

SECTION 22 0519
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Positive displacement meters.
- B. Flow meters.
- C. Pressure gages and pressure gage taps.
- D. Thermometers and thermometer wells.
- E. Static pressure gages.
- F. Filter gages.

1.02 RELATED REQUIREMENTS

- A. Section 23 0923 - Direct-Digital Control System for HVAC.
- B. Section 23 0943 - Pneumatic Control System for HVAC.
- C. Section 23 0993 - Sequence of Operations for HVAC Controls.
- D. Section 23 2113 - Hydronic Piping.
- E. Section 23 2213 - Steam and Condensate Heating Piping.

1.03 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2007.
- C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.
- E. AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case; 2015.
- F. AWWA C701 - Cold-Water Meters -- Turbine Type, for Customer Service; 2012.
- G. AWWA C702 - Cold-Water Meters -- Compound Type; 2010.
- H. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012.
- I. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.
- J. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
- C. Project Record Documents: Record actual locations of components and instrumentation.

1.05 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 POSITIVE DISPLACEMENT METERS (LIQUID)

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 - 2. FMC Technologies; _____: www.fmctechnologies.com.
 - 3. Venture Measurement, a Danaher Corporation Company; _____: www.venturemeasurement.com.

4. Substitutions: See Section 01 6000 - Product Requirements.
- B. AWWA C700, positive displacement disc type suitable for fluid with bronze case and cast iron frost-proof, breakaway bottom cap, hermetically sealed register, remote reading.
- C. Meter: Brass body turbine meter with magnetic drive register.
 1. Service: Cold water, 122 degrees F.
 2. Nominal Flow: _____ gpm.
 3. Pressure Drop at Nominal Flow: _____ psi.
 4. Maximum Flow: _____ gpm.
 5. Maximum Operating Pressure: _____ psi.
 6. Accuracy: 1-1/2 percent.
 7. Maximum Counter Reading: 10 million gallons.
 8. Size: 3/4 inch.

2.02 HEAT CONSUMPTION METERS

- A. Manufacturers:
 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 2. FMC Technologies; _____: www.fmctechnologies.com.
 3. Venture Measurement, a Danaher Corporation Company; _____: www.venturemeasurement.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Meter: Brass body turbine meter with magnetic drive register, platinum temperature sensors.
 1. Maximum Service Temperature: 200 degrees F.
 2. Nominal Flow: _____ gpm.
 3. Pressure Drop at Nominal Flow: _____ psi.
 4. Maximum Flow: _____ gpm.
 5. Maximum Operating Pressure: _____ psi.
 6. Accuracy: 1-1/2 percent.
 7. Maximum Counter Reading: 1 million btuh.
 8. Size: 1/2 inch.
 9. Power: Lithium battery.

2.03 LIQUID FLOW METERS

- A. Manufacturers:
 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 2. Venture Measurement, a Danaher Corporation Company; _____: www.venturemeasurement.com.
 3. McCrometer, Inc; _____: www.mccrometer.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Calibrated ASME MFC-3M venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gage in case.
- C. Annular element flow stations with meter set.
 1. Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
 - a. Pressure rating: 275 psi.
 - b. Maximum temperature: 400 degrees F.
 - c. Accuracy: Plus 0.55 percent to minus 2.30 percent.
 2. Portable Meter Set: Dry single diaphragm type pressure gage with 6 inch dial pointer, stainless steel wetted metal parts, variable pulsation damper, equalizing valve, two bleed valves, and master chart for direct conversion of meter readings to flow rate, mounted in rust-proof carrying case with two ten foot long rubber test hoses with brass valves or quick connections for measuring stations.

2.04 PRESSURE GAGES

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 - 2. Moeller Instrument Company, Inc; _____: www.moellerinstrument.com.
 - 3. Omega Engineering, Inc; _____: www.omega.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1. Case: Steel with brass bourdon tube.
 - 2. Size: 4-1/2 inch diameter.
 - 3. Mid-Scale Accuracy: One percent.
 - 4. Scale: Psi and kPa.

2.05 PRESSURE GAGE TAPPINGS

- A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.
- B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
- D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.06 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 - 2. Omega Engineering, Inc; _____: www.omega.com.
 - 3. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear Lexan.
 - 3. Stem: _____ inch brass.
 - 4. Accuracy: 2 percent, per ASTM E77.
 - 5. Calibration: Degrees F.
- C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear Lexan.
 - 3. Stem: 3/4 inch NPT brass.
 - 4. Accuracy: 2 percent, per ASTM E77.
 - 5. Calibration: Degrees F.

2.07 DIAL THERMOMETERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 - 2. Omega Engineering, Inc; _____: www.omega.com.
 - 3. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
 - 1. Size: 5 inch diameter dial.

2. Lens: Clear glass.
 3. Accuracy: 1 percent.
 4. Calibration: Degrees F.
- C. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
1. Size: 5 inch diameter dial.
 2. Lens: Clear glass.
 3. Accuracy: 1 percent.
 4. Calibration: Degrees F.
- D. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.
1. Size: 4-1/2 inch diameter dial.
 2. Lens: Clear glass.
 3. Length of Capillary: Minimum 5 feet.
 4. Accuracy: 2 percent.
 5. Calibration: Degrees F.

2.08 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.09 TEST PLUGS

- A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.
- B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gages, one gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.10 STATIC PRESSURE GAGES

- A. Manufacturers:
 1. Dwyer Instruments, Inc; _____: www.dwyer-inst.com.
 2. Omega Engineering, Inc; _____: www.omega.com.
 3. Weksler Glass Thermometer Corp; _____: www.wekslerglass.com.
- B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
- C. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.
- D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.
- C. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.
- D. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Extend nipples and siphons to allow clearance from insulation. Provide siphon on gages in steam systems.

- E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- F. Install thermometers in air duct systems on flanges.
- G. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 23 0943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.
- H. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.
- I. Coil and conceal excess capillary on remote element instruments.
- J. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- K. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- L. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- M. Locate test plugs adjacent thermometers and thermometer sockets.

3.02 SCHEDULES

- A. Pressure Gages, Location and Scale Range:
 - 1. Pumps, 0 to ____ psi.
 - 2. Expansion tanks, 0 to ____ psi.
 - 3. Pressure tanks, 0 to ____ psi.
 - 4. Standpipe, highest points, 0 to ____ psi.
 - 5. Standpipe and sprinkler water supply connection, 0 to ____ psi.
 - 6. Sprinkler system, 0 to ____ psi.
 - 7. Pressure reducing valves, 0 to ____ psi.
 - 8. Backflow preventers, 0 to ____ psi.
- B. Pressure Gage Tappings, Location:
 - 1. Control valves 3/4 inch & larger - inlets and outlets.
 - 2. Major coils - inlets and outlets.
 - 3. Heat exchangers - inlets and outlets.
 - 4. Chiller - inlets and outlets.
 - 5. Boiler - inlets and outlets.
- C. Stem Type Thermometers, Location and Scale Range:
 - 1. Headers to central equipment, 0 to ____ degrees F.
 - 2. Coil banks - inlets and outlets, 0 to ____ degrees F.
 - 3. Heat exchangers - inlets and outlets, 0 to ____ degrees F.
 - 4. Boilers - inlets and outlets, 0 to ____ degrees F.
 - 5. Chiller - inlets and outlets, 0 to ____ degrees F.
 - 6. Water zone supply and return, 0 to ____ degrees F.
 - 7. After major coils, 0 to ____ degrees F.
 - 8. Domestic hot water supply and recirculation, 0 to ____ degrees F.
- D. Thermometer Sockets, Location:
 - 1. Control valves 1 inch & larger - inlets and outlets.
 - 2. Reheat coils - inlets and outlets.
 - 3. Cabinet heaters - inlets and outlets.
 - 4. Unit heaters - inlets and outlets.
- E. Dial Thermometers, Location and Scale Range:
 - 1. Each supply air zone, 0 to ____ degrees F.
 - 2. Outside air, 0 to ____ degrees F.

3. Return air, 0 to ____ degrees F.
 4. Mixed air, 0 to ____ degrees F.
- F. Static Pressure and Filter Gages, Location and Scale Range:
1. Built up filter banks, 0 to ____ inches W.C..
 2. Unitary filter sections, 0 to ____ inches W.C..
 3. Supply fan discharge, 0 to ____ inches W.C..
 4. Building static, 0 to ____ inches W.C..

END OF SECTION 22 0519