SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Bimetallic-actuated thermometers.
   2. Liquid-in-glass thermometers.
   3. Duct-thermometer mounting brackets.
   4. Thermowells.
   5. Dial-type pressure gages.
   6. Gage attachments.

B. Related Requirements:
   1. Section 232216 "Steam and Condensate Piping Specialties" for steam and condensate meters.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Include diagrams for power, signal, and control wiring.

1.03 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.01 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Flo Fab Inc.
      b. Miljoco Corporation.
      c. Palmer Wahl Instrumentation Group.
      d. Tel-Tru Manufacturing Company.
      e. Trerice, H. O. Co.

f. Weiss Instruments, Inc.
g. Weksler Glass Thermometer Corp.
h. Winters Instruments - U.S.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue [or red] organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass.
   a. Stem: Aluminum and of length to suit installation.
   b. Design for Air-Duct Installation: With ventilated shroud.
   c. Design for Thermowell Installation: Bare stem.
8. Connector: 1 ¼ inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.02 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.03 THERMOWELLS

A. Thermowells:
1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS ½-inch, NPS ¾-inch, or NPS 1-inch, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.04 DIAL-TYPE PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ametek U.S. Gauge.
   b. Ashcroft Inc.
   c. Ernst Flow Industries.
   d. Flo Fab Inc.

e. Marsh Bellofram.
f. Miljoco Corporation.
g. Noshok.
h. Palmer Wahl Instrumentation Group.
i. REOTEMP Instrument Corporation.
j. Tel-Tru Manufacturing Company.
k. Trerice, H. O. Co.
l. Watts; a Watts Water Technologies company.
m. Weiss Instruments, Inc.
n. Weksler Glass Thermometer Corp.
o. WIKA Instrument Corporation.
p. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4 ½- inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS ¼-inch or NPS ½-inch, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.05 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS ¼-inch or NPS ½-inch, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
B. Siphons: Loop-shaped section of brass pipe with NPS ¼-inch or NPS ½-inch pipe threads.
C. Valves: Brass ball, with NPS ¼-inch or NPS ½-inch, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter to center of pipe and in vertical position in piping tees.
B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
C. Install thermowells with extension on insulated piping.
D. Fill thermowells with heat-transfer medium.
E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.
H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
I. Install valve and snubber in piping for each pressure gage for fluids (except steam).
J. Install valve and syphon fitting in piping for each pressure gage for steam.
K. Install test plugs in piping tees.
L. Install flow indicators in piping systems in accessible positions for easy viewing.
M. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.
N. Install flowmeter elements in accessible positions in piping systems.
O. Install wafer-orifice flowmeter elements between pipe flanges.
P. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.
Q. Install permanent indicators on walls or brackets in accessible and readable positions.
R. Install connection fittings in accessible locations for attachment to portable indicators.
S. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.
T. Install thermometers in the following locations:
    1. Inlet and outlet of each hydronic zone.
    2. Inlet and outlet of each hydronic boiler.
    3. Two inlets and two outlets of each chiller.
    4. Inlet and outlet of each hydronic coil in air-handling units.
    5. Two inlets and two outlets of each hydronic heat exchanger.
    6. Inlet and outlet of each thermal-storage tank.
    7. Outside, return, supply, and mixed-air ducts.
U. Install pressure gages in the following locations:
    1. Discharge of each pressure-reducing valve.
    2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
    3. Suction and discharge of each pump.

3.02 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.
B. Connect flowmeter-system elements to meters.
C. Connect flowmeter transmitters to meters.
D. Connect thermal-energy meter transmitters to meters.

3.03 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.
B. Adjust faces of meters and gages to proper angle for best visibility.

3.04 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be the following:
    1. Industrial-style, liquid-in-glass type.
B. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up

central systems shall be the following:
1. Liquid-filled type.

C. Thermometer stems shall be of length to match thermowell insertion length.

3.05 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 150 deg. F.
B. Scale Range for Heating, Hot-Water Piping: 20 to 240 deg. F.

3.06 PRESSURE-GAGE SCHEDULE

A. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be the following:
1. Liquid-filled Sealed-mounted, metal case.

B. Pressure gages at suction and discharge of each pump shall be the following:
1. Liquid-filled Sealed-mounted, metal case.

3.07 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 160 psi.
B. Scale Range for Heating, Hot-Water Piping: 0 to 160 psi.

END OF SECTION