

**SECTION 00 91 13
ADDENDUM NO. 01**

To all prospective bidders and others concerned, YOU ARE HEREBY ADVISED THAT the Contract Documents for the above referenced Project are revised in the following particulars:

Section	Description of Change
00 01 10	Delete the following Section(s) from the Project Manual and from Section 00 01 10 in their entirety: 07 26 00 - Vapor Retarders 26 05 33 - Raceways and Boxes 26 24 17 - Intelligent Panelboard for Lighting Control and Energy Management 26 28 16 - Low Voltage Circuit Breakers 40 71 13 - Magnetic Flowmeters 40 72 00 - Level Measurements
00 01 10	Delete the following Section(s) from the Project Manual in their entirety and replace with the Section(s) accompanying this Addendum: 22 05 13 - Common Motor Requirements for HVAC Equipment
00 01 10	Add the following Section(s) from the Project Manual in their entirety and accompany this Addendum: 22 05 19 - Meters and Gauges for Plumbing Piping 22 05 23 - General-Duty Valves for Plumbing Piping 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment 22 05 53 - Identification for Plumbing Piping and Equipment 22 10 00 - Plumbing Materials and Methods 22 10 05 - Plumbing Piping
01 21 00	Add the following Allowance Schedule in paragraph 1.07 of Section 01 21 00: 1. SCADA Allowance: Work for SCADA system shall be performed by MAK Controls in accordance with their proposal contained in these specifications. An amount of \$12,000.00 shall be included in the contract for this work. 2. Owner Controlled Change Allowance: This allowance is for unforeseen work which may arise during the course of construction and will only be used at the Owner's direction. An amount of \$150,000.00 shall be included in the contract for this work.
02 41 00	Delete paragraph 1.01.A.1 in its entirety from Section 02 41 00 which begins "Demolish buildings ...".
22 13 33	In paragraph 1.02.D of Section 22 13 33, replace the reference to Section 40 63 00 with Section 40 91 00.
22 13 33	In paragraph 1.06.D of Section 22 13 33, change the words "one (1) year" to "two (2) years".
22 13 33	In paragraph 2.09, add the following as 2.09.F: F. Provide four (4) float switches, levels to be set in the field as directed by the Engineer.

Section	Description of Change
09 96 00	Delete paragraph 3.09 from Section 09 96 00 in its entirety. (Note: Daily Coating Inspection Report sheet is not a part of this paragraph and thus remains.)
33 34 00	In paragraph 2.02.G of Section 33 34 00, replace the words “neoprene gaskets” with “Styrene Butadiene Rubber (SBR) gaskets conforming to ANSI/AWWA A21.11/C 111 requirements.”
40 23 00	In paragraph 2.01.B.5.a of Section 40 23 00, replace the last sentence of this paragraph with the following sentence: “Gaskets shall be Styrene Butadiene Rubber (SBR) conforming to ANSI/AWWA A21.11/C 111 requirements.”

Sheet	Description of Change
	Reissue all sheets as listed in the Cover sheet.

This Addendum is hereby incorporated into the original Contract Documents for the bidding referred to above and is considered as binding as though originally appearing therein. Receipt of this Addendum must be noted in the place provided in Section 00 42 43 - Proposal, dated July 10, 2023.

**SECTION 00 01 10
TABLE OF CONTENTS**

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

- 00 01 10 - Table of Contents
- 00 11 13 - Advertisement for Bids
- 00 21 13 - Instructions to Bidders
- 00 42 43 - Proposal
- 00 43 13 - Bid Bond Form
- 00 43 45 - Legal Status of Bidder
- 00 45 13 - Statement of Bidder's Qualifications
- 00 45 19 - Non-Collusion Affidavit of Prime Bidder
- 00 51 00 - Notice of Award
- 00 52 00 - Agreement
- 00 55 00 - Notice to Proceed
- 00 60 00 - Project Forms
- 00 61 12 - Performance Bond
- 00 61 13 - Labor and Material Payment Bond
- 00 61 19 - Maintenance and Guarantee Bond
- 00 62 75 - Engineer's Certificate for Payment
- 00 62 76 - Contractor's Application for Payment
- 00 62 77 - Payment Schedule
- 00 63 25 - Substitution Request Form
- 00 65 16 - Certificate of Substantial Completion
- 00 65 20 - Sworn Statement
- 00 65 21 - Prevailing Federal Wage Rate - Davis Bacon Act
- 00 72 00 - General Conditions
- 00 73 00 - Supplementary Conditions

SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

- 01 11 00 - Summary of Work
- 01 12 13 - Work Sequence
- 01 21 00 - Allowances
- 01 31 19 - Project Meetings
- 01 33 00 - Submittal Procedures
- 01 45 00 - Quality Control
- 01 50 00 - Temporary Facilities and Controls

- 01 57 13 - Temporary Erosion and Sediment Control
- 01 60 00 - Product Requirements
- 01 71 23 - Construction Layout
- 01 77 00 - Closeout Procedures
- 01 89 00 - Site Construction Performance Requirements

DIVISION 02 - EXISTING CONDITIONS

- 02 41 00 - Demolition
- 02 41 13 - Selective Demolition

DIVISION 03 - CONCRETE

- 03 01 30 - Concrete Repair and Rehabilitation
- 03 11 00 - Concrete Forming
- 03 15 00 - Concrete Accessories
- 03 20 00 - Concrete Reinforcing
- 03 30 00 - Cast-in-Place Concrete
- 03 32 00 - Construction and Expansion Joints
- 03 34 00 - Controlled Low Strength Material
- 03 41 00 - Precast Concrete
- 03 41 33 - Precast Structural Pretensioned Concrete
- 03 60 00 - Grouting

DIVISION 04 - MASONRY

- 04 05 11 - Mortaring and Grouting
- 04 05 13 - Masonry Mortaring
- 04 20 00 - Unit Masonry
- 04 23 00 - Glass Unit Masonry

DIVISION 05 - METALS

- 05 12 00 - Structural Steel Framing
- 05 50 00 - Metal Fabrications
- 05 50 01 - Miscellaneous Metal Work
- 05 52 13 - Pipe and Tube Railings
- 05 55 13 - Wedgewire Screens

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

- 06 11 40 - Wood Blocking and Curbing

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

- 07 10 00 - Dampproofing and Waterproofing
- 07 14 16 - Cold Fluid-Applied Waterproofing
- 07 19 00 - Water Repellent Coating
- 07 53 23 - Single Ply Roofing Fully Adhered Conventional
- 07 62 00 - Sheet Metal Flashing and Trim

07 92 00 - Joint Sealants

DIVISION 08 - OPENINGS

08 10 00 - Hollow Metal Doors and Frames

08 11 50 - Custom Steel Doors

08 12 13 - Custom Steel Frames

08 31 13 - Access Hatches

08 33 23 - Overhead Doors

08 70 00 - Door Hardware

08 80 00 - Glazing

DIVISION 09 - FINISHES

09 10 00 - Piping Identification Systems

09 96 00 - Painting

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

DIVISION 12 - FURNISHINGS

DIVISION 13 - SPECIAL CONSTRUCTION

DIVISION 14 - CONVEYING EQUIPMENT

DIVISION 21 - FIRE SUPPRESSION

DIVISION 22 - PLUMBING

22 10 00 - Plumbing Materials and Methods

22 11 23 - Domestic Water Pumps

22 13 33.13 - Submersible Wastewater Pumps with Integrated Pump Control Systems

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 05 13 - Common Motor Requirements for HVAC Equipment

23 05 48 - Vibration and Seismic Controls for HVAC

23 05 93 - Testing, Adjusting, and Balancing for HVAC

23 08 00 - Commissioning of HVAC

23 31 00 - HVAC Ducts and Casings

23 33 00 - Air Duct Accessories

23 34 16 - Centrifugal HVAC Fans

23 82 00 - Convection Heating and Cooling Units

DIVISION 25 - INTEGRATED AUTOMATION

DIVISION 26 - ELECTRICAL

26 05 00 - Common Work Results for Electrical

26 05 10 - Basic Electrical Materials and Methods

26 05 26 - Grounding Systems

26 05 29 - Hangers and Supports for Electrical Systems

26 05 29 - Supporting Systems

- 26 05 33 - Raceways and Boxes
- 26 05 33.13 - Underground Conduit Systems
- 26 05 33.16 - Boxes for Electrical Systems
- 26 05 33.23 - Surface Raceways for Electrical Systems
- 26 05 53 - Electrical Identification
- 26 07 00 - Wire and Cable
- 26 07 05 - Electrical Testing and Equipment
- 26 07 05.10 - Electrical Test Certificates
- 26 07 10 - Demonstration and Training
- 26 08 00 - Calibration and Start-up of Systems
- 26 24 16 - Panelboards
- 26 24 16.13 - Panel Components and Devices
- 26 24 19 - Motor Control Centers
- 26 27 16 - Cabinets and Enclosures
- 26 28 13 - Fuses
- 26 28 16.13 - Circuit Breakers
- 26 28 16.16 - Enclosed Switches

DIVISION 27 - COMMUNICATIONS

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

DIVISION 31 - EARTHWORK

- 31 10 00 - Site Preparation
- 31 22 00 - Grading
- 31 23 13 - Subgrade Preparation
- 31 23 16 - Structural Excavation and Backfill
- 31 23 19 - Dewatering
- 31 23 33 - Trenching and Backfilling
- 31 50 00 - Temporary Excavation Support Systems

DIVISION 32 - EXTERIOR IMPROVEMENTS

- 32 11 23 - Aggregate Base Courses
- 32 12 16 - Bituminous Paving
- 32 13 15 - Sidewalks and Driveways
- 32 31 00 - Fences and Gates
- 32 92 19 - Seeding

DIVISION 33 - UTILITIES

- 33 05 13 - Manholes and Structures
- 33 30 00 - Sanitary Utility Sewerage Piping
- 33 34 00 - Sanitary Utility Force Mains

DIVISION 34 - TRANSPORTATION

DIVISION 40 - PROCESS INTEGRATION

40 05 07 - Pipe Hangers and Supports

40 05 53 - Process Valves

40 23 00 - Process Piping

40 90 00 - Process Instrumentation, Controls and Monitoring Equipment - General Requirements

40 91 00 - Instrumentation and Controls

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

46 21 83 - Septage Receiving Equipment

END OF SECTION

SECTION 22 05 13
COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Three phase electric motors.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).
- B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators 2017.
- C. NEMA MG 1 - Motors and Generators 2018.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.
- D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- E. Operation Data: Include instructions for safe operating procedures.
- F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Baldor Electric Company/ABB Group; _____: www.baldor.com/#sle.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:

1. Open drip-proof type except where specifically noted otherwise.
2. Design for continuous operation in 104 degrees F environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

D. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

A. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

B. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

2.04 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

I. Sound Power Levels: To NEMA MG 1.

J. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

- K. Nominal Efficiency: As indicated at full load and rated voltage when tested in accordance with IEEE 112.
- L. Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 22 05 19
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pressure gauges.

1.02 REFERENCE STANDARDS

- A. AGA/ANSI B109 Set - INCLUDES ANSI B109.1, ANSI B109.2, ANSI B109.3, ANSI B109.4 2000.
- B. ASME B40.100 - Pressure Gauges and Gauge Attachments 2022.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.
- C. Project Record Documents: Record actual locations of components and instrumentation.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements. for additional provisions.
 - 2. Extra Pressure Gauges: One of each type and size.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

- A. Manufacturers:
 - 1. Ashcroft, Inc
 - 2. Dwyer Instruments, Inc
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.02 INSTALLATION

- A. Install pressure gauges as follows:
 - 1. At Pumps: Place single gauge before strainer, suction side and discharge side.
 - 2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
 - 3. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

3.03 SCHEDULES

- A. Pressure Gauges, Location and Scale Range:
 - 1. Pumps, 0 to 100 psi.
 - 2. Pressure reducing valves, 0 to 100 psi.
- B. Pressure Gauge Tappings, Location:

1. Control valves 3/4 inch & larger - inlets and outlets.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ball valves.
- B. Check valves.
- C. Gate valves.
- D. Chainwheels.

1.02 RELATED REQUIREMENTS

- A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- B. Section 22 10 05 - Plumbing Piping.

1.03 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

- A. API STD 594 - Check Valves: Flanged, Lug, Wafer, and Butt-Welding 2022.
- B. ASME B1.20.1 - Pipe Threads, General Purpose, Inch 2013 (Reaffirmed 2018).
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard 2020.
- E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2022.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- G. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.
- H. ASME B31.9 - Building Services Piping 2020.
- I. 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 2023.
- J. ASTM A536 - Standard Specification for Ductile Iron Castings 1984, with Editorial Revision (2019).
- K. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings 2015 (Reapproved 2021).
- L. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.

- M. AWWA C606 - Grooved and Shouldered Joints 2022.
- N. MSS SP-45 - Drain and Bypass Connections 2020.
- O. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends 2011.
- P. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends 2018.
- Q. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
- R. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.
- S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
- T. MSS SP-125 - Check Valves: Gray Iron and Ductile Iron, In-Line, Spring-Loaded, Center-Guided 2018.
- U. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- V. NSF 372 - Drinking Water System Components - Lead Content 2022.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
 - 5. Secure check valves in either the closed position or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.

2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

1.08 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:

- A. Handle large valves with sling, modified to avoid damage to exposed parts.
- B. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
 1. Shutoff: Ball, butterfly, gate or plug.
 2. Swing Check (Pump Outlet):
 - a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
 - b. 2-1/2 inch and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.
- D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- E. Required Valve End Connections for Non-Wafer Types:
 1. Steel Pipe:
 - a. 2 inch and Smaller: Threaded ends.
 - b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - c. 5 inch and Larger: Grooved or flanged ends.
 2. Copper Tube:
 - a. 2 inch and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - c. 5 inch and Larger: Grooved or flanged ends.
- F. Sanitary Waste Water Valves:
 1. 2 inch and Smaller:
 - a. Bronze and Brass: Provide with solder-joint.
 - b. Ball: One piece, full port, brass with brass trim.
 - c. Bronze Swing Check: Class 125, bronze disc.
 - d. Bronze Gate: Class 125, NRS.
 2. 2-1/2 inch and Larger:
 - a. Iron, 2-1/2 inch to 4 inch: Provide with threaded ends.
 - b. Iron Ball: Class 150.

- c. Iron Swing Check: Class 125, metal seats.
- d. Iron Gate: Class 125, NRS.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.
- D. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
 - 4. Solder Joint Connections: ASME B16.18.
- E. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.
 - 3. Building Services Piping Valves: ASME B31.9.
- F. Potable Water Use:
 - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- G. Valve Bypass and Drain Connections: MSS SP-45.
- H. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRASS, BALL VALVES

- A. Two Piece, Full Port with Brass Trim and Female Thread, Male thread, or Solder Connections:
 - 1. Comply with MSS SP-110.
 - 2. WSP Rating: 150 psi.
 - 3. WOG Rating: 600 psi.
 - 4. Body: Forged brass.
 - 5. Seats: PTFE.
 - 6. Ball: Chrome-plated brass.
 - 7. Operator: Lockable handle and memory stop.
 - 8. Manufacturers:
 - a. Apollo Valves
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 BRASS, INLINE CHECK VALVES

- A. Class 150:
 - 1. WOG Rating: 200 psi.

2. Maximum Service Temperature: 250 degrees F.
3. Body: Forged brass.
4. Disc: Forged brass.
5. Seal: PTFE, bubble-tight.
6. End Connections: Press.
7. Manufacturers:
 - a. Jomar Valves, a division of Jomar Group
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 BRASS, HORIZONTAL SWING CHECK VALVES

- A. Class 125, Threaded End Connections:
 1. WOG Rating: 200 psi.
 2. Body: Forged brass.
 3. Disc: Forged brass.
 4. Hinge-Pin, Screw, and Cap: Forged brass.
 5. Manufacturers:
 - a. Jomar Valves, a division of Jomar Group
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 BRONZE, SWING CHECK VALVES

- A. General:
 1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
 1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 2. Design: Y-pattern, horizontal or vertical flow.
 3. WOG Rating: 200 psi.
 4. Body: Bronze, ASTM B62.
 5. End Connections: Threaded.
 6. Disc: Bronze.
 7. Manufacturers:
 - a. Apollo Valves
 - b. Jomar Valves, a division of Jomar Group
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Class 150:
 1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 2. Design: Y-pattern, horizontal or vertical flow.
 3. WSP Rating: 150 psi.
 4. WOG Rating: 300 psi.
 5. Body: Bronze, ASTM B62.

6. End Connections: Threaded or soldered.
7. Disc: Bronze.
8. Manufacturers:
 - a. FNW; 1241, Federal:
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 BRONZE, GATE VALVES

- A. General:
 1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Rising Stem or OS&Y:
 1. Pressure-Temperature Range: MSS SP-80, Type I.
 2. Class 150: CWP Rating; 300 psi.
 3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 4. End Connections: Threaded or solder.
 5. Stem: Bronze.
 6. Disc: Solid wedge; bronze.
 7. Packing: Asbestos free.
 8. Handwheel Operator: Malleable iron.
 9. Manufacturers:
 - a. Apollo Valves
 - b. FNW; 1221, Federal:
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Non-Rising Stem or NRS
 1. Pressure-Temperature Range: MSS SP-80, Type I.
 2. Class 125:
 3. Class 150: CWP Rating; 300 psi.
 4. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 5. Ends Connections: Threaded or solder.
 6. Stem: Bronze.
 7. Disc: Solid wedge; bronze.
 8. Packing: Asbestos free.
 9. Handwheel Operator: Malleable iron.
 10. Manufacturers:
 - a. Apollo Valves
 - b. FNW; 1211, Federal
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install check valves where necessary to maintain direction of flow as follows:
 - 1. Lift Check: Install with stem plumb and vertical.
 - 2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Strut systems for pipe or equipment support.
- B. Pipe hangers.
- C. Pipe supports, guides, shields, and saddles.
- D. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 50 00 - Metal Fabrications.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- 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 2023.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures 1999 (Reapproved 2022).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.
- I. 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 2023.
- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- K. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position 2022.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023a.
- M. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).
- N. MFMA-4 - Metal Framing Standards Publication 2004.
- O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- P. UL (DIR) - Online Certifications Directory Current Edition.

- Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
1. Fiberglass Strut Channel Framing Systems: Include requirements for strength derating according to ambient temperature.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
- D. Derating Calculations for Fiberglass Strut Channel Framing Systems: Indicate load ratings adjusted for applicable service conditions.
- E. Installer's Qualifications: Include evidence of compliance with specified requirements.
- F. Manufacturer's 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.

1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- C. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
- D. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
 - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
 - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- E. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
 - 1. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

- A. Strut Channels:
 - 1. Manufacturers:
 - a. ABB Installation Products
 - b. Gripple, Inc; Universal Bracket
 - c. Unistrut, a brand of Atkore International Inc
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
 - 3. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
 - 1. Threaded zinc-plated steel unless otherwise indicated.
 - 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Piping up to 1 inch: 1/4 inch diameter.
 - c. Piping larger than 1 inch: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch in length.
- C. Channel Nuts:
 - 1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation
 - b. FNW; 7821
 - c. Unistrut, a brand of Atkore International, Inc
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.03 PIPE HANGERS

A. Band Hangers, Adjustable:

1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation
 - b. Gripple, Inc; Universal Clamp (Threaded):
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
2. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B. Clevis Hangers, Adjustable:

1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation
 - b. FNW; 7005:
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
2. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
3. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
4. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch.

2.04 PIPE CLAMPS

A. Riser Clamps:

1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation
 - b. Substitutions: See Section 01 60 00 - 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. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

2.05 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Stanchions:

1. Manufacturers:
 - a. Anvil International
 - b. B-Line, a brand of Eaton Corporation
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
2. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.

3. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
 4. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
- C. 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:
 - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.
- D. Copper Pipe Supports:
1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ANCHORS AND FASTENERS

- A. Manufacturers - Mechanical Anchors:
1. Hilti, Inc
 2. Powers Fasteners, Inc
- B. Manufacturers - Powder-Actuated Fastening Systems:
1. Hilti, Inc
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- D. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- E. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- F. Hollow Masonry: Use toggle bolts.
- G. Plastic and lead anchors are not permitted.
- H. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
1. Channel Material: Use galvanized steel.
 2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- 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.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe markers.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - 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.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Nameplates:
 - 1. Control panels, transducers, and other related control equipment products.
 - 2. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.
- B. Tags:
 - 1. Piping: 3/4 inch diameter and smaller.
 - 2. Manual operated and automated control valves.
 - 3. Instrumentation, relays, gauges, and other related control equipment products.
- C. Pipe Markers: 3/4 inch diameter and higher.

2.02 NAMEPLATES

- A. Description: Laminated piece with up to three lines of text.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.

2.03 TAGS

- A. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.
- B. Piping: 3/4 inch diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.04 STENCILS

- A. Pipe: Stencil size required per external insulated or uninsulated pipe diameter.
 - 1. 3/4 to 1-1/4 inch Range: 1/2 inch text over 8 inch long background.
 - 2. 1-1/2 to 2 inch Range: 3/4 inch text over 8 inch long background.
 - 3. 8 to 10 inch Range: 2-1/2 inch text over 24 inch long background.
- B. Equipment: Use 2-1/2 inch text using Owner defined scheme.
- C. Background Paint: Semi-gloss enamel in compliance with Section 09 91 23.
- D. Stencil Paint: As specified in Section 09 91 23, semi-gloss enamel, colors complying with ASME A13.1.
- E. Fluid Service Identification Scheme, ASME A13.1:
 - 1. Water; Potable, Cooling, Boiler Feed and Other: White text on green background.

2.05 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. 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.
- C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- D. Identification Scheme, ASME A13.1:
 - 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 - a. 3/4 to 1-1/4 inches: Use 8 inch field-length with 1/2 inch text height.
 - b. 2-1/2 to 6 inches: Use 12 inch field-length with 1-1/4 inch text height.
 - c. 8 to 10 inches: Use 24 inch field-length with 2-1/2 inch text height.
 - d. Over 10 inches: Use 32 inch field-length with 3-1/2 inch text height.
 - 2. Secondary: Color scheme per fluid service.
 - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
 - 3. Tertiary: Other Details.
 - a. Directional flow arrow.

PART 3 EXECUTION

3.01 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 09 91 23 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. Apply ASME A13.1 Pipe Marking Rules:

1. Place pipe marker adjacent to changes in direction.
2. Place pipe marker adjacent each valve port and flange end.
3. Place pipe marker at both sides of floor and wall penetrations.
4. Place pipe marker every 25 to 50 feet interval of straight run.

END OF SECTION

**SECTION 22 10 00
PLUMBING MATERIALS AND METHODS**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Section includes piping materials and installation methods including, but not limited to pipe, fitting and joining materials, piping specialties, and basic piping installation instructions.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 33 00 - Submittal Procedures

1.03 REFERENCE STANDARDS

- A. ANSI B9.1, Standard Safety Code for Mechanical Refrigeration.
- B. ANSI B31.1.0 - Standard Code for Pressure Piping, Power Piping, and The American Welding Society, Welding Handbook.

1.04 SUBMITTALS

- A. Submit product data for the following:
 - 1. Escutcheons.
 - 2. Dielectric unions and fittings.
 - 3. Mechanical sleeve seals.
- B. Quality Control Submittals: Submit welders' certificates specified in Quality Assurance Article below.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide factory applied plastic end-caps on each length of pipe and tube except for concrete, corrugated metal, hub and spigot, and clay pipe.
- B. Maintain end-caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect stored pipes and tubes. Elevate above grade and enclose with durable, waterproof wrapping. When stored inside, do not exceed structural capacity of the floor.
- D. Protect flanges, fittings, and specialties from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.
- E. Store pipe in a manner to prevent sagging and bending.

1.06 QUALITY ASSURANCE

- A. Welder's Qualifications: Welders shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
- B. Welding procedures and testing shall comply with ANSI B31.1.0 and ANSI B9.1.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Pipe Escutcheons:
 - a. Chicago Specialty Mfg. Co.
 - b. Grinnell.

- c. Sanitary-Dash Mfg. Co.
- 2. Dielectric Waterway Fittings:
 - a. Epco Sales, Inc.
 - b. Victaulic Company of America.
- 3. Dielectric Unions:
 - a. Eclipse, Inc.
 - b. Perfection Corp.
 - c. Watts Regulator Co.
- 4. Mechanical Sleeve Seals:
 - a. Thunderline Corp.
- 5. High-Impact Thermoplastic Wall Sleeve:
 - a. Thunderline.
 - b. Silicone Rubber Adhesive:
 - c. General Electric.
- 6. High-Density Polyethylene Pipe (64.2):
 - a. Driscopipe 8000.
 - b. Nipak.
 - c. Dupont.
- 7. High-Density Polyethylene Pipe (64.7):
 - a. Driscopipe 8600.
 - b. Nipak.
 - c. Dupont.

2.02 MATERIALS

- A. Refer to the individual piping system specifications in Sections 22 1113 for specifications on piping materials required from those listed below:
 - 1. Steel Pipe (61.1):
 - a. Normal Service Pressure: Up to 150 psig
 - b. Temperature: Up to 366 degrees Fahrenheit

Type	Size	Specification
Pipe	1/4-inch thru 4-inch	Carbon steel pipe, Schedule 40, ASTM A 120 seamless or electric welded. Note: Standard weight and Schedule 40 are the same in all sizes through 10 inches; in larger sizes, the wall thickness differs.
Types of Joints	1/4-inch thru 2-inches 2-1/2-inch and larger	Screwed Welded
Fittings	1/4-inch thru 2-inches	Black malleable iron, 150-pound class, screwed. ANSI

		standard B16.3
Nipples	1/4-inch thru 2-inches	Carbon steel, extra strong, ASTM A 120 or A 53
Unions	1/4-inch thru 2-inches	Malleable iron, 250-pound class (500 WOG), railroad type with brass seats
Thread Sealant		Pipe dope. John Crane Insoluble Plastic Lead seal No. 2 or approved equal. Exception: For temperatures in excess of 250 degree Fahrenheit, use Teflon ribbon, 1/2-inch wide.

2. Cast Iron (62.2):

a. Temperature: Up to 180 degrees Fahrenheit

Type	Size	Specifications
Pipe	2-inches thru 15-inches	Cast iron soil pipe, plain end, service weight (SV), bituminous coating inside and outside. Cast Iron Soil Pipe Institute Std. 301
Type of Joints	2-inches thru 15-inches	No-hub coupling.
Fittings	2-inches thru 15-inches	Cast iron soil pipe, no-hub type, service weight (SV), bituminous coating inside and outside. Cast Iron Soil Pipe Institute Std. 301.

3. Copper Tubing (63.1):

a. Normal Service Pressure: Up to 150 psig

b. Temperature: Up to 250 degrees Fahrenheit

c. Use solder fittings at all joints between terminal points.

d. Bends may be used for 1/4-inch and 3/8-inch tubing.

1) Bends shall be made with a bending tool to the following minimum radii:

(a) 1/4-inch: 9/16-inch minimum radius

(b) 3/8-inch: 15/16-inch minimum radius

Type	Size	Specification
Pipe	All sizes	Copper tubing, type L, hard-drawn above ground. Type K (soft) for below grade
Types of Joints	1/4-inch thru 1/2-inch	Soldered or compression type as required
	5/8-inch and larger	Soldered (Exposed), Flared (Buried)
Compression	1/4-inch thru 1/2-inch	Brass compression type fittings

Fittings (Exposed)	All sizes	Gyrolok, Swagelok, Parker CPI
Unions	1/4-inch thru 2-inches	Wrought copper or cast bronze; solder joint union
Flanges	All sizes	Copper, solder-joint flange. 150-pound ASME drilling. Raised or flat face to match equipment
Gaskets		1/16-inch Teflon; ring type for raised-face, or full-face for flat face flange
Solder		Tin/Antimony (or lead-free to meet Code requirements)
Thread Sealant		Teflon tape

4. High Density Polyethylene Pipe (64.2) for Gas Distribution:

- a. Normal Service Pressure: 80 psig
- b. Temperature: Up to 140 degrees Fahrenheit

Type	Size	Specifications
Pipe	3/4-inch and larger	High-density polyethylene, SDR-11, ASTM D2513, PE 3408
Type of Joints	3/4-inch and larger	Fusion welded, ASTM D2513 or socket
Fittings	3/4-inch and larger	High-density polyethylene, SDR-11, socket fusion type, with diameters compatible with pipe for fusion joining
Gaskets	3/4-inch and larger	1/16-inch solid neoprene, full-face type
Flanges	3/4-inch and larger	PVC, 150-pound, flat-face, Sch 80, socket type

5. PVC DWV Pipe (64.6):

- a. Normal Service Pressure: 5 psig (maximum)
- b. Temperature: Up to 150 degrees Fahrenheit

Type	Size	Specifications
Pipe	1-inch thru 8-inches	PVC, Sch 40, ASTM D2665
Type of Joints	1-inch thru 8-inches	Solvent welded
Fittings	1-inch thru 8-inches	PVC, Sch 40, socket type, ASTM D2949

6. High-Density Polyethylene Pipe (64.7) for Sump Discharge:

- a. Normal Service Pressure: 80 psig (maximum)
- b. Temperature: Up to 140 degrees Fahrenheit

Type	Size	Specifications
Pipe	3/4-inch and larger	High-density polyethylene,

		SDR-11, ASTM D3350, PE 3408
Type of Joints	3/4-inch and larger	Fusion welded, ASTM D 3261 or socket. ASTM D2683
Fittings	3/4-inch and larger	High-density polyethylene, SDR-11, socket fusion type, with diameters compatible with pipe for fusion joining
Gasket	3/4-inch and larger	1/16-inch solid hypalon, full-face type
Flanges	3/4-inch and larger	PVC, 150-pound, flat-face, Sch 80, socket type

2.03 JOINTING MATERIALS

- A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.
- B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.
- C. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed, and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.04 PIPING SPECIALTIES

- A. Escutcheons: Chrome plated, stamped steel, hinged, split-ring escutcheon with setscrew. Inside diameter shall closely fit pipe outside diameter or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.
- B. Unions: Malleable iron, Class 150 for low-pressure service and Class 250 for high-pressure service; hexagonal stock with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.
- C. Dielectric Unions: Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion. Insulated and gasketed, galvanized, malleable iron unions as manufactured by Crane No. 1259, ITT-Grinnell, Figure 470, or equal.
- D. Dielectric Waterway Fittings: electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining.
- E. Sleeves: Unless otherwise shown on Drawings, at all points where pipes must pass through walls, floors or roofs of structures, Contractor shall furnish and install suitable sleeves or wall castings.
 - 1. In general, the wall sleeve or casting shall be of the same material as the pipe, or standard weight steel pipe thimbles of at least 1 size larger than the pipe itself shall be installed. Iron pipe wall castings, wall pipe, transition sleeves and solid sleeves shall meet the requirements or AWWA Specifications C100 and shall be of the lightest class conforming to the pressure rating of the pipelines which they connect, but in no case shall be lighter than Class B. Sleeves shall be shop coated with universal primer 2 mils minimum thickness.
 - 2. A high-impact thermoplastic wall sleeve as manufactured by Thunderline may be used for low and standard temperature service.

F. Sleeve Seals:

1. Unless otherwise shown or permitted, the space between the pipe and the sleeve shall be caulked at the inside and outside wall faces on walls exposed to earth or water/sewage, at one face of the other walls, and at the top surface of floors and slabs. The space shall be caulked with lead and oakum as specified under Bell and Spigot Lead with an RTV-silicone rubber adhesive as manufactured by General Electric or sealed with a rubber link seal. Rubber link seal shall be identical rubber links interconnected with bolts and elongated nuts and washers.
2. Sealing element shall be made of synthetic rubber material especially compounded to resist aging, ozone, sunlight, and chemical action.
3. Bolts and metal parts shall be made of galvanized or cadmium-plated steel to resist corrosion. Rubber link seal joints shall be submitted to Engineer for approval.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 INSTALLATION

- A. Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for submittals.
- B. Piping shall be exposed unless indicated otherwise.
- C. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on Drawings.
- E. Install piping far enough from slabs, beams, joists, columns, walls, and other permanent elements of the building to permit access for painting. Provide space to permit insulation applications, with 3-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- F. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- G. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.
- H. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals.

3.03 FITTINGS AND SPECIALTIES

- A. Use fittings for all changes in direction and all branch connections.
- B. Remake leaking joints using new materials.
- C. Install unions adjacent to each valve, and at the final connection to each piece of equipment and plumbing fixture having 2-inch and smaller connections, and elsewhere as indicated.
- D. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum).

- E. Install dielectric fittings to connect piping materials of dissimilar metals in wet piping systems (water, steam).

3.04 JOINTS

A. Steel Pipe Joints:

- 1. Pipe 2-inch and Smaller: Thread pipe with tapered pipe threads in accordance with ANSI B2.1.

- a. Cut threads full and clean using sharp dies.
- b. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten joint to leave not more than 3 threads exposed.

B. Pipe Larger than 2-inches:

- 1. Brazed and Soldered Joints: For copper tube and fitting joints, braze joints in accordance with ANSI B31.1.0, Standard Code for Pressure Piping, Power Piping, and ANSI B9.1, Standard Safety Code for Mechanical Refrigeration.
- 2. Mechanical Joints: Flared compression fittings may be used for refrigerant lines 3/4-inch and smaller.
- 3. Joints for other piping materials are specified within the respective piping system sections.

3.05 TESTING

- A. Refer to individual piping system specification Sections for more information regarding testing.

END OF SECTION

SECTION 22 10 05 PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, above grade.
- D. Storm drainage piping, buried within 5 feet of building.
- E. Storm drainage piping, above grade.
- F. Pipe flanges, unions, and couplings.
- G. Pipe hangers and supports.
- H. Pipe sleeve-seal systems.
- I. Ball valves.
- J. Pressure reducing valves.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting.
- B. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.
- C. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- D. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- E. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- F. Section 22 07 19 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
- C. ASME B31.1 - Power Piping 2022.
- D. ASME B31.3 - Process Piping 2022.
- E. ASME B31.9 - Building Services Piping 2020.
- F. 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 2023.
- G. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Potable Water Distribution Systems 2020.
- H. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.
- I. ASTM A536 - Standard Specification for Ductile Iron Castings 1984, with Editorial Revision (2019).
- J. ASTM B32 - Standard Specification for Solder Metal 2020.
- K. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- L. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed 2019.
- M. ASTM B75/B75M - Standard Specification for Seamless Copper Tube 2020.

- N. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.
- O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- S. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings 2020.
- T. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings 2020.
- U. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2021a.
- V. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings 2022.
- W. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2020.
- X. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- Y. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- Z. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- AA. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.
- BB. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe 2014 (Reapproved 2021).
- CC. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings 2021.
- DD. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992 (Reapproved 2022).
- EE. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2019.
- FF. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 2021.
- GG. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- HH. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).
- II. AWWA C550 - Protective Interior Coatings for Valves and Hydrants 2017.
- JJ. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm) 2022.
- KK. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2021.
- LL. 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.

- MM. FM 1680 - Approval Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/ Commercial and Residential 1989.
- NN. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements 2018, with Editorial Revision (2020).
- OO. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry 2018, with Editorial Revision (2020).
- PP. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements 2017, with Editorial Revision (2020).
- QQ. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2023.
- RR. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- SS. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
- TT. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - 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.
- C. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.
- D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- E. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.
- F. Sustainable Design Documentation: For products meeting regulatory lead-content restrictions.
- G. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 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.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- B. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.
 - 1. Fittings: PVC.
 - 2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service 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: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
 - 3. Joints: AWS A5.8M/A5.8, BCuP copper and silver braze.
- B. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), 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: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), 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: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Anvil International
 - 2) Grinnell Products
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.

2.06 STORM DRAINAGE PIPING, ABOVE GRADE

- 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.

2.07 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch and Under:
 - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. 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.
 - 5. Manufacturers:
 - a. Ideal Clamp Products, Inc; Standard
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Shielded, Heavy Duty No-Hub Couplings:
 - 1. Testing: In accordance with ASTM C1540 and FM 1680.
 - 2. Gasket Material: Neoprene complying with ASTM C564.
 - 3. Band Material: Stainless steel.
 - 4. Eyelet Material: Stainless steel.
 - 5. Manufacturers:
 - a. Ideal Clamp Products, Inc; Yellow Shield Heavy Duty
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 PIPE HANGERS AND SUPPORTS

- A. See Section 22 05 29 for additional requirements.
- B. 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.
 - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

2.09 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. Service Requirements:
 - a. Corrosion resistant.
 - b. Underground, buried, and wet conditions.
 - c. Fire Resistant: 1 hour, UL (DIR) approved.
5. Glass reinforced plastic pressure end plates.

2.10 BALL VALVES

- A. Manufacturers:
 1. Anvil International
 2. Apollo Valves
 3. Grinnell Products
 4. Nibco, Inc
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or 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.

2.11 PRESSURE REDUCING VALVES

- A. Manufacturers:
 1. Cla-Val Company
 2. Flomatic Valves
 3. Watts Regulator Company
 4. Zurn Industries, LLC; 500XL3
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. 2 inch 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.
 - b. Connected into brass or bronze pilot piping and fittings.
 - c. Fixed flow restrictor, pressure gauges, and isolation valves.
- C. 2 inch 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.
 - b. Connected into brass or bronze pilot piping and fittings.

- c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 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.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than 3.5 ft of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
 - 1. See Section 09 91 23 for painting of interior plumbing systems and components.
- L. 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.
- M. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- N. Sleeve pipes passing through partitions, walls, and floors.
- O. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- P. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.

5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 7. Provide copper plated hangers and supports for copper piping.
 8. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 22 05 48.
 9. Support cast iron drainage piping at every joint.
- Q. 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.
- R. 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.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Provide spring-loaded check valves on discharge of water pumps.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
 1. Perform hydrostatic testing for leakage prior to system disinfection.
 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
 3. General:
 - a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
 4. Metal Piping Systems Subject to Freezing Conditions:

- a. Inject 40 psi of compressed air into piping to spot check for leaks with liquid soap. Document and repair leaks as necessary.
 - b. Raise injected compressed air pressure to 1.5 times rated service pressure or minimum pressure of 100 psi for a duration of 2 hours and verify with a gauge that no perceptible pressure drop is measured.
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

3.08 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inch to 1-1/4 inch:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inch to 2 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inch to 3 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
 - d. Pipe Size: 4 inch to 6 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION