

SECTION 23 05 19
METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes meters and gages and related accessories for HVAC piping systems.
- B. Additional related Sections include the following:
 - 1. HVAC equipment Sections that specify meters and gages as part of factory-fabricated equipment.
 - 2. Division 23 Section "Instrumentation and Control for HVAC" for flow meters connected to the building automation system.

1.3 ACTION SUBMITTALS

- A. Product Data: Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified. Include schedule indicating manufacturer's number, scale range, fittings, and location for each meter and gage.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For meters and gages to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dial-Type Bimetallic-Actuated Thermometers:
 - a. Weksler / Ashcroft Inc.
 - b. Ernst Flow Industries
 - c. Miljoco Corp.
 - d. Trerice: H. O. Trerice Co.
 - e. Weiss Instruments, Inc.
 - f. Or equal as approved by the Professional.

2. Pressure and Differential Pressure Gages:

- a. Weksler / Ashcroft Inc.
- b. Ernst Flow Industries
- c. Miljoco Corp.
- d. Trerice: H. O. Trerice Co.
- e. Weiss Instruments, Inc.
- f. Or equal as approved by the Professional.

3. Test Plugs (P/T Ports):

- a. Flow Design, Inc.
- b. MG Piping Products Co.
- c. National Meter.
- d. Peterson Equipment Co., Inc.
- e. Sisco Manufacturing Co.
- f. Trerice: H. O. Trerice Co.
- g. Watts Industries, Inc.; Water Products Div.
- h. Or equal as approved by the Professional.

4. Sight Flow Indicators:

- a. Axiom Industries
- b. Dwyer Instruments Inc.
- c. Emerson Process Management; Rosemount Div.
- d. Ernst Flow Industries
- e. Kobold Instruments Inc.
- f. Or equal as approved by the Professional.

5. Make Up Water Meters:

- a. Master Meter, Inc.
- b. Hersey; a Div. of Mueller Systems LLC
- c. Sensus Technologies, Inc.
- d. Badger Meter Inc.
- e. Neptune Technology Group
- f. Or equal as approved by the Professional.

2.2 DIAL-TYPE BIMETALLIC-ACTUATED THERMOMETERS

A. Standard: ASME B40.200, Grade A.

B. Scale Range: Temperature ranges for services listed are as follows:

- 1. Heating Hot Water: 30 to 240 deg. F., with 2-degree scale divisions.
- 2. Steam and Steam Condensate: 50 to 400 deg. F., with 5-degree scale divisions.

C. Case: Hermetically sealed type; constructed of stainless steel or cast aluminum, with minimum 3-inch nominal diameter.

- 1. Exception: Gauges located over 7 feet above the finished floor shall be minimum 5-in. diameter, and shall be positioned so that they are readable from floor level.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

- E. Connector Type(s): Union joint, 0-90 degree adjustable angle, with unified-inch screw threads.
- F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch in diameter; stainless steel, of length to match that of the thermowell insertion length, with silicone vibration damping to prevent pointer flutter.
- H. Window: Shatterproof glass, gasketed.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.
- M. Recalibrator Adjustment: Reset screw.

2.3 SEPARABLE SOCKETS (THERMOWELLS)

- A. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem. Sockets shall be a 1-piece machined design. Two-piece welded types are not acceptable.
 - 1. Standard: ASME B40.200.
 - 2. Material:
 - a. Brass, for use in copper piping.
 - b. Type 304 or 316 stainless steel, for use in steel piping.
 - 3. Extension-Neck Length: Nominal thickness of 2 inches, but not less than thickness of insulation. Omit extension neck for sockets for piping not insulated.
 - 4. Insertion Length: To extend 2 inches into pipe.
 - a. For piping smaller than 3-inches, provide a tee fitting and bushing for the installation of the thermowells. Position the bushing and thermowell on the top of the pipe.
 - 5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
 - 6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
 - 7. Bore: Diameter required to match thermometer bulb or stem.
 - 8. Cap: Threaded, with chain permanently fastened to socket.
 - 9. Bushings: For converting size of socket's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Compound: Thermally conductive compound (grease or paste form), containing heat conducting additives, suitable for service temperatures up to 390 deg F.
 - 1. Minimum conductivity (k): 16 BTU-in / hr-sq.ft-deg. F.
 - 2. Acceptable product: Omega Instruments "Omegatherm 201", or approved equal.

2.4 PRESSURE GAGES

- A. Description: Designed to measure the pressure of a single pressure source. ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated. Liquid filled types should be filled with low temperature glycerin.
- B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch-diameter, glass lens.
 - 1. Exception: Gauges located over 7 feet above the finished floor shall be 6-in. diameter, and shall be positioned so that they are readable from floor level.
- C. Connector: Brass, NPS 1/4.
- D. Flexible Capillary Tube: For use with remote mounted gauge on installations where the gauge is subject to pipeline vibration, such as immediately adjacent to pumps.
- E. Scale: White-coated aluminum with permanently etched markings.
- F. Accuracy: Grade A, plus or minus 1 percent of middle 50 percent of scale.
- G. Range: Comply with the following:
 - 1. Fluids under Pressure: Two times the operating pressure.
 - 2. Vacuum: 30 inches Hg of vacuum to two times the operating pressure.

2.5 DIFFERENTIAL PRESSURE GAUGES

- A. Description: Designed to measure the differential pressure between two separate pressure sources. Bourdon tube, dry type, with brass or stainless steel body and case. Case shall be minimum 4-1/2" diameter. Pressure and temperature rating of no less than 1,000 psig and 200 deg. F. Provide an isolation valve and snubber on each connection to the gauge.
- B. Connector: Brass or stainless steel, NPS 1/4.
- C. Flexible Capillary Tube: For use with remote mounted gauge on installations where the gauge is subject to pipeline vibration, such as immediately adjacent to pumps.
- D. Scale: White with black markings, and glass window.
- E. Accuracy: Plus or minus 2 percent of full scale.
- F. Range: Shall be available in 0-5 psid, 0-10 psid, 0-15 psid, 0-30 psid, and 0-60 psid ranges. Select range appropriate for application.

2.6 PRESSURE-GAGE FITTINGS

- A. Valves: NPS 1/4 brass or stainless-steel needle type, with PTFE packing, and aluminum T-bar handle. Include tubing connections.
 - 1. Construct of brass for use with copper and polyethylene tubing and of stainless steel for use with stainless-steel tubing.

- B. Trumpet Valves: One-piece brass or stainless steel manifold with no less than four (4) integral NP 1/4 needle valves and compression fitting connections for connecting pressure gauges and a test port / drain connection. Spring return pushbuttons on the trumpet valve trigger the pressure reading of the selected port. Attach trumpet valve to the system piping or building wall approximately 60" above the floor. Trumpet valve shall be manufactured by Flow Conditioning Corp, ('Hydronic Indication System'), or approved equal.
- C. Snubbers: ASME B40.5, NPS 1/4 brass bushing with sliding piston damping mechanism. Snubber shall be suitable for system fluid and working pressure. Select the piston for the fluid being measured. Include extension for use on insulated piping. Snubbers shall be Kele '47S', or approved equal.
- D. Syphons: NPS 1/4 coil of brass tubing with threaded ends. Syphons shall be Kele 'PT' or approved equal.

2.7 TEST PLUGS (P/T PORTS)

- A. Description: Nickel-plated, brass-body test plug in NPS 1/2 fitting.
- B. Body: Length as required to extend beyond insulation.
- C. Pressure Rating: 500 psig minimum.
- D. Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage.
- E. Core Material for Air, Water, Oil, and Gas: 20 to 200 deg F, chlorosulfonated polyethylene synthetic rubber.
- F. Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.
- G. Gauge Kit: Furnish one (1) gauge kit to the Client Agency. The kit shall include a pressure gage and adapter with probe, two bimetal dial thermometers, and padded carrying case.
 - 1. Pressure Gage and Thermometer Ranges: Approximately two (2) times the system's operating conditions.

2.8 SIGHT FLOW INDICATORS

- A. Description: Piping inline-installation device for visual verification of flow. Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends. Size shall match connecting piping.
 - 1. Minimum Pressure Rating: 125 psig.
 - 2. Minimum Temperature Rating: 200 deg F.
 - 3. End Connections for NPS 2 and Smaller: Threaded.
 - 4. End Connections for NPS 2-1/2 and Larger: Flanged.

2.9 MAKE-UP WATER METERS

- A. Description: AWWA C700, nutating disc type, bronze case, threaded ends. Mechanical register displaying totalized flow in gallons. Minimum Working-Pressure Rating: 150 psig (1035 kPa).

PART 3 - EXECUTION

3.1 METER AND GAGE INSTALLATION, GENERAL

- A. Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.
- B. Locate and position meters and gauges where readings can be easily seen from the floor.
- C. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

3.2 THERMOMETER INSTALLATION

- A. Install thermometers and adjust vertical and tilted positions.
- B. Install separable sockets (thermowells) in vertical position in piping tees where fixed thermometers are indicated. Thermowells shall be sized to match thermometer connectors. Include bushings if required to match sizes.
 - 1. Install with socket extending a minimum of 2 inches into fluid.
 - 2. Fill sockets with a thermally conductive compound (grease or paste form), containing heat conducting additives.

3.3 PRESSURE-GAGE INSTALLATION

- A. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.
- B. Install dry-type pressure gages, except where liquid filled are indicated or required.
- C. Install liquid-filled-type pressure gages at suction and discharge of each pump and in other locations subject to strong fluid pulsations. Provide compound type liquid-filled gauges on the suction side of pumps.
- D. Install pressure-gage needle valve and snubber in piping to pressure gages.
 - 1. Exception: Install syphon instead of snubber in piping to steam pressure gages.
- E. Where indicated and where gauge installations are subject to strong vibrations and fluid particulates, provide a remote mounted gauge with flexible capillary tube with a diaphragm seal. Ashcroft Type 1115 or approved equal.
 - 1. For locations subject to strong vibrations only, the diaphragm seal may be omitted.
 - 2. Provide remote mounted gauges with flexible capillary tube on pump installations.

3.4 TEST PLUG (P/T PORT) INSTALLATION

- A. Install test plugs in piping tees.

- B. Do not expose plugs to soldering, brazing or welding heat. Complete this work before installing the plugs.
- C. Install the plug horizontally or higher (top of pipe) to reduce contamination / plugging potential.

3.5 DOMESTIC MAKE UP WATER METER INSTALLATION

- A. Install water meters at locations indicated on the Drawings.
 - 1. Install displacement-type water meters with shutoff valve on water meter inlet. Install valve on water meter outlet and valved bypass around meter.

3.6 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:
 - 1. Install meters and gages adjacent to machines and equipment to allow service and maintenance.
- B. Install sight flow indicators on connections to bypass feeders and filters, and elsewhere as shown on the Drawings.

3.7 ADJUSTING AND CLEANING

- A. Calibrate meters according to manufacturer's written instructions, after installation.
- B. Adjust faces of meters and gages to proper angle for best visibility.
- C. Clean windows of meters and gages and clean factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION