

**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:

S	D	C
00 01 10	Delete the following Section(s) in their entirety from the Project Manual and from Section 00 01 10:  26 05 33 - Raceways and Boxes 26 36 23 - Automatic Transfer Switches	
00 01 10	Replace the following Section(s) in their entirety in the Project Manual and in Section 00 01 10:  22 05 13 - Common Motor Requirements for Plumbing Equipment 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 14 29 - Sump Pumps	
00 01 10	Add the following Section(s) in their entirety in the Project Manual and in Section 00 01 10:  22 10 05 - Plumbing Piping 26 29 13 - Enclosed Motor Controllers	
01 21 00	Add the following Allowance Schedule to 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 27,000.00 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.	
40 05 52	Revise paragraph 2.03 C. of Section 40 05 52 to read as follows:  "Valve Lining: Provide factory-applied lining; use epoxy lining unless other material is indicated."	
40 20 00	In paragraph 2.02.A.2 of Section 40 20 00, replace the paragraph to read as follows:  "External Coating: Coated on the outside with manufacturer's standard primer coat compatible with finished epoxy."	

S	D C
40 20 00	<p>In paragraph 2.02.A.3.b of Section 40 20 00, replace the paragraph with the following:</p> <p style="text-align: center;">“Gaskets shall be Styrene Butadiene Rubber (SBR) conforming to ANSI/AWWA A21.11/C 111 requirements.”</p>
40 20 00	<p>Add paragraph the following paragraph to paragraph 2.04 of Section 40 2000:</p> <p>B. Flange Coupling Adapters for Joining Flange to Plain End: Gasketed assembly for connecting flanged pipe or fitting to plain end steel pipe; sized to match piping. Designed in accordance with AWWA C219.</p> <ol style="list-style-type: none"> <li>1. Flange: AWWA C207 Class D Flange with ANSI 150 lb. drilling.</li> <li>2. Flange Sizes: To mate accurately with specified flanged fittings.</li> <li>3. Sleeve: Carbon steel per ASTM A36</li> <li>4. Center Ring: Carbon steel per ASTM A36</li> <li>5. End Ring: Carbon steel per AISI 1018/1020</li> <li>6. External Finish: Same as for pipe.</li> <li>7. Gaskets: Wedge type; Styrene Butadiene Rubber (SBR) per ASTM D2000.</li> <li>8. Manufacturers: <ol style="list-style-type: none"> <li>a. Ford Meter Box Company.</li> <li>b. Smith-Blair, Inc.</li> <li>c. Romac.</li> </ol> </li> </ol>
40 72 00	Delete paragraph 2.03 (Float Switches (Chemical Duty Type)) from Section 40 72 00.

S	D C
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.

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**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

- 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.
  - 4. Motors with frame sizes 254T and larger: Energy efficient 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 and explosion proof environments: Totally enclosed type.
- B. Motors located in outdoors: 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; : [www.dwyer-inst.com/](http://www.dwyer-inst.com/) sle.
  - 3. Substitutions: See Section 01 60 00 - Product Requirements.

**PART 3 EXECUTION**

**3.01 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.

**3.02 SCHEDULES**

- A. Pressure Gauges, Location and Scale Range:
  - 1. Pumps, 0 to 100 psi.
  - 2. Pressure reducing valves, 0 to 100 psi.
  - 3. Backflow preventers, 0 to 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 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- C. 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& : 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 A48/A48M - Standard Specification for Gray Iron Castings 2022.
- K. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings 2004 (Reapproved 2019).

- L. ASTM A536 - Standard Specification for Ductile Iron Castings 1984, with Editorial Revision (2019).
- M. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings 2015 (Reapproved 2021).
- N. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- O. AWWA C606 - Grooved and Shouldered Joints 2022.
- P. MSS SP-45 - Drain and Bypass Connections 2020.
- Q. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends 2011.
- R. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends 2018.
- S. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
- T. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.
- U. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
- V. MSS SP-125 - Check Valves: Gray Iron and Ductile Iron, In-Line, Spring-Loaded, Center-Guided 2018.
- W. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- X. 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.
    - c. 2-1/2 inch and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- 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.
- F. Domestic, Hot and Cold Water Valves:
  - 1. 2 inch and Smaller:
    - a. Bronze and Brass: Provide with solder-joint ends.
    - 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.
- G. 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. Gear Actuator: Quarter-turn valves 8 inch and larger.
  - 2. Handwheel: Valves other than quarter-turn types.
  - 3. Hand Lever: Quarter-turn valves 6 inch 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.
- 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.
  - 5. Grooved End Connections: AWWA C606.
- 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**

### **2.04 IRON, BALL VALVES**

- A. Class 125, Full Port, Stainless Steel Trim:
  - 1. Comply with MSS SP-72.
  - 2. CWP Rating: 200 psi.
  - 3. Body: ASTM A536 Grade 65-45-12, ductile iron.
  - 4. End Connections: Flanged.
  - 5. Seats: PTFE.
  - 6. Operator: Lever with locking handle.

### **2.05 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: -pattern, horizontal or vertical flow.
  - 3. WOG Rating: 200 psi.
  - 4. Body: Bronze, ASTM B62.
  - 5. End Connections: Threaded.
  - 6. Disc: Bronze.

### **2.06 IRON, HORIZONTAL SWING CHECK VALVES**

### **2.07 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL**

- A. Class 125 with Lever and Spring-Closure Control.
  - 1. Comply with MSS SP-71, Type I.
  - 2. Description:
    - a. CWP Rating: 200 psi.
    - b. Design: Clear or full waterway.
    - c. Body: ASTM A126, gray iron with bolted bonnet.
    - d. Ends: Flanged as indicated.
    - e. Trim: Bronze.
    - f. Gasket: Asbestos free.
    - g. Closer Control: Factory installed, exterior lever, and weight.

### **2.08 BRONZE, GATE VALVES**

- A. General:
  - 1. Fabricate from dezincification resistant material.
  - 2. Copper alloys containing more than 15 percent zinc are not permitted.

## **2.09 IRON, GATE VALVES**

- A. Bolted Bonnet: OS& ; Rising Stem:
  - 1. Pressure and Temperature Rating: MSS SP-70, Type I.
  - 2. Class 125: WOG Rating; 200 psi.
  - 3. Body: ASTM A126, gray iron with bolted bonnet.
  - 4. End Connections: Flanged.
  - 5. Trim: Bronze.
  - 6. Disc: Solid wedge.
  - 7. Packing and Gasket: Asbestos free.

## **2.10 CHAINWHEELS**

- A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
  - 1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
  - 2. Attachment: For connection to ball valve stems.
  - 3. Sprocket Rim with Chain Guides: Ductile iron. Include zinc coating.
  - 4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

## **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. Swing Check: Install horizontal maintaining hinge pin level.
- D. Provide chainwheels on operators for valves 4 inch and larger where located 96 inch or more above finished floor, terminating 60 inch above finished floor.

**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.
- C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for  $\frac{1}{8}$  in (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for  $\frac{1}{8}$  in 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,  $\frac{1}{8}$  in-Coated (Galvanized) or  $\frac{1}{8}$  in-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  $\frac{1}{8}$  in on Iron and Steel 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023a.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).
- M. MFMA-4 - Metal Framing Standards Publication 2004.
- N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- O. UL (DIR) - Online Certifications Directory Current Edition.

- P. 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, and post-installed concrete and masonry anchors.
  - 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 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.
- C. Channel Nuts:
  - 1. Manufacturers:
    - a. Unistrut, a brand of Atkore International, Inc; : [www.unistrut.com/](http://www.unistrut.com/) sle.
    - b. 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; : [www.eaton.com/](http://www.eaton.com/) sle.
    - b. Gripple, Inc; Universal Clamp (Threaded): [www.gripple.com/](http://www.gripple.com/) sle.
    - 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; : [www.eaton.com/](http://www.eaton.com/) sle.
    - b. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.04 PIPE CLAMPS

- A. Riser Clamps:
1. Manufacturers:
    - a. B-Line, a brand of Eaton Corporation; : [www.eaton.com/](http://www.eaton.com/) sle.
    - 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. 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. 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.
- C. Pipe Supports, Thermal Insulated:
1. General Requirements:
    - 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. Provide pipe supports for 1/2 to 30 inch iron pipes.
    - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
  2. PVC Jacket:

- a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
- b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
- c. Minimum Thickness: 60 mil, 0.06 inch.

## **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. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Field-Welding (where approved by Engineer): Comply with Section 05 50 00.
- G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H. 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.
- 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. Stencil:
  - 1. Piping: 3/4 inch diameter and higher.
- D. 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: 1/2 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. 2-1/2 to 6 inch Range: 1-1/4 inch text over 12 inch long background.
  4. 8 to 10 inch Range: 2-1/2 inch text over 24 inch long background.
  5. Over 10 inches: 3-1/2 inch text over 32 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. 1-1/2 to 2 inches: Use 8 inch field-length with 3/4 inch text height.
    - c. 2-1/2 to 6 inches: Use 12 inch field-length with 1-1/4 inch text height.
    - d. 8 to 10 inches: Use 24 inch field-length with 2-1/2 inch text height.
    - e. 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 PREPARATION**

- A. Degrease and clean surfaces to receive identification products.

- B. Prepare surfaces for stencil painting, see Section 09 91 23.

### **3.02 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

T	S	S
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

T	S	S
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

T	S	S
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

T	S	S
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

T	S	S
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

T	S	S
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 OINTING 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 2 PRODUCTS**

**1.01 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.
- 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.

**END OF SECTION**



## **SECTION 22 14 29 SUMP PUMPS**

### **PART 1 GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Section includes submersible sump pump and related appurtenances.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01 33 00 - Submittal Procedures
- B. Section 01 77 00 - Closeout Procedures

#### **1.03 REFERENCE STANDARDS**

- A. Hydraulic Institute Compliance: Design, manufacture, and install pumps in accordance with Hydraulic Institute Standards.
- B. National Electrical Code Compliance: Components shall comply with NFPA 70 - National Electrical Code.
- C. UL Compliance: Pumps shall be listed and labeled by UL and comply with UL 778 - Motor Operated Water Pumps.
- D. NEMA Compliance: Electric motors and components shall be listed and labeled NEMA.
- E. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with the Sump and Sewage Pump Manufacturers Association (SSPMA) Standards.

#### **1.04 SUBMITTALS**

- A. Submit Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
  - 1. Shop Drawings showing layout and connections for pumps. Include setting Drawings with templates, and directions for installation of foundation bolts, anchor bolts, and other anchorages.
  - 2. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories, plus installation and start-up instructions.
  - 3. Contractor shall submit to Engineer for approval performance curves on each pump. These curves shall include capacity, head, required NPSH efficiency and horsepower required for operation as shown on Pump Schedule and on Drawings.
  - 4. Wiring diagrams detailing wiring for power, signal, and control systems; differentiating between manufacturer-installed wiring and field-installed wiring.
- B. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01 77 00 - Closeout Procedures, operation and maintenance manuals for items included under this Section.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- A. Apply factory finish paint to assembled, tested units prior to shipping.
- B. Preparation for Shipping: After assembly and testing, clean flanges and exposed machined metal surfaces and treat with an anti-corrosion compound. Protect flanges, pipe openings, and nozzles.
  - 1. Store pumps in a dry location.
  - 2. Retain shipping flange protective covers and protective coatings during storage.
  - 3. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

4. For extended storage times (greater than 30 days), dry internal parts with hot air or a vacuum-producing device. After drying, coat internal parts with light oil, kerosene, or antifreeze. Dismantle bearings and couplings, dry and coat with an acid-free, heavy oil, and tag and store in dry location.

C. Comply with manufacturer's rigging instructions for handling, if required.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

A. Pump shall be a submersible model as manufactured by:

1. ABS Model EJ 04W-2
2. Engineer approved equal

### **2.02 EQUIPMENT**

- A. Pump shall be a heavy-duty submersible model.
- B. Casing: Cast iron.
- C. Impeller: PTB Vortex impeller capable of passing 2-inch solids.
- D. Seal: Ceramic-faced mechanical seal.
- E. Shaft: Shaft shall be stainless steel.
- F. Motor: Motors shall be hermetically sealed.
- G. Controls: Fully automatic, equipped with float switches.
- H. Pump Discharge Piping: Contractor shall provide discharge check and gate valve meeting the appropriate specifications.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. The following requirements apply only to pumps furnished under this Section. Pumps furnished under other Sections may have different requirements.
  1. Examine areas, equipment foundations, and conditions for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.
  2. Examine rough-in for piping systems to verify actual locations of piping connections prior to installation.

### **3.02 INSTALLATION**

- A. Comply with manufacturer's written installation and alignment instructions.
- B. Install pumps in locations and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support pumps and piping separately so that the weight of the piping system does not rest on the pump.
- D. Electrical wiring and connections are specified in Division 26.

**END OF SECTION**

## **SECTION 26 29 13 ENCLOSED MOTOR CONTROLLERS**

### **PART 1 GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Furnish labor, materials, equipment, and incidentals to provide magnetic motor starters and combination magnetic motor starters as shown on the Drawings, specified or required.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 26 05 00 - Common Work Results for Electrical
- B. Section 26 05 10 - Basic Electrical Materials and Methods
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems
- D. Section 26 05 33.16 - Boxes for Electrical Systems
- E. Section 26 05 53 - Electrical Identification
- F. Section 26 24 16.13 - Panel Components and Devices

#### **1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- E. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum)
- F. NFPA 70 - National Electric Code (NEC)
- G. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- H. UL 198E - Class R Fuses.

#### **1.04 REGULATORY REQUIREMENTS**

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide switch ratings and enclosure dimensions.
- B. Test Reports: Indicate field test and inspection procedures and test results.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- D. The equipment shall not be released for manufacture prior to approval of, and coordination with, the Short Circuit, Flash Hazard, and Protective Devices Coordination Analyses.

#### **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with NECA Standard of Installation.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00 - Product Requirements.

## 1.08 SPARE PARTS

- A. Furnish under provisions of Section 01 77 00 - Closeout Procedures.
- B. Furnish one (1) set of replaceable contacts for each type of relay and each size of contactor or starter installed in motor controllers furnished under this Contract.
- C. Furnish three (3) push-to-test indicating light assemblies to match those installed in motor controllers furnished under this Contract.
- D. Furnish ten (10) indicating light lamps.
- E. Furnish two (2) indicating light lens' of each color installed in motor controllers furnished under this Contract.
- F. Furnish one (1) control switch assembly of each type installed in motor controllers furnished under this Contract.
- G. For additional spare parts requirements, see Section 26 00 00 - General Requirements for Electrical Work.

## PART 2 PRODUCTS

### 2.01 MAGNETIC MOTOR STARTERS

- A. Full voltage starters shall be combination motor circuit protector type, unless otherwise noted, and motor starter complete with three pole, ambient compensating overload relays, and control circuit transformer. Starters shall be equipped with a spare auxiliary contact in addition to those shown on the Drawings, shall be minimum NEMA Size 1, and shall have 120 volt coils.
- B. Where indicated on the Drawings, starters shall include ground fault protective devices. The ground fault protective devices shall include a current transformer, a ground fault relay, and test circuit and shall be suitable for interrupting the starter control circuit. Ground fault monitoring and test devices shall be mounted on the starter door and shall include a trip indicator, a manual reset button, and a test button. Testing with or without tripping shall be possible.
- C. Starters shall be electrically operated and held type, three pole assemblies with coil, contact assemblies, and integral overload protection. Coil shall be warranted for life.
- D. Motor overload protection shall consist of a thermal overload relay of the three pole, ambient compensating, manual reset, and solid state type.
- E. Solid state motor overload protection shall include time-current characteristics and shall be field selectable or adjustable. Accuracy shall be within 2%. Solid state overloads shall monitor three phase motor current utilizing three current sensors. The trip Class 10, 20, and 30 shall be field selectable and provide 10, 20, or 30 second delay at six times the full load running protection respectively. Solid state overloads shall be manually reset with the ability to convert to automatic reset in the field. Overload relay shall have two outputs: 1) an alarm indicator indicating motor is running in overload and, 2) an overload trip indicator.
- F. Oiltight pushbutton and selector switches and push-to-test, transformer type, indicating lights shall be provided as indicated on the Drawings. Control devices mounted on doors of NEMA Type 4 enclosed starters shall be NEMA Type 4 rated. All starters with manual reset overload relays shall have an external overload reset pushbutton mounted on the enclosure door.
- G. Control devices shall be as specified under Section 26 24 16.13 - Panel Components and Devices.
- H. Starters shall have NEMA Type 12 enclosures where mounted indoors, stainless steel NEMA Type 4 enclosures where outdoors or below grade indoors, or non-metallic NEMA Type 4X enclosures in corrosive locations, unless otherwise shown on the Drawings. All hardware on the exterior of NEMA Type 4 enclosures, including hinge pins, screws, bolts, nuts, washers, etc., shall be made of stainless steel.

- I. Control circuit transformers shall have fused primary windings and 120 volt, fused, and grounded secondary windings. Control circuit transformers shall have extra capacity where required to carry connected loads.
- J. Fuses shall be as specified under Section 26 28 13.
- K. All unit line and load terminals or lugs shall be 75°C rated for copper conductors. Terminal boards or blocks shall be provided for all external connections and shall be readily accessible from the front of the starter enclosure. All wiring to external devices shall be terminated at the terminal blocks, excluding incoming power feeders and motor leads. All wires and terminals shall be tagged to agree with schematic and wiring diagrams.
- L. Each starter shall have a reduced size, approved, "as-built," schematic wiring diagram, in ladder diagram format, inside each unit, indicating all internal components and wiring terminal strip connections, all 480 V. power wiring, all 120 V. control and power wiring, all instrument wiring, and all external components and wiring (shown dotted). Wiring diagrams shall have a plasticized coating to protect them from dirt, heat, and normal wear and tear.
- M. Motor starters shall be Eaton Cutler-Hammer A200 Series, Allen-Bradley Bulletin 500 Line, or Square D.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Provide motor starters for each motor not provided for by others or controlled by starters in motor control centers.
- B. Contractor shall verify all motor horsepowers prior to procurement of starters and installation of motor wiring.
- C. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.
- D. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Height: 5 ft. (1.6 M) to operating handle or as indicated on the Drawings.
- F. Install fuses in fusible switches.
- G. Select and install overload heater elements or set solid state overload relays in motor controllers to match installed motor characteristics.
- H. All device settings shall be provided and installed by the device supplier, based on equipment operating and protection requirements. Submit for Owner approval prior to implementation. All as-built settings shall be included in supplied O&M manuals.
- I. Provide engraved plastic nameplates under the provisions of Section 26 05 53 - Electrical Identification.
- J. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
- K. NEMA Type 4 and Type 4X enclosures in other than corrosive areas shall be equipped with a combination drain and breather. The drain shall be mounted on a bolt-on, gasketed hub. Combination drain and breather shall be Crouse-Hinds ECD Combination Series, Appleton, or equal.
- L. Arc flash and shock hazard warning labels shall be provided on the door of each contactor and starter enclosure and shall be marked as specified in Section 26 05 53 - Electrical Identification.

### **3.02 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Sections 01 45 00 - Quality Control and Section 26 08 00 - Calibration and Start-up of Systems.

B. Inspect and test each enclosed controller to NEMA ICS 2.

**END OF SECTION**