and USB 3.0 devices.
- B. Tamper-Resistant Duplex and USB Charging Receptacles:

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1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
2. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
3. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
4. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Feed Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Feed Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Type: Feed Non-feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.

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5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.5 TOGGLE SWITCHES, 120/277 V, 15 A AND 20A

A. Single-Pole Switches, 120/277 V, 15 A AND 20A:

1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 15 A AND 20A:

1. Comply with UL 20 and FS W-S-896.
2. Description: Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
3. Standards: Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 15 A AND 20A:

1. Comply with UL 20 and FS W-S-896.

2.6 DECORATOR-STYLE DEVICES, 15 A AND 20 A

A. Decorator Duplex Receptacles, 125 V, 15 A AND 20A:

1. Description: Two pole, three wire, and self-grounding. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.

B. Decorator, Tamper-Resistant, Duplex Receptacles, 125 V, 15 A AND 20A,:

1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Decorator, Tamper- and Weather-Resistant, Duplex Receptacles, 125 V, 15 A AND 20A:

1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.

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4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

D. Decorator Single-Pole Switches, 120/277 V, 15 A AND 20A:

1. Comply with UL 20.

2.7 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant, GFCI Receptacles, 125 V, 15 A:

1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 943 and UL 1699.

B. Residential-Grade, Tamper-Resistant, AFCI Receptacles, 125 V, 15 A:

1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 943 and UL 1699.

C. Residential-Grade, Tamper-Resistant Receptacles, 125 V, 15 A:

1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 498.

D. Weather- and Tamper-Resistant Receptacles, 125 V, 15 A:

1. Configuration: NEMA WD 6, Configuration 5-15R.
2. Feed-through connectors.
3. Standards: Comply with UL 498.
4. Marked as "Weather Resistant."

2.8 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting Smooth, high-impact thermoplastic 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.

3. Material for Unfinished Spaces: Galvanized steelSmooth, high-impact thermoplastic.
 4. Material for Damp Locations: Thermoplastic Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum]thermoplastic with lockable cover.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 3. Install wiring devices after all wall preparation, including painting, is complete.
- C. Device Installation:
1. Connect devices to branch circuits using pigtails that are not less than 6 inches (152.4 mm) in length.
 2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- D. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up down, and on horizontally mounted receptacles to the right]left.
 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. In healthcare facilities, prepare reports that comply with NFPA 99.
 2. Test Instruments: Use instruments that comply with UL 1436.

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3. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

- C. Test straight-blade convenience outlets in patient-care areas]hospital-grade outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

- D. Wiring device will be considered defective if it does not pass tests and inspections.

- E. Prepare test and inspection reports.

END OF SECTION 262726

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SECTION 262813 - FUSES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.2 SUMMARY

- A. Section Includes:

- 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Control circuits.
 - b. Motor-control centers.
 - c. Panelboards.
 - d. Switchboards.
 - e. Enclosed controllers.
 - f. Enclosed switches.

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bussman; Eaton.
 - 2. Littlefuse.
 - 3. Mersen; Ferraz Shawmut.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

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1. Type RK-1: 250 600V, zero to 600A rating, 200 kAIC, time delay.
 2. Type RK-5: 250 600V, zero to 600A rating, 200 kAIC, time delay.
 3. Type J: 600V, zero to 600A rating, 200 kAIC, time delay.
 4. Type L: 600V, 601 to 6000A rating, 200 kAIC, time delay.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Architect/Owner.

3.2 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Enclosed safety switches.
- B. Enclosed fused power-circuit devices.

1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
 - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.
- F. Section 262513 - Low-Voltage Busways: Fusible switch busway plug-in units.
- G. Section 262813 - Fuses.
- H. Section 262913 - Enclosed Controllers: Manual motor controllers.
- I. Section 263600 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- J. UL 977 - Fused Power-Circuit Devices; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Field Quality Control Test Reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. See Section 262813 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

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- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ENCLOSED SAFETY SWITCHES

- A. Manufacturers:
 - 1. Eaton Corporation: www.eaton.com/#sle.
 - 2. Schneider Electric: www.se.com/#sle.
 - 3. Siemens Industry, Inc: www.siemens.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- E. Horsepower Rating: Suitable for connected load.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Short Circuit Current Rating:

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1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
 - c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
 - d. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
1. Comply with NEMA BS 31047.
 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

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3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.

P. General Duty Switches:

1. Conductor Terminations:
 - a. Provide mechanical lugs.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Identify enclosed switches in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.

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- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.16

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SECTION 265119.01 - LED LIGHTING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.
- B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- F. SSPC-SP 5/NACE No.1 - White Metal Blast Cleaning; 2006.
- G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.2 SUMMARY

- A. Section includes the interior LED luminaires listed in the plan schedules.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- B. Product Certificates: For each type of luminaire.

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- C. Product test reports.
- D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified. and the luminaire will be fully operational during and after the seismic event."
- C. Ambient Temperature: 41 to 104 deg F to 104 deg F.
 - 1. Relative Humidity: Zero to 95 percent.
- D. Altitude: Sea level to 1000 feet (30480 cm).

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- F. UL Compliance: Comply with UL 1598 and listed for wet location.
- G. California Title 24 compliant.
- H. Standards:
 - 1. ENERGY STAR certified.
 - 2. RoHS compliant.
 - 3. UL Listing: Listed for location to be installed.
 - 4. Recessed luminaires shall comply with NEMA LE 4.

2.3 INTERIOR METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 EXTERIOR FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
 3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0 inch (0.02 mm) or thicker) complying with AAMA 611.
 4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0 inch (0.02 mm) or thicker), complying with AAMA 611.
 - a. Color: Per plan schedule.
- D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No.1 or SSPC-SP 8.
 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color:
 - 1) As selected from manufacturer's standard catalog of colors.

2.5 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

2.6 EXTERIOR FIXTURE MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum, Stainless steel, or Epoxy-coated steel per plan schedule. Form and support to prevent warping and sagging.

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- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch (3.18 mm) minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer for exterior fixtures.
 - 1. Fasten luminaire to structural support.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.

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4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support based on manufacturer's requirements.
- F. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- G. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Aim as indicated on Drawings.
- B. Install on concrete base with top 4 inches (101.6 mm) above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119.01

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, and removing/abandoning site utilities
- B. Related Sections:
 - 1. Division 01 Specifications apply to this section.
 - 2. Division 02 Section and "Site Demolition" for demolition of site improvements.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.
- D. Tree-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

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1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions. Provide copy to Engineer of Record.

1.6 QUALITY ASSURANCE

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

1.7 PROJECT CONDITIONS

- A. Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties, public right-of-way and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners. The full width of pavements damaged due to construction access and other construction-related activities shall be replaced with a structural section (pavement and base) at least equal to the adjacent existing section.
 - 3. Protect existing utility lines indicated to remain. Notify Architect immediately of any damage to or encounter with an unknown existing utility line. Immediately repair damage to existing utility lines.
- B. Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 - 1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
 - 2. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating

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- formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Architect. Employ a licensed arborist to repair damage to trees and shrubs.
 4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- D. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Contractor shall delineate with construction stakes, the property line along the southeast side of the project.
 2. Contractor shall document the pre-construction condition and photograph the existing CMU retaining wall along the southeast property line.
 3. Do not proceed with work on adjoining property until directed by Architect.
- E. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises per owner's direction.
- F. Utility Locator Service: Notify UNDERGROUND SERVICE ALERT for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earthwork."
1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
- B. Tree Wound Paint: Bituminous based paint of standard manufacture specially formulated for the intended use.

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PART 3 - EXECUTION

3.1 SITE CLEARING

- A. Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
 - 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 2. Unless specifically designated to remain, strip the upper two inches (minimum) of soil containing vegetation and root growth within the Limits of Work shown on the Drawings.
- B. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
 - 1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings. Removing abandoned underground piping or conduits interfering with construction is included under this Section.
 - 2. Contractor shall refer to the project's Asbestos Abatement Report for removal of asbestos containing materials and other potential hazardous materials.
- C. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
 - 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 - 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 - 3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer and compact in accordance with the requirements specified in Section 31 "Earthwork" to make the new surface conform with the existing adjacent surface of the ground.
 - 4. Trim trees, designated to be left standing within the cleared areas, of dead branches 1-1/2 inches or more in diameter; and trim all branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1-1/4 inches in diameter with specified tree-wound paint.
- D. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.
 - 1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
 - a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
 - 2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind and sediment erosion.
 - 3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.

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- E. Protect and maintain benchmarks and survey control points from disturbance during construction.
- F. Locate and clearly identify trees, shrubs, and other vegetation to remain.

3.2 EXISTING UTILITIES

- A. Arrange with Owner for disconnecting and sealing of all overhead and underground utilities that serve adjoining existing structures before site clearing.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Arrange with owner scheduling of utilities shut off.
- C. Locate, identify, and disconnect utilities indicated to be removed.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Contractor shall note that various unknown and undocumented underground utilities exist at the project site. Contractor shall ensure that utilities are inactive or shut off prior to removal or abandonment. Contractor shall document all found underground utilities and notify engineer of record for further direction.

3.3 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

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3.4 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 nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

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SECTION 312000 - EARTHWORK

PART 1 - GENERAL

- 1.1 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. Preparing and grading subgrades for slabs-on-grade, walks, pavements and landscaping
2. Excavating and backfilling for buildings and structures.
3. Drainage and moisture-control fill course for concrete slabs-on-grade.
4. Base course for concrete walks, asphalt and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches for utilities and appurtenances outside building lines.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Division 03 Section "Cast-in-Place Concrete" for granular course beneath the slab-on-grade.
3. Division 31 Section "Site Clearing" for site stripping, grubbing, and removal of above- and below-grade improvements and utilities.

1.3 REFERENCE SPECIFICATION

- A. Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", [Latest](#) Edition, [City of Fontana](#) Ordinances and Amendments, latest editions, UBC and [2022](#) CBC. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
- B. The recommendations found in the Geotechnical Exploration Report prepared by [Geocon West, Inc.](#) dated [September 2025](#) apply to this Section.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

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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.
- B. Base Course: Aggregate layer placed between the subbase course and the surface pavement in paving system.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill when sufficient approved soil material is not available from excavations
- E. Drainage Fill: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.
1. Authorized Additional Excavation: Excavation below subgrade elevations as directed by Architect.
 2. Unauthorized Excavation: Excavation below subgrade elevations without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. 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.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. 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.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.
- L. Compaction: Any method of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum dry density obtained by the test procedure described in ASTM D 1557 for general soil types abbreviated in this Specification as 90 percent of maximum dry density".
- M. Hard Material: Weathered rock, dense consolidated deposits or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal

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- N. Lift: A layer or course of soil placed on top of previously prepared or placed soil in a fill or embankment.
- O. Unsatisfactory Material: Soil or other material identified as having insufficient strength or stability to carry intended loads without excessive consolidation or loss of stability.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Warning Tape
 - 2. Geotextile
 - 3. Water Quality Filter Media
- B. Location of Borrow Materials.
- C. Material Test Reports
- D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction
- B. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- C. Pre-excavation Conference: Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.
 - 1. Provide a minimum 48-hours' notice to the Architect and receive written notice to proceed before interrupting any utility.

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- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies and owner to shutoff services if lines are active.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- D. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- E. Utility Locator Service: Notify UNDERGROUND SERVICE ALERT for area where Project is located before beginning earth moving operations.
- F. Do not commence earth moving operations until temporary erosion/sedimentation control measures, specified in Division 01 are in place.
- G. Perched Groundwater was encountered at 20 feet below the ground surface during exploration.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil materials imported or excavated on the property determined to be suitable as referenced in the project Geotechnical Investigation Report; and approved by the Geotechnical Engineer.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.
 - 1. Refer to Geotechnical Investigation Report, for unsuitable materials and disposal methods for unsatisfactory soils.
- D. Backfill and Fill Materials: Satisfactory soil materials.
- E. Base Material: Shall conform to crushed aggregate base or crushed miscellaneous base, as specified on plan, in accordance with section 200-2.2 or 200-2.4, respectively, of the Reference Specification, and compacted to at least 95% of the maximum dry density as determined by ASTM Test Method D 1557.

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- F. Engineered Fill: Base Materials and compacted fill materials
- G. Bedding Material: **Shall be clean coarse sand unless otherwise called in Soils report.**
- H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No. 8 sieve
- I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 50 sieve.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
 - 3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
 - 4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
 - 5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
 - 6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 - 7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
 - 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
 - 6. White: Steam systems
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility,

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with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.
6. White: Steam Systems

PART 3 - EXECUTION

3.1 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. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Tree protection is specified in the Section 31 10 00 "Site Clearing". Refer to landscape architectural plans for instructions.
- D. Prepare subgrade and place base materials in accordance with sections 301-1.2 and 301-2, respectively, of the Reference Specification.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Dewatering shall be done in accordance with NPDES waste discharge requirements. Contractor shall obtain all necessary Dewatering permits from state and local jurisdictions.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

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3.4 EXCAVATION, GENERAL

- A. General: Excavation shall be to the contours, elevations and dimensions indicated. Keep excavations free from water and debris while construction is in progress. Notify the Owner immediately in writing where it becomes necessary to remove hard, soft, weak, or wet material to a depth greater than indicated. Unless otherwise indicated, concrete placed below grade will be formed and excavations shall allow for placement and removal of forms. Side cuts shall be cribbed and shored as required.
- B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions as described in the referenced Geotechnical Investigations Report.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials, replace with satisfactory soil materials.
 - 2. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and rocks.
 - 3. Rock fragments greater than 3 inches in diameter shall be taken off-site or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal.

3.5 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
- B. Unshored Temporary Excavations:
 - 1. Unshored temporary excavations may be sloped back at 1 to 1 (horizontal to vertical) or flatter up to 5 feet in height. Where sloped embankments are used, the tops of the slopes should be barricaded to prevent vehicles and storage loads within seven feet of the tops of the slopes. If the temporary construction slopes will be maintained during the rainy season, construct berms along the tops of the slopes where necessary to prevent run-off water from entering the excavation and eroding the slope faces.

3.6 EXCAVATION FOR STRUCTURES

- A. Excavation Limits: Shall be to a tolerance of plus-or-minus 0.10 foot and shall extend five (5) feet laterally beyond the building limits at the excavation level and five (5) feet below existing grade, or deeper to excavate existing fill. The excavation side slopes shall not exceed a slope ratio of 1.5 to 1, horizontal to vertical, up to 5 feet in height, unless they are positively retained by shoring or other approved methods. Over-excavation side slopes may be vertical, as long as they are no higher than allowed by the State of California Construction Safety Orders, in which case they shall be no steeper than 1.5 to 1. If cut below depths indicated, excavations shall be

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filled with concrete when the foundations or footings are placed. Revise first subparagraph below if footings and foundations are placed on engineered fill.

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.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot. Do not disturb bottom of excavations intended as bearing surfaces.

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.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.8 EXCAVATION FOR UTILITY TRENCHES

- A. Excavation made with power-driven equipment is not permitted within two feet of any known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, use hand or light equipment excavation. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines and other existing work affected by the excavation work of this Section until approval for backfill is granted by the geotechnical engineer. Immediately report damage to utility lines or subsurface construction to the Owner.
- B. Where unidentified existing utilities are encountered, determine whether these are active or abandoned. Remove interfering portions of abandoned utilities and cap or plug open ends of pipe to remain. The cap or plug must seal the opening in such a manner that would permit remaining portions of the utility to be reactivated. Notify Owner for instructions on utilities which are determined to be active. Do not proceed without instructions, except to correct an immediate hazard or emergency condition. Relocation work performed on an active utility without obtaining prior approval from Owner shall be done at the Contractor's expense and liability.
- C. In areas where compacted backfill has been placed, additional consolidation may occur after completion due to changes in moisture content and surcharge. Utility connections crossing this backfill, and improvements adjoining the building at the backfill line shall be installed taking into account this additional consolidation, or sufficient time shall be scheduled between backfilling operations and such improvements to allow this consolidation to take place.

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Damage to utilities or other improvements due to Contractor's negligence in regard to this paragraph shall be repaired at the Contractor's expense

- D. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, and any other damage. Repair and re-establish damaged or eroded grades and slopes and restore surface construction prior to acceptance
- E. Cutting Pavement, Curbs, and Gutters: Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Architect.
- F. Contractor shall pothole at all identifiable crossings of existing utilities prior to any trenching operations and provide Architect with a survey of the top elevations (and bottom elevations, if applicable), of possible interferences so that an evaluation of necessary adjustments to the current profile or alignment may be made. Additionally, Architect shall be given the opportunity to view possible conflicts in the field prior to providing revised designs.
- G. Provide a minimum cover from grade of 3 feet for water mains and gas mains unless otherwise indicated on plans and details. Storm drains and sewers shall be to the depths indicated. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
- H. Keep excavations free from water while construction is in progress.
- I. Notify the Owner immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Excavate large rock, boulders, and other unyielding material to depth at least 6 inches below the bottom of the pipe, conduit, duct and appurtenances, unless otherwise indicated or specified. Over-excavate soft, weak, or wet excavations to an depth at least 6 inches below the bottom of the pipe, conduit, duct or appurtenances unless otherwise indicated or specified.
- J. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
- K. Excavate trenches to uniform widths to provide a working 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, except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. See plans for detail.
- L. At the option of the Contractor, the excavations may be overcut to depth of not less than 4 inches and refilled to required grade as specified.
- M. 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 stones and sharp objects to avoid point loading.

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1. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation.

3.9 APPROVAL OF SUBGRADE

- A. Notify Architect when excavations have reached required subgrade.
- B. If and when Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Roll subgrade below the building slabs and pavements with a pneumatic-tired roller to identify soft pockets and areas of excess yielding. Do not roll wet or saturated subgrades.
 1. Completely roll subgrade in one direction, repeating rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Unforeseen additional excavation and replacement material will be paid for according to Contract provisions for Changes in Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

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3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. 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.

3.12 SOIL TREATMENT

- A. All chemical applications used for soil treatment are subject to the approval of the Owner.
- B. Recommended termiticide: Chlorpyrifos "Dursban TC", or "Permetrin Torpedo" or "Dagnet", or approved equal.
- C. Do not apply soil treatment solution until excavating, filling and grading operations are completed and prior to any membrane being placed beginning concrete placement or other construction activities.
- D. To ensure penetration, do not apply soil treatment to excessively wet soils or during inclement weather. Comply with handling and application instruction of soil toxicant manufacturer.
- E. Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under foundations.
- F. Apply soil treatment solution at rates recommended by soil toxicant manufacturer.
- G. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities
- H. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

3.13 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, subdrainage, damp-proofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

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3.14 UTILITY TRENCH BACKFILL AND COMPACTION

- A. Backfilling of exterior utility trenches shall not be undertaken until geotechnical engineer has received 24-hours notice, until required tests and inspections have been completed, and until as-built location notes have been furnished. Remove uninspected backfill in accordance with requirements of this specification. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings.
- B. Place backfill material in accordance with Section 306-1.3.2 of the Reference Specifications and achieve at least 90% of the maximum density. The top 12 inches of backfill in the building or paved areas shall be compacted to 90% of maximum density.
- C. Compaction by ponding or flooding will not be permitted.
- D. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- E. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings
- F. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway base.
- G. Place and compact initial backfill of satisfactory soil material or base material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

3.15 FILL

- A. Preparation: Scarify and remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
 - 1. The scarified ground shall be brought to optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than 12 inches in depth, the excess shall be removed and placed in lifts restricted to six inches.
 - 2. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use base materials

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4. Under building slabs, use base materials
 5. Under footings and foundations, use drainage fill materials.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.16 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
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.
 - a. Stockpile or spread and dry removed wet satisfactory soil material.

3.17 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 6 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. Keep rollers and other heavy equipment at least 18 inches from footings, foundations, piers and walls of buildings and accessory construction. Use mechanical and hand tampers weighing at least 90 pounds with a maximum face area of 48 inches square to compact backfill within 18 inches of construction and where access is restricted.
- C. Percentage of Maximum Dry Density Requirements: Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
1. For general site fills, compact each layer of backfill or fill material at 90 percent maximum dry density.
 2. Under structures, building slabs, and steps, scarify and recompact top 24 inches below footing or slab and each layer of backfill or fill soil material at 90 percent maximum dry density.
 3. Under walkways and paving, scarify and recompact top 12 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent maximum dry density.
 4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent maximum dry density.

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3.18 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
 - 3. If necessary, the Contractor's selected equipment and construction procedure shall be altered, changed or modified in order to meet the specified compaction requirements. Flooding and water jetting is prohibited.
- 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. Lawn or Unpaved Areas: ± 0.10 foot, unless otherwise indicated.
 - 2. Concrete Walks: ± 0.025 foot.
 - 3. Pavements:
 - a. Concrete: 0.025 foot minus, with no high spots.
 - b. Asphalt: 0.05 foot minus, with no high spots.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of $\frac{1}{2}$ inch when tested with a 10-foot straightedge.

3.19 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Storm Drainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches x 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 90 percent of maximum dry unit weight
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 90 percent of maximum dry unit weight
 - 2. Place and compact impervious fill over drainage backfill in 6-inch thick compacted layers to final subgrade.

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3.20 BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 - 1. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density.
 - 2. Shape base to required crown elevations and cross-slope grades.
 - 3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
 - 4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 PAVEMENT REPAIR

- A. Repair or patch asphalt pavement as specified in Section 32 12 16 Asphalt Paving. Repair or patch concrete pavement, curbs and gutters as specified in Section 32 1313 Concrete Paving. Do not repair pavement until trench has been backfilled and compacted as herein specified. As a minimum, maintain one-way traffic on roads and streets crossed by trenches.

3.22 FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
 - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017
 - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Architect.
- B. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

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- C. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
- D. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
- E. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
- F. 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.

3.23 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.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact at optimum moisture content to the required density.
- 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.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

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SECTION 312219 - FINISH GRADING

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. Weeding.
 - 2. Finish grading of lawn and planting areas.
- B. Related Sections include the following:
 - 1. 32 90 00: Section: Landscape Planting
 - 2. 32 80 00: Irrigation System
 - 3. 31 20 00: Earthwork

1.3 DEFINITIONS

- A. Finish grading: finish grading shall consist of adjusting and finishing soil surfaces with site or imported topsoil, raking grades to a smooth, even, uniform plane. Remove and legally dispose of all extraneous matter off site. Facilitate natural run-off water and establish grades and drainage indicated as part of the contract work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Topsoil: Refer to Section 32 90 00 Landscape Planting.
- B. Obtain imported topsoil from approved local sources.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Prior to commencing the finish grading, review the installed work of other trades and verify that their work is complete.
 - 1. Rough Grading: Grading in planting areas (except raised planter areas) shall be established to within plus or minus 0.10 foot prior to beginning of finish grading.
- B. Import topsoil only when necessary to supplement site soil to achieve grades shown on drawings, or if site soil is unsuitable for planting.

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3.2 PREPARATION

- A. Weeding: Before finish grading, weeds and grasses shall be dug out by the root or sprayed with an herbicide and disposed of off-site. This procedure is outlined under the Landscape Planting Section.
- B. Debris: Remove stones and debris 1 inch in diameter and greater and clumps of earth that do not break up. Dispose of off-site.

3.3 INSTALLATION

- A. General: When rough grading and weeding have been completed, and the soil has dried sufficiently to be readily worked, lawn and planting areas shall be graded to the elevations indicated on the Drawings.
 - 1. Grades indicated on Drawing are grades that will result after thorough settlement and compaction of the soil.
 - 2. Grades not otherwise indicated shall be uniform finish grades and, if required, shall be made at the direction of the Architect.
 - 3. Finish grades shall be smooth, even, and a uniform plane with no abrupt change of surfaces.
 - 4. Soil areas adjacent to buildings shall slope away from the building to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the run off water at 2% minimum grade.
 - 5. Low spots and pockets shall be graded to drain properly.
- B. Drainage: Finish grade with proper slope to drains.
 - 1. Flow lines, designated or not, shall be graded and maintained to allow free flow of surface water.
 - 2. If any drainage problems arise during construction period due to Contractor's work (such as, but not limited to, low spots, slides, gullies and general erosion), the Contractor shall be responsible for repairing these areas to a condition equal to their original condition, and in so doing shall prevent further drainage problems from occurring.
- C. Toe of slope: To prevent soil creep or erosion across pavement, where pavement (walk, curb, etc.) is at the toe of a slope, finish grade is to level out or swale slightly at least 6" before reaching pavement.
- D. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction occurs, nor when it is so dry that dust may form in the air or that clods do not break readily. Water may be applied, if necessary, to provide moisture content for tilling and planting operations. It is the Contractor's responsibility to control dust that is spread as a result of grading operations.
- E. Grades: The finish grade in areas to be planted with turf shall be 2 inches below grade of adjacent pavement and walks unless shown otherwise on landscaping plans and details.
- F. Compaction: Soils in planted areas shall be loose and friable, yet firm enough that no settling occurs from normal foot traffic or irrigation.

3.4 FIELD OBSERVATION

- A. It is the Contractor's responsibility to contact the Architect 48 hours or two working days in advance of each agreed observation or conference.

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- B. Schedule for On-Site Reviews: at completion of finish grading and prior to any planting operations.

END OF SECTION 312219

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SECTION 320120 - DETECTABLE WARNING SURFACES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Raised truncated domes.

1.2 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Samples: 5 by 5 inch sample.
- C. Shop Drawings: Show fabrication details, composite structural system, joints, and material to be used as well as outlining installation materials and procedure.
- D. Qualification Data: For manufacturer.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance requirements indicated, based on comprehensive testing of current materials.
- F. Minutes of preinstallation conference.

1.3 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Duration: 5 years. Such warranty shall indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicate that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for specified years after initial installation.
 - 1. As used in this bulletin, "not degrade significantly" means that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.
- B. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Raised Truncated Domes: Subject to compliance with requirements, provide either the named product or an equal product by one of the other manufacturers specified.
 - 1. Armor-Tile by Engineered Plastics Inc. (Basis of Design)
 - 2. Armorcast Products Company.
 - 3. ADA Tactile Systems.
 - 4. Or equal.

2.2 RAISED TRUNCATED DOMES

- A. Product: Vitrified Polymer Composite (VPC) Cast In Place Detectable/Tactile Warning Surface Tile based on Armor-Tile by Engineered Plastics Inc.
 - 1. Type: Surface applied system.
 - 2. Material: Epoxy polymer composition with ultra violet stabilized coating employing aluminum oxide particles in truncated domes. The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.35" as measured on a diagonal and 1.67" as measured side by side. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch.
 - 3. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the tile.
 - 4. Installation: Flush install by pressing into wet concrete per manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proceed with operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 INSTALLATION

- A. Surface Applied System:
 - 1. During all surface preparation and tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
 - 2. The application of all tile, adhesives, mechanical fasteners, and caulking shall be in strict accordance with the guidelines set by their respective manufacturers.

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3. Ensure that the surfaces being prepared and fabricated to receive the tiles are constructed correctly and adequately for tile installation. Review design drawings with the Contractor prior to the construction and refer any and all discrepancies to the Architect.
4. Set the tile true and square to the curb ramp area as detailed in the design drawings, so that its location can be marked on the concrete surface. A thin permanent marker works well. Remove tile when done marking its location.
5. The surface to receive the detectable warning surface tile (not recommended for asphalt) is to be mechanically cleaned with a diamond cup grinder or shot blaster to remove any dirt or foreign material. This cleaning and roughening of the concrete surface should include at least 4 inches around the perimeter of the area to receive the tile, and also along the cross pattern established by the corresponding areas on the backside of the tile. Those same areas should then be cleaned with a rag soaked in Acetone.
6. Immediately prior to installing the detectable warning surface tile, the concrete surfaces must be inspected to ensure that they are clean, dry, free of voids, curing compounds, projections, loose material, dust, oil, grease, sealers and determined to be structurally sound and cured for a minimum of 30 days.
7. Using Acetone, wipe the backside of the tile around the perimeter and along the internal cross pattern, to remove any dirt or dust particles from the area to receive the adhesive.
8. Apply the adhesive on the backside of the tile, following the perimeter and internal cross pattern established by the tile manufacturer. Sufficient adhesive must be placed on the prescribed areas to have full coverage across the 2" width of the adhesive locator. A 3 x 4 foot tile will typically require an entire tube of adhesive.
9. Set the tile true and square to the curb ramp area as detailed in the design drawings.
10. Standing with both feet applying pressure around the molded recess provided in the tile, drill a hole true and straight to a depth of 3-1/2 inch using the recommended diameter bit. Drill through the tile without hammer option until the tile has been successfully penetrated, and then with hammer option to drill into the concrete.
11. Immediately after drilling each hole, and while still applying foot pressure, vacuum, brush or blow away dust and set the mechanical fastener as described below, before moving on to the next hole.
12. Mechanically fasten tiles to the concrete substrate using a hammer to set the fasteners. Ensure the fastener has been placed to full depth in the dome, straight, and flush to the top of dome. Drive the pin of the fastener with the hammer, taking care to avoid any inadvertent blows to the truncated dome or tile surface. A plastic deadblow or leather hammer is recommended.
13. Working in a sequence which will prevent buckles in the tile, proceed to drill and install all fasteners in the tile's molded recesses.
14. Following the installation of the tiles, the perimeter caulking sealant should be applied. Follow the perimeter caulking sealant manufacturer's recommendations when applying. Tape all perimeter edges of the tile and also tape the adjacent concrete back 1/2" from the tile's perimeter edge. Tool the perimeter caulking with a plastic applicator or spatula to create a straight edge in a cove profile between the tile and adjacent concrete. Remove tape immediately after tooling perimeter caulking sealant.
15. Do not allow foot traffic on installed tiles until the perimeter caulking sealant has cured sufficiently to avoid tracking.

END OF SECTION 320120

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SECTION 321216 - ASPHALT PAVING

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. Hot-mix asphalt paving.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt overlays.
 - 4. Asphalt surface treatments:
 - a. Fog seals.
 - b. Slurries.
 - 5. Pavement-marking paint.
- B. Related Sections include the following:
 - 1. Section 31 20 00 "Earthwork" for aggregate subbase and base courses and aggregate pavement shoulders.
 - 2. Section 32 13 13 "Concrete Paving" for pavement marking on portland cement concrete pavement and herbicide treatment under portland cement concrete paving.
 - 3. Section 32 17 23 "Painted Pavement Marking" for pavement marking requirements.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
 - 1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", **Latest** Edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
 - 2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Job-Mix Designs: For each job mix proposed for the Work.

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- D. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.
- E. Samples: 12 by 12 inches (300 by 300 mm) minimum, of paving fabric.
- F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.
- H. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
 - 1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.
- C. Testing Agency Qualifications: Demonstrate to Architect's satisfaction, based on Architect's evaluation of criteria conforming to ASTM D 3666, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- D. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.
- E. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.
- F. Preinstallation Conference: Review methods and procedures related to asphalt paving including, but not limited to, the following:
 - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - 2. Review condition of substrate and preparatory work performed by other trades.
 - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - 4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
 - 5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
 - 6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
 - 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag; complying with ASTM D 692.
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof; complying with ASTM D 1073.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT PAVEMENT MATERIALS

- A. Asphalt Pavement Leveling Course: Conform to Viscosity Grade B-PG 64-10 in section 203-1.2 and section 203-6 of the Reference Specification.
- B. Asphalt Pavement Wearing (Surface) Course: Conform to Viscosity Grade III C2-PG 64-10, C3-PG 64-10 in section 203-1.2 and section 203-6 and section 400-4 to be used with Class III asphalt of the Reference Specification.

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- C. Prime Coat: Grade SC-70 liquid asphalt conforming to section 203-2 of the Reference Specification.
- D. Tack Coat: Emulsified asphalt grade SS-1h conforming to section 203-3 of the Reference Specification.
- E. Asphalt Paint: Conform to ASTM D41 or D43 per section 203-8 of the Reference Specification.
- F. Slurry Seal: Emulsified asphalt grade [SS-1h] [CSS-1h] and aggregate conforming to section 203.5 of the Reference Specification.
- G. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.
- H. Asphalt Cement: ASTM D 3381 for viscosity-graded material.
- I. Undersealing Asphalt: ASTM D 3141, pumping consistency.
- J. Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC-250.
- K. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.
- L. Prime Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- M. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- N. Fog Seal: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- O. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.
- D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.
- E. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.
 - 1. Color: As indicated.
 - 2. Color: White (for parking stalls, other than handicapped).
 - 2. Color: Yellow (for parking stalls, other than handicapped).
 - 3. Color: Blue (for pavement markings identifying handicap parking)
 - 4. Color: Red (for "No Parking" areas as shown)

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- F. Glass Beads: AASHTO M-247.

2.4 MIXES

- A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 2. Base Course: As indicated.
 3. Surface Course: As indicated.
- B. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 2. Provide mixes complying with the composition, grading, and tolerance requirements of ASTM D 3515 for the following nominal, maximum aggregate sizes:
 - a. Base Course: 1 inch (25 mm).
 - b. Surface Course: 1/2 inch (13 mm).
- C. Emulsified-Asphalt Slurry: ASTM D 3910, consisting of emulsified asphalt, fine aggregates, and mineral fillers and as follows:
1. Composition: Type 1.
 2. Composition: Type 2.
 3. Composition: Type 3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Subgrade, Subbase, and Base:
1. Proof-roll prepared subgrade and base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 COLD MILLING

- A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
1. Repair or replace curbs, manholes, and other construction damaged during cold milling.
- B. Cold mill existing asphalt concrete pavement in accordance with section 302-5.2 of the Reference Specification.

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3.3 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
 - 1. Tack coat faces of excavation and allow to cure before paving.
 - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
 - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.
- C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.
- E. Asphalt paint: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.
 - 1. Allow asphalt paint to cure undisturbed before paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.
- C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic.

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- Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.
- D. Prime Coat: Comply with section 302-5.3 of the Reference Specification. Apply primer at a rate of between 0.20 and 0.25 gallons per square yard to top surface of base course prior to asphalt placement.
- E. Tack Coat: If a leveling course has been used for construction traffic, apply tack coat to all leveling course surfaces in accordance with section 302-5.4 of the Reference Specification at a rate of 0.10 gallons per square yard.

3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to 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. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 5. 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 (3 m) wide, except where infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.
- 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.
- D. The asphalt pavement shall be completed in phases; the leveling course during construction for temporary construction traffic and storage of materials and; the wearing (surface) course just prior to turnover to Owner; unless the entire paving operation is completed just prior to turnover to the Owner such that no construction traffic or storage of materials shall be allowed on the finished pavement surface after its completion. Contractor shall schedule final surface course paving operations so that the required waiting period specified in the Division 2 Section "Pavement Marking" will allow project completion within the specified time.
- E. Construct asphalt pavement in accordance with section 302-5 of the Reference Specification and as shown on the Drawings.
- F. Two Layer Method: The leveling course shall be installed to elevations which will allow the future placement of a wearing (surface) course no thinner than 1-1/2 inches. Prior to placing the wearing (surface) course, repair all areas damaged during construction use, thoroughly clean the leveling course of all loose material and place a tack coat pursuant to paragraph 3.4 D. herein.

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3.6 JOINTS

- A. Construct joints to ensure 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.
 - 2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).
 - 3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
 - 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 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 vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.
- 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 at least 95 percent of the Hveem density (ASTM D 2726-05a).
- 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 still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt, with a thickness one inch greater than the existing, and to match existing finish surface grades such that no local ponding of water will result. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

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1. Leveling Course: $\pm 1/2$ inch (13 mm).
 2. Surface Course: Plus $1/4$ inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
1. Leveling Course: $1/4$ inch (6 mm).
 2. Surface Course: $1/8$ inch (3 mm).
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is $1/4$ inch (6 mm).

3.9 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.70 L/sq. m) to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with a fine sand.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.
 2. Slurry seal to be applied min. 30 days after completion of asphalt pavement.
- C. Slurry seals: Apply in accordance with section 302-4 of the Reference Specification.

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to cure for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).
- E. Comply with paint manufacturer's maximum drying time requirements to prevent undue softening of bitumen and pick-up, displacement, or discoloration of pavement marking by vehicular traffic.
- F. Paint pavement, curbs and other surfaces, as shown on the Drawings. Painting shall be straight, uniform, exact and sharp without blobs at the start and finish. Edges shall be even, accurate, symmetrical and free of fuzziness.
- G. Apply markings for disabled access symbols in accordance with State of California Building Code, Part 2, Title 24, CCR.
- H. Where work consists of modifications of, or additions to existing parking striping, match existing color and width of lines as closely as possible.

3.11 FIELD QUALITY CONTROL

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- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. Perform flood tests on asphalt paved areas to determine if surface grades allow proper runoff of surface water and if drainage devices function properly. Such tests shall be conducted in the presence of the Architect and the Owner. Promptly correct paving work found to be defective due to ponding of water or improper drainage.
- F. In-Place Density tests will be performed using nuclear gauge (ASTM D 2950-05) to verify at least 95 percent relative compaction of the Hveem density has been achieved. Representative samples of the AC will be collected and tested in the laboratory for Hveem density (ASTM D 2726-05a), theoretical maximum density (ASTM D 2041-03a), stability (ASTM D 1560-05), gradation (ASTM C 136-05), and asphalt content (ASTM D 6307-05).
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321216

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SECTION 321313 - CONCRETE PAVING

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 exterior Portland cement concrete paving for the following:
 - 1. Curbs and gutters.
 - 2. Walkways.
 - 3. Driveways
 - 3. Concrete pavement.
 - 4. Concrete wheel stops
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 31 20 00: Earthwork for subgrade preparation, grading and base course.
 - 2. Section 03 30 00: Cast-in-Place Concrete for general building applications of concrete.
 - 3. Section 32 13 73: Paving Joint Sealants for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SYSTEM DESCRIPTION

- A. Provide concrete pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
 - 1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", latest edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
 - 2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.
- D. Submit manufacturer's product data for the following:
 - 1. Form release agent.
 - 2. Concrete coloring additive.

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3. Prefabricated control joint.
4. Preformed joint filler.
5. Sealants.
6. Slip plane joint.
7. Concrete mix design.

1.5 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
 4. Standard specifications for PWC (Green Book) latest edition, section 201-1.
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Paving work, base course etc., shall be done only after excavation and construction work, which may damage them, have been completed. Damage caused during construction shall be repaired before acceptance.
- D. Existing paving area shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.
- E. Pavement, base, or subbase shall not be placed on a muddy subgrade.
- F. Provide sawcut control joints as required to construct 100 sq. ft. maximum panel sizes, unless otherwise called on the plans.
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.7 TESTING AND INSPECTION

- A. The owner reserves the right to inspect and test paving and associated work.

PART 2 - PRODUCTS

2.1 FORMS

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- A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a 100-foot or less radius.
- B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Debond Form Coating, L & M Construction Chemicals.
 - b. Crete-Lease 880 VOC, Cresset Chemical Company.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 40 for #3 bars and Grade 60 for bars larger than #3, deformed.
- B. Plain, Cold-Drawn Steel Wire: ASTM A 82.
- C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- D. Dowel Sleeves: Speed Dowel, Aztec Concrete Accessories, Inc.
- E. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- F. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. Use supports with sand plates or horizontal runners where base material will not support chair legs.
- G. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II
 - 1. Use one brand of cement throughout Project. Coordinate with Division 3 Section "Cast-In-Place Concrete."
- B. Normal-Weight Aggregates: ASTM C 33, Class 4M non-reactive, and as follows. Provide aggregates from a single source.
 - 1. Maximum Aggregate Size: 1-inch.
 - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
 - 3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- C. Water: Potable.

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- D. Admixtures: Comply with requirements specified in Division 3 Section "Cast-In-Place Concrete."
 - 1. Do not use admixtures containing calcium chloride or chloride ions.

2.4 COLOR ADMIXTURE

- A. Color admixture shall be suitable for flatwork concrete and shall meet or exceed the requirements set by Portland Cement Association (PCA) and ATSM C 494.
- B. Color admixture shall be of a type and quality which will not adversely affect workability, setting, or strength of concrete. Color pigments shall consist of chemically inert, non-fading, alkali-fast mineral oxides, finely ground and specially prepared for the use in both cement and mortar. Admixture shall not contain calcium chloride.
- C. Color admixture shall be Chromix admixture, manufactured by L.M. Scofield Company, Los Angeles, CA 90040, or approved equal.
- D. Mix design shall conform to manufacturer's recommendations, and directions of the Architect to achieve proposed color. Strictly monitor additive / cement ratio throughout job to ensure uniform color.

2.5 CURING MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. White burlap-polyethylene sheet.
- C. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Moisture loss not more than 0.55 kg/sq. meter in 72 hours when applied at a rate of 200 sq. ft./gal.
 - 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
 - 2. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - a. L & M Cure R, L & M Construction Chemicals, Inc.
 - b. 1100-Clear, W.R. Meadows, Inc.
 - 3. Do not use sodium silicate type curing agents.
- D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
 - 1. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - a. Eucobar; Euclid Chemical Co.
 - b. E-Con; L&M Construction Chemicals, Inc.
 - c. Confilm; Master Builders, Inc.

2.6 RELATED MATERIALS

- A. Bonding Agent: Acrylic or styrene butadiene, complying with ASTM C 1059, Type 2.

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- B. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.
- C. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - 1. Bonding Agent:
 - b. SBR Latex; Euclid Chemical Co.
 - c. Daraweld C; W.R. Grace & Co.
 - d. Everbond; L&M Construction Chemicals, Inc.
 - e. Acryl-Set; Master Builders Inc.
 - 2. Epoxy Adhesive:
 - a. Burke Epoxy M.V., The Burke Co.
 - b. Concsive Standard Liquid; Master Builders, Inc.
 - c. Rezi-Weld 1000; W.R. Meadows, Inc.
- D. Concrete Sealer: Water-based, deep penetrating, non-staining, non-darkening silane micro emulsion.
 - 1. Positive chloride-ion screening, prevents water intrusion, minimizes rebar corrosion and potential concrete spalling, and protects against damaging effects of alkalis and other contaminants.
 - 2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
 - 3. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
 - a. Pentane WB, L & M Construction Chemicals, Inc. This product is intended to establish the characteristics and level of quality intended for this Project.
- D. Expansion and Isolation Joint Fillers: ASTM D 1751, cellulosic fiber.

2.7 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
 - 1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28-Day): 2500 psi for concrete for sidewalks; 3200 psi for concrete in traffic areas, curbs and gutters.
 - 2. The minimum cement content shall be 5-1/4 sacks per cubic yard.
 - 3. The maximum concrete slump shall be 3 inches \pm 1/2 inch, for all walks; and 4 inches \pm 1 inch for all other Portland cement concrete paving.
 - 4. Water/Cement Ratios:
 - a. 0.50 maximum for all site concrete.
- C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

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- D. Admixtures: Comply with requirements specified in Division 3 Section "Cast-In-Place Concrete".

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.9 GROUT

- A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.
- B. Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be non-oxidizing; metallic grout may be used in other locations.
1. Non-shrink grout shall be one of the following or approved equal:

<u>Manufacturer</u>	<u>Product</u>
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco
U.S. Grout Corporation	Five Star Grout

2.10 SANDBLASTING MATERIAL

- A. Material for sandblasting shall be 16/20 mesh sand.

2.11 HERBICIDE TREATMENT

- A. Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
 - a. Ciba-Geigy Corp.
 - b. Dow Chemical U.S.A.
 - c. E.I. Du Pont de Nemours & Co., Inc.
 - d. FMC Corp.
 - e. Thompson-Hayward Chemical Co.
 - f. U.S. Borax and Chemical Corp.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Areas to be paved shall be compacted and brought to subgrade elevation per soils report before work of this section is performed. Final fine grading, filling, and compaction of areas

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to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.
- C. Subgrade of areas to be paved shall be re-compacted per soils report.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, base, or pavement, subsequent backfill and compaction shall be performed per soils report.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and re-compacted before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.
- H. Prepared subgrade will be inspected by Soils Engineer. Subgrade shall be approved before installation of gravel base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.
- I. Proof-roll subgrade or base surface prepared by others to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- J. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subgrade prior to installation of base course.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

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- B. Clean reinforcement of loose rust and mill scale, earth, or other bond-reducing materials. Where there is delay in placing concrete after reinforcement is in place, bars shall be re inspected and cleaned when necessary.
- C. Any bar showing cracks after bending shall be discarded.
- D. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.
- F. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
 - 2. Make joints, including sawed joints, full depth required and from edge to edge of paving.
- B. Control Joints: Provide weakened-plane control joints, sectioning concrete into areas as shown on Drawings. Construct control joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
 - 1. Tooled Joints: Form control joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 - 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction/shrinkage cracks.
 - 3. Inserts: Form control joints by inserting pre-molded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
 - 1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. Isolation Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

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- E. Expansion Joints: Form expansion joints of preformed joint filler strips.
 - 1. Install dowel bars and support assemblies at joints where indicated. When no sleeves are used, lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.
 - 2. Where spacing is not shown, locate expansion joints at 32-foot maximum spacing or less to fit the control joints pattern.
- F. Installation of joint fillers and sealants is specified in Section "Joint Sealants".
 - 1. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 - 2. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 - 3. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- G. Where plastic "zip strips" are used to construct concrete joints, cut and remove, as a minimum, the top 1/4 inch of these strips after concrete has cured, and coordinate installation of joint filler as specified in Section "Joint Sealants".

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Moisten subgrade or base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- D. 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.
- E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

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- G. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- H. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
- I. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- J. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared, and the 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 within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across concrete, perpendicular to line of traffic, to provide a uniform gritty texture finish.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
 - 4. Do not use troweling machines within 12 inches of electrical junction and outlet boxes which are set to finish flush with concrete slabs. Float and trowel such areas by hand with wood floats and steel trowels, taking care to see that concrete is finished flush with box cover and matches adjacent surfaces.

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- B. Slip-Resistant Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface in accordance with manufacture's written instructions
 - 1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 - 2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose non-slip aggregate
- C. Finishing formed surfaces:
 - 1. Curb forms shall leave a smooth face.
 - 2. Remove all fins.
- D. Provide steel trowel finish on tops of curbs and flow lines of curbs, gutters and integral curb and gutters.
- E. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - 1. Radius: 1/4 inch.
 - 2. Radius: 3/8 inch.
- F. Finish surfaces to produce a uniform appearance throughout area involved and throughout adjacent areas with the same treatment.
- G. Sandblast finish shall be consistent finish throughout and match approved mock-up.
- H. Where concrete finishing occurs adjacent to finished metal or other surfaces, particularly where serrated or indented surfaces occur, remove all traces of cement film before allowing to harden.
- I. Apply integral wood float and broom finish to the all concrete pavements and walkways, unless otherwise shown on the Drawings.
 - 1. After screeding and compacting, finish with a wood float using a circular motion to produce a uniform texture and finish throughout.
 - 2. For vehicular traffic areas, the finish shall be coarse enough to provide a non-slip surface with a minimum static friction coefficient of 0.6.
 - 3. For pedestrian traffic areas, finish shall be a non-slip surface with a minimum static coefficient of friction of 0.6.
 - a. For ramps, the static coefficient of friction shall be a minimum of 0.8. Ramps are defined as any sloping path of travel with a slope in the direction of travel of 5.0%, or greater.
 - 4. Tests for coefficient of friction shall be either ASTM C-1028 (field test) or ASTM D-2047 (laboratory test).

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

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- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- E. Spray-apply concrete sealer to all concrete pavement. Comply with sealer manufacturer's application instructions.

3.8 CURING COLORED CONCRETE

- A. Colored concrete shall not, under any circumstances, be cured using water fog misting or ponding, burlap, plastic sheeting, or other wet covering.
- B. Curing material and method shall be in strict conformance with manufacturer's guidelines and recommendations.
- C. Only if additional protection is absolutely required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof kraft curing paper may be used.

3.9 FIELD QUALITY CONTROL TESTING

- A. The Owner will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 - b. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 - d. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store

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- cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
- e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
 - 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- B. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.
- C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- D. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- E. Manufacturer's Field Service: When placing integral colored concrete, arrange for the services of a qualified technical representative of the color pigment manufacturer, equipped with wet-batch color control test devices to ensure concrete of uniform color and matching approved mock-up.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section. Concrete which is not true to line and plane, which is not thoroughly troweled and properly surfaced as required, which varies in excess of 1/4-inch along a 10-foot straight edge, which is scuffed or has a rough top surface, except where required, or which does not connect properly to adjoining work, does not slope as required for drainage or is not properly cured, will be deemed defective.
- 1. General: Patch defective areas immediately following form removal. Remove defective concrete to a width and depth necessary for proper patching, but in no case less than 1 inch deep. Make the walls of the cut area perpendicular to the surface and do not feather out the edge. Dampen the patch area and the adjacent area 6 inches around the patch area.
 - 2. Exposed concrete: Prepare a patching mortar of one part Portland cement, adjusted to match the color of the surrounding concrete, and 2-1/2 parts sand with the least water

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required to produce a workable mass. Re-work this mortar until it is the stiffest consistency that will permit placing. Brush the patch area with a bond of neat cement and water paste and apply patching mortar when the water sheen is off the bond. Strike off the mortar slightly higher than the surrounding surface, let set for 1 hour and finish flush with the surrounding surface.

- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete 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.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION 321313

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SECTION 323113 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Chain-Link Fences: Industrial.
 - 2. Gates: Swing.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
- B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, swing gate, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
- C. Product Certificates: For each type of chain-link fence, and gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1043.
- D. Qualification Data: For Installer.
- E. Maintenance Data: For the following to include in maintenance manuals:

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Preinstallation Conference: Conduct conference at Project site.

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1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- B. Interruption of Existing Utility Service: Do not interrupt utility services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect no fewer than 2 days in advance of proposed interruption of utility services.
 - 2. Do not proceed with interruption of utility services without Architect's written permission.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chain-link fences and gates that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Chain-Link Fences and Gates: Subject to compliance with requirements, provide products by one of the following.
 - 1. Master-Halco.
 - 2. Ameristar.
 - 3. Anchor Fence.
 - 4. Merchants Metals.
 - 5. Swan Fence Inc.
 - 6. Or equal.

2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
 - 1. Steel Wire Fabric: Metallic-coated wire with 9 gage (0.144 inches) core thickness.
 - a. Mesh Size: 2 inches.
 - b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
 - 2. Selvage: Knuckled at both selvages.

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2.3 INDUSTRIAL FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, and the following:
 - 1. Group: Group IC round high yield pipe, ASTM F 1043, domestic (not imported) Deluxe Quality (DQ-40) Industrial (not Schedule 40).
 - 2. Fence Height: As indicated on Drawings.
 - 3. Strength Requirement: Heavy industrial according to ASTM F 1043.
 - 4. Post Diameter and Thickness:
 - a. Top and Bottom Rail: 1-5/8 inch O.D. (nominal 1-1/4 inch).
 - b. Terminal Post (Corner, End, and Gate Post): 2-7/8 inch O.D. (nominal 2-1/2 inch).
 - c. Line and Brace Rail: 1-7/8 inch O.D. (nominal 1-1/2 inch).
 - d. Swing Gate Members: 1-7/8 inch O.D. (nominal 1-1/2 inch).
 - 5. End and Corner Post Top: Dome.
 - 6. Coating for Steel Framing:
 - a. Metallic Coating:
 - 1) Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123 or 4.0-oz./sq. ft. zinc coating per ASTM A 653.
 - 2) Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
 - 3) External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- thick, zinc pigmented coating.
 - 4) Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. coating.
 - 5) Coatings: Any coating above.

2.4 TENSION WIRE

- A. General: Provide horizontal tension wire at the following locations:
 - 1. Location: Extended along bottom of fence fabric and along top when either top or bottom rails are not indicated on Drawings.
- B. Metallic-Coated Steel Wire: Minimum 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:
 - 1. Metallic Coating: Matching chain-link fabric coating type and weight.

2.5 FITTINGS

- A. General: Comply with ASTM F 626.

2.6 INDUSTRIAL SWING GATES

- A. General: Comply with ASTM F 900 for swing gate types.
 - 1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

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- B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900, domestic Deluxe Quality (DQ), and the following:
1. Gate Fabric Height: 2 inches less than adjacent fence height.
 2. Leaf Width: As indicated.
 3. Frame members, including interior bracing:
 - a. Tubular Steel: 1-7/8 inch O.D. (nominal 1-1/2 inch).
- C. Frame Corner Construction:
1. Welded adjustable truss rods for panels 5 feet wide or wider.

D. Hardware:

2 ea	Hinges 1600 series, single acting	Silver	DAC Industries 800/888-9768
1 ea	Panic Device 6003	Silver	DAC Industries
1 ea	Lock Box	Silver	DAC Industries
1 ea	Receiver Bracket 6020	Silver	DAC Industries
1 ea	Guard 24"	Silver	DAC Industries
1 ea	2 piece Mounting Plate	Silver	DAC Industries
1 ea	6100 ADA lever (outside)	Silver	DAC Industries
1 ea	Rim Cylinder 63-34 LF key-way, 111113 bitted	626	Sargent

2.7 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94.
1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.

2.8 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.4 CHAIN-LINK FENCE INSTALLATION

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Hole diameter dug or drilled minimum 4 times largest cross section of post and minimum depth of 24 inches plus additional 3 inch for each 1 foot increase in fence height over 4 feet.
 - b. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- D. Line Posts: Space line posts equidistant at intervals not exceeding 10 feet o.c unless otherwise indicated.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

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1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
 1. Top Tension Wire: Install tension wire through post cap loops.
 2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- H. Bottom Rails: Install, spanning between posts.
- I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
- K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

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- B. Lubricate hardware and other moving parts.

END OF SECTION 323113

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SECTION 323119 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Decorative metallic-coated steel tubular picket fences.
 - 2. Swing gates.
 - 3. Rolling gates.
 - 4. Composite siding attached to metal framing.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each fence material and for each color specified.
 - 1. Provide Samples 12 inches in length for linear materials.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for decorative metallic-coated steel tubular picket fences, including finish, indicating compliance with referenced standard and other specified requirements.

1.3 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of ornamental metal fences and gates that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years.
- B. Installer's Warranty: 1 year.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Picket Fences:
 - 1. Local metal fabricators.
 - 2. Ameristar Fence Products.
 - 3. Master Halco.
 - 4. Merchants Metals; a division of MMI Products, Inc.
 - 5. Xcel Fence.
 - 6. Or equal.
- B. Gate Operators:
 - 1. Hy Security. (Basis of Design)
 - 2. Elite.
 - 3. Door King.
 - 4. Or equal.
- C. Composite Siding:
 - 1. Fiberon. (Basis of Design)
 - 2. Resysta.
 - 3. TimberTech.
 - 4. Trex.
 - 5. Or equal.

2.2 STEEL PICKET FENCES

- A. Product: Custom metal fence with composite siding based on manufactured fences.
 - 1. Material: Steel material for fence panels and posts shall conform to the requirements of ASTM A653, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft², Coating Designation G-60.
 - 2. Material for pickets: As indicated on Drawings.
 - 3. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
 - 4. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly.
 - 5. The manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be (specify Black or Bronze). The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shall meet or exceed the coating performance criteria of ASTM F2408.
 - 6. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Commercial weight fences under ASTM F2408.

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7. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

2.3 SWING GATES

- A. Gate Configuration: As indicated.
- B. Gate Frame Height: As indicated.
- C. Gate Opening Width: As indicated.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes as indicated on Drawings.
- E. Frame Corner Construction: Welded or assembled with corner fittings and 5/16-inch- diameter, adjustable truss rods for panels 5 feet wide or wider.
- F. Hinges: Mammoth-180 by Locinox or equal.
- G. Exit Hardware: 98/99 Rim exit device by Von Duprin or equal.
 1. Type: Ax - Accessible device.
 2. Description: UL certified to meet 5 lb. maximum operating force requirement.
 3. Exceeds ANSI/BHMA requirements.
 - a. ANSI/BHMA A156.3 2014 Grade 1 certified.
 - b. ANSI/UL 305.
 - c. CAN/ULC-S132.
- H. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 3/4-inch- diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.
- I. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
 1. Same factory finish as fencing.

2.4 HORIZONTAL-SLIDE GATES

- A. Product: The steel roll gate system shall conform to Ameristar PassPort IS (Impasse Security) design series by Ameristar or equal.
 1. Gate Configuration: As indicated.
 2. Gate Frame Height: As indicated.
 3. Gate Opening Width: As indicated.
 4. Steel material for roll gate components (i.e. pales, rails, diagonals and uprights), shall be commercial steel with minimum yield strength of 45,000 psi (344 MPa).
 5. The manufactured roll gates and bolt-on panels shall be subjected to the PermaCoat® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pre-treatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder

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coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm).

a. Color: As selected by Architect from manufacturer’s full range.

B. V-Groove Wheel Assembly:

1. V-Groove Wheels: Gate shall travel on a minimum of two (2) v-groove wheel assemblies. Each v-groove wheel shall capable of carrying a minimum of 100% of the gross gate weight.
2. V-Groove Track shall be 1-1/2” x 1-1/2” x 3/16” steel angle welded to 1/4” x 5” steel bar with hot dipped galvanized finish. Track shall be installed across the entire area of gate travel, flush with roadway surface and lagged to the concrete footing.

2.5 GATE OPERATORS

A. Product: SlideDriver II model SD50F with SmartTouch 725™ Controller by HySecurity or equal.

1. Operation shall be by means of a metal rail passing between a pair of aluminum alloy wheels with polyurethane treads.
2. Operator drive wheels will be driven using hydraulic motors, and system shall not include belts, gears, pulleys, roller chains or sprockets to transfer power from operator to gate panel. The operator shall generate a minimum horizontal pull of 300 lb. without the drive wheels slipping and without distortion of supporting arms.
3. Operator shall be capable of handling gates weighing up to 5,000 lb.
4. The operator shall be speed controlled by an electronic Variable Frequency Drive (VFD) which will accelerate and decelerate the gate gradually to prevent shock loads to the gate and operator assembly.
5. The maximum gate velocity of the SD50F shall be selectable between 2.2 ft/s and 3 ft/s.
6. The operator shall contain an Emergency Fast Operation (EFO) mode wherein a separate continuous input allows the operator to override all safety inputs and run at the EFO speed. The gate velocity during Emergency Fast Operation (EFO) shall not be less than 3 ft/s.
7. Upon starting, the VFD will gradually accelerate the gate to its operating speed. When at the slow down limit, the VFD will gradually reduce gate velocity to 1 ft/s, thereafter, at the stop limit, the VFD will slow the electric motor and gate to a gradual stop.
8. Two adjustable hydraulic brake valves (one for each direction) assist in slowing the gate to a precise stop.

2.6 COMPOSITE SIDING

A. Product: PE Composite Lumber by Fiberon or equal.

1. Material: Wood-plastic composite core with co-extruded PermaTech cap on three sides
2. Contains 95% recycled content.
3. A Fire-rated version of Sanctuary decking is also available and approved for use in all Wildland Urban Interface (WUI) zones.
 - a. Testing method and performance:
 - 1) ASTM E84 Class B, FSI 70.
 - 2) CA SFM 12-7A-4, BML 8110-2045:0502.
4. Available Sizes:
 - a. Square Edge = .92 in. x 5.25 in.
 - 1) Length: 16 ft. and 20 ft.

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- b. Grooved Edge = .92 in. x 5.25 in.
 - 1) Lengths: 12 ft., 16 ft. and 20 ft.
- c. Fascia: .75 in. x 11.25 in. x 12 ft.
- d. Riser Board: .75 in. x 7.25 in. x 12 ft.
- 5. Trim pieces: As required for complete system.
- 6. Color: As selected by Architect from manufacturer's full range.
- 7. Screws and Bolts: Galvanized steel, size as recommended by composite lumber manufacturer.
- 8. Framing: Galvanized steel fence and gates as indicated on Drawings.

2.7 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94.
 - 1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.
- B. Use: Mow strip, concrete band, and fencing footing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 1. Construction layout and field engineering are specified in Division 1 Section "Execution Requirements."

3.3 FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.

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- B. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and sleeves and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade. Finish and slope top surface to drain water away from post.
 - b. Concealed Concrete: Top 2 inches below grade to allow covering with surface material. Slope top surface of concrete to drain water away from post.
 - 3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.
 - 4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
 - a. Extend posts at least 5 inches into sleeve.
 - b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
 - 5. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch larger than outside diagonal dimension of post.
 - a. Extend posts at least 5 inches into concrete.
 - b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
 - 6. Mechanically Driven Posts: Drive into soil to depth of 30 inches. Protect post top to prevent distortion.
 - 7. Space posts uniformly at 6 feet o.c.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

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END OF SECTION 323119

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SECTION 331000 - WATER DISTRIBUTION

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 piping and specialties for combined potable and fire protection water service outside the building.
- B. Related Sections include the following:
 - 1. Section 31 20 00 - Earthwork for trench excavation and backfill.
 - 2. Drawings for potable and fire protection piping inside the building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum testing pressure requirements for piping and specialties, unless otherwise indicated:
 - 1. Combined Potable Water and Fire Protection Water Service: 200 psig (1380 kPa).

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For the following:
 - 1. Pipe, joint restraints and fittings.
 - 2. Valves and covers
 - 3. Backflow preventer
 - 4. Fire Department Connection
- C. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.5 QUALITY ASSURANCE

- A. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.
- B. Comply with NSF Standard 61, "Drinking Water System Components", for material, installation, and testing requirements.
- C. Comply with City of Fontana requirements for tapping of water mains.
- D. Comply with City of Fontana standards for potable water-service piping for testing and disinfections.
- E. Comply with City of Fontana Fire Department installation and testing requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

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- A. Preparation for Transport: Prepare valves according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves according to the following:
 - 1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.

1.7 PROJECT CONDITIONS

- A. Verify existing utility locations and meters. Contact utility locating service.
- B. Verify that it is possible to install water service piping to comply with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.
- D. Obtain necessary connection permits with local water company as required.
- E. Obtain necessary street excavation and encroachment permits from the [City of Fontana](#) Dept. of Public Works.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.
- C. Coordinate with other site utility work.

PART 2 - PRODUCTS

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2.1 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.
- C. PVC Plastic, Fire Service Pipe: UL 1285 and AWWA C900, Class 200 or 150 as noted on plans. Include elastomeric seal according to ASTM F 477.
- D. Pipe sizes up to 2 inches shall be copper water tubing, Type K hard, ANSI H23.1, ASTM B 88, IAPMO IS. Muller Brass, Cambridge-Lee Halstead, or equal. An approved protective wrap shall be used to completely isolate and protect all underground copper tubing and extend past the surface a minimum 12 inches. The excess wrapping shall be trimmed down and taped to copper tubing with 10 mill PVC pipe tape at grade level of concrete or asphalt.
- B. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

2.2 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.
- C. PVC Plastic, Socked Fittings: ASTM D2466, Schedule 40.
- D. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.

2.3 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.
- C. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.
- D. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.

2.4 PIPING SPECIALTIES

- A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
 - 1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
 - 2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.

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3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum pressure to suit system pressures.
4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure to suit system pressures.
5. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
6. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig (2070-kPa) working pressure at 225 deg F (107 deg C).

2.5 POLYETHYLENE ENCASEMENT

- A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.6 VALVES

- A. All Gate Valves, 4-Inch NPS (DN80) and Larger in size shall conform to AWWA Standard Specifications C500. All valves, including those over 12", shall be rated to a minimum working pressure of 200 psi. All valves shall be iron body, bronze mounted, double-disk, parallel scat gate valves. All valves shall open by turning the stem counterclockwise. Buried valves shall be non-rising type with O-ring seal equipped with 2 inch square operating nut, and shall be bituminous coated. End connections shall be flanged, or mechanical joint as required for the type of pipe used. Buried valves shall have stem extensions to place operating nut within 6" of top of valve box.
- B. Valve Boxes shall be precast concrete with cast iron traffic rated cover with lettering "WATER", bottom section with base of size to fit over valve and barrel approximately 5 inches (125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
 1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut. After installation of valve box cover and after installation of adjacent paving, if any, covers shall be sandblasted or wire-brushed as necessary and painted with bituminous black paint, unless another color is required by the Architect.
- C. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve. Posts above and including connection to riser shall be sandblasted, if necessary, after installation and painted red, unless another color is required by the Architect.
- D. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
 1. Tapping Sleeve: Cast- or ductile-iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.
- E. No ball valves shall be used for underground installation.

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2.7 BACKFLOW PREVENTERS

- A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
- B. Working Pressure: 200 psig (1380 kPa) minimum, unless otherwise indicated.
- C. 2-Inch NPS (DN50) and Smaller: Bronze body with threaded ends.
- D. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.
- E. Interior Components: Corrosion-resistant materials.
- F. Strainer on inlet if strainer is indicated.
- G. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- H. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
 - 1. Pressure Loss: 12 psig (83 kPa) maximum through middle third of flow range.
 - 2. Double Detector Check Assembly: 15 psi (103.75 kPa) entry loss.
- I. Exterior Finish: Red or yellow (as directed by Water Purveyor or local Fire Department) alkyd-gloss enamel paint. Entire device above and including connection to riser shall be sandblasted, if necessary, after installation and re-painted.

Manufacturer	Model	Size
Cia-Val	RP-LEX	2", 2 1/2", 3", 4", 6", 8", 10"
Cia-Val	RP-2	3/4", 1", 1-1/4", 1-1/2"
Cia-Val	RP4	6 "
Febco	825YD2	2-1/2", 3", 4", 6", 8", 10"
Febco	825Y	3/4", 1", 1-1/4", 1-1/2", 2"
Febco	825YA	3/4", 1", 1-1/2", 2"
Febco	845	3/4", 1"
Mueller	H-9506	4", 6", 8", 10"
Orion	80-0069	1-1/2"
Orion	BRP	3/4", 1", 3", 4"
Orion	9-2929	2 "
Rain Bird	RPA-075-R	3/4"
Rain Bird	RPA-100-R	1"
Rain Bird	RPA-125-R	1-1/4"
Rain Bird	RPA-150-R	1-1/2"
Rain Bird	RPA-200-R	2"
Rain Bird	RPA-250-R	2-1/2"
Rain Bird	RPA-400-R	4 "
Rain Bird	RPA-600-R	6"
Rain Bird	RPA-800-R	8"

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Rain Bird	RPA-1000-R	10"
Watts	909 PCQT	3/4"-2"
Watts	909HWQT	3/4",1",1-1/4",1-1/2",2"
Watts	909 PCRW	2-1/2"-10"
Watts	909 RW Bronze	2-1/2",3"
Watts	009QT	3/4",1",1-1/4",1-1/2",2"
Watts	009SSQT	3/4",1",1-1/4",1-1/2",2"
Wilkins	975XL	3/4",1",1-1/4",1-1/2",2"
Wilkins	375(SM)	1/2", 3/4",1",1-1/4",1-1/2",2"
Wilkins	375A	2 1/2", 3", 4", 6", 8", 10"
Wilkins	375ADA	2 1/2", 3", 4", 6", 8", 10"
Wilkins	450DA	4", 6", 8", 10"

2.7 FIRE DEPARTMENT CONNECTIONS

- A. Exposed Fire Department Connections: UL 405, cast-brass body, with thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- (460-mm-) high brass sleeve; and round escutcheon plate.
1. Connections: Two 2-1/2-inch NPS (DN65) inlets and 6-inch NPS (DN150) outlet.
 2. Inlet Alignment: Inline, horizontal.
 3. Finish Including Sleeve: Polished chrome-plated.
 4. Escutcheon Plate Marking: "AUTO SPKR."

2.8 ANCHORAGES

- A. Concrete Reaction Backing: Portland cement concrete mix, 2000 psig (13.8 MPa).
1. Cement: ASTM C 150, Type I.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.

2.9 IDENTIFICATION

- A. Refer to Division 2 Section "Earthwork" for underground warning tape materials.
- B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."
- C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches (25 by 75 mm), with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 31 20 00 "Earthwork" for excavation, trenching, and backfilling.

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- B. Refer to Section 32 12 16 "Asphalt Concrete Paving" for cutting and patching of existing asphalt paving.
- C. Refer to Section 32 13 13 "Concrete Paving" for cutting and patching of existing concrete paving.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 2 to NPS 16 shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type K and B 251; wrought-copper, solder-joint fittings; and brazed joints.
 - 2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
- F. Underground water-service piping NPS 30 shall be the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, 3-Inch NPS (DN80) and Larger: AWWA, gate valves, non-rising stem, with valve box.
 - 2. Underground Valves, 4-Inch NPS (DN100) and Larger: UL/FM, gate valves, non-rising stem, with indicator post.

3.4 JOINT CONSTRUCTION

- A. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.
- B. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Install piping as indicated, unless deviations to layout are approved in advance by the Architect or USC.

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- B. Install components with pressure rating equal to or greater than system operating pressure.
- C. Install piping free of sags and bends.
- D. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
 - 1. Install dielectric fittings to connect piping of dissimilar metals.

3.6 SERVICE ENTRANCE PIPING

- A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
 - 1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.
- B. Sleeves and mechanical sleeve seals are specified in Drawings.
- C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.7 PIPING INSTALLATION

- A. Make connections larger than 2-inch NPS (DN50) with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to manufacturer's written instructions.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
- B. If hot tap is not possible, install cut-in tee with C-110 fittings.
- C. Comply with NFPA 24 for fire-protection water-service piping materials and installation.
- D. Install ductile-iron piping according to AWWA C600.
 - 1. Encase piping with PE film according to ASTM A 674 or AWWA C105.
 - 2. Install encasement per manufacturer's written instructions. Close seams and overlaps in the polyethylene tubes with polyethylene compatible adhesive tape. The tape shall be approximately two inches wide and shall have the ability to bond securely to a metal surface and the polyethylene material. Repair all rips, tears and other damage with suitable adhesive tape.
- E. Bury piping with depth of cover over top at least 30 inches (750 mm) and according to the following:

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1. Under Driveways: With at least 36 inches (900 mm) cover over top.
2. If trenching before rough grading is completed would result in a lesser depth of cover than specified above, then trenching for water piping installation shall not be done until the specified minimum cover depth can be achieved. If construction traffic will be allowed to pass over completed water piping installations prior to finish paving, then a protective pavement blanket at least equivalent to the final pavement and base thickness shall be constructed within the vehicle access area for a minimum distance of three feet on either side of the pipe. As an alternative to the temporary pavement blanket, the water pipe shall be installed at a minimum of two (2) feet deeper than specified within construction traffic areas.

3.8 ANCHORAGE INSTALLATION

- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
 2. Fire-Service Piping: According to NFPA 24.
- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use non-rising-stem UL/FM gate valves for installation with indicator posts.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

3.10 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install fire department connection of type and features indicated.

3.11 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 6 to 8 inches (150 to 200 mm) below finished grade, directly over piping.

3.12 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
 1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage

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is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

- C. Prepare reports for testing activities.

3.13 CLEANING

- A. Clean and disinfect water distribution piping as follows:
1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
 - a. Comply with NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 1) Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.
 - 2) Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - 3) Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
 - 4) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports for purging and disinfecting activities.

END OF SECTION 331000

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SECTION 333100 - SANITARY SEWER

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sanitary drainage piping, fittings and accessories.
- B. Connection of building sanitary sewer drainage system to site sewer systems
- C. Cleanout access.

1.2 REFERENCES

- A. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- B. ASTM D3034 - polyvinyl chloride (PVC), SDR 35, for solvent-cemented or gasketed joints.
- C. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
- D. SSPWC - Standard Specifications for Public Works Construction, latest Edition.

1.3 REGULATORY REQUIREMENTS

- A. Conform to Section 306, Standard Specifications for Public Works Construction, for materials and installation of Work of this Section.

1.4 SUBMITTALS

- A. Shop drawings indicating dimensions, locations and elevations of manholes, cleanouts and sub-surface structures.
- B. Product data for pipe and pipe accessories.
- C. Inspection and test reports specified

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record location of existing and proposed pipe runs, connections, manholes, cleanouts and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

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2.1 SEWER PIPE MATERIALS

- A. Gravity-Flow, Non-pressure Plastic Pipe: Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for gasketed joints. Gaskets: ASTM F 477, elastomeric seal.
- B. PVC pipe is for outside conditions.
- C. Vitrified Clay Pipe (VCP) - pipe shall be "extra strength VCP" and shall comply with Section 207-8 of the Standard Specifications for Public Works Construction. Pipe shall be manufactured in accordance with ASTM C-700 and installed in accordance with ASTM C-12. Joints for Vitrified Clay Pipe shall comply with Section 208-2.3 of SSPWC and manufactured in accordance with ASTM C-425. All VCP pipe, fittings and couplings shall be clearly marked at an interval not to exceed 5 feet as follows:
 - 1) Nominal pipe diameter.
 - 2) VCP classification.
 - 3) Company, plant, shift ASTM, and date designation.
 - 4) Service designation or legend.
- D. Reinforced Concrete Pipe and Fittings: ASTM C76 (ASTM C76M), Class III, Wall B, for gasketed joints.
 - 1) Gaskets: ASTM C443 (ASTM C443M), rubber.
- E. Hub and Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A74, Service class, gray cast iron for gasketed joints. Include ASTM C564, rubber compression-type gaskets.
- F. Backwater Valves: Gray iron.
- G. Cleanouts: PVC.
- H. Corrosion-Protection Piping Encasement: LLDPE film.
- I. Manholes: Standard precast concrete.
 - 1. Resilient pipe connectors.
 - 2. Reinforced-concrete grade rings.
 - 3. Protective coating.
 - 4. Manhole frames and covers, with protective coating.
 - 5. Manhole cover inserts.

2.2 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- B. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T", bends, elbows, cleanouts, reducers, traps and other configurations required.
- C. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.
 - 1. Gaskets: ASTM F477, Elastomeric seals.

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2. Primer: ASTM F 656.
3. Solvent Cement: ASTM D 2564

2.3 CLEANOUTS

- A. Lid and Frame: Cast iron construction, removable lid, closed checkerboard grill lid design; nominal lid and frame diameter as required for pipe sizes. [SPPWC 204-2]
- B. Manholes: SPPWC Standard Drawing 200-3.

2.4 FILL MATERIAL

- A. Bedding and Fill: As specified in Section 31 20 00 "Earthwork"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut, or excavation base is ready to receive work, excavations, dimensions and elevations are as indicated on drawings.
- B. Beginning of installation means acceptance of existing conditions.
- C. Verify that existing invert elevations on site will allow proper tie in to new work with proper positive slope. Ascertain accuracy prior to trenching and installation of sanitary sewer system.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with approved fill material.
- B. Remove large stones or other hard matter that could damage sewer pipe or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

- A. Prior to commencing Work, Contractor shall pothole existing utilities at points of connection and verify the joining invert shown on plan. Notify Architect in event of discrepancies.
- B. Install pipe, fittings and accessories in accordance with Section 306, SSPWC and manufacturer's instructions. Seal joints watertight.
- C. Concrete Pipe and Fittings: Install according to ACPA "Concrete Pipe Handbook". Provide the following seals:
 1. Round Pipe and Fittings: ASTM C443 (ASTM C443M), rubber gaskets.
 2. Elliptical Pipe: ASTM C877 (ASTM C877M), Type I, sealing bands.
 3. Arch Pipe: ASTM C877 (ASTM C877M), Type I, sealing bands.

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- D. All below grade piping consisting of ferrous metals shall be given a high-quality protective coating, such as 18-mil plastic tape, extruded polyethylene, coal-tar enamel, or Portland cement mortar. Below-grade metals should be electrically insulated (isolated) from above-grade metals by means of dielectric fittings in ferrous utilities and/or exposed metal structures breaking grade.
- E. Place pipe on bedding as specified in Section 31 20 00.
- F. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.
- G. Do not displace or damage pipe when compacting.
- H. Connect to site sewer outlet system through installed sleeves.
- I. Do not cover joints until lines have been tested and approved.

3.4 INSTALLATION - CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Establish elevations and pipe inverts.
- C. Mount lid and frame level in grout secured to top cone section to elevation indicated.

3.5 PROTECTION

- A. Protect pipe cover from damage or displacement until backfilling operation is in progress.

3.6 TESTING

- A. After installation, test each sanitary drain and/or sewer and each section between successive manholes for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.
- B. Where excessive ground water is encountered test the pipeline for infiltration.
- C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the required limits.

END OF SECTION 333100