

SECTION 15130

METERS AND GAGES

PART 1 – DESIGN DIRECTIVE

1.1 QUALITY ASSURANCE

- A. Comply with applicable UL standards pertaining to meters and gages and with applicable portions of ASME and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

1.2 DESIGN CRITERIA

- A. The designer shall indicate on the drawing details and flow schematics the locations of all gauges.
- B. At hydronic pumps a single pressure gauge shall be installed with isolated taps before the strainer, between the strainer and the pump inlet, and after the pump discharge. This is not required at domestic hot water recirculation pumps.
- C. Every main shall have a minimum of one pressure gauge and one temperature gauge for every section of pipe between isolation valves.
- D. Every major device where the temperature can change shall be equipped with a temperature gauge and pressure gauge on both the inlet and discharge piping connections.
- E. Provide low pressure drop flow meters on piping systems served by pumps equipped with variable frequency drives.

PART 2 – PRODUCTS

2.1 THERMOMETERS, GENERAL

- A. Accuracy shall be 1% of range span, grade A.
- B. Temperature ranges for services listed as follows (center of range shall be the scheduled fluid temperature):
 - 1. Domestic Hot Water: 0° to 200°F with 2° scale divisions.
 - 2. Domestic Cold Water: 30° to 130°F with 2° scale divisions.
 - 3. Hot Water: 0° to 250°F with 2° scale divisions.
 - 4. Condenser Water: 0° to 200°F with 2° scale divisions.
 - 5. Chilled Water: 30° to 130°F with 2° scale divisions.
 - 6. Steam and Condensate: 50° to 300°F with 2° scale divisions .

2.2 BIMETAL DIAL THERMOMETERS

- A. Direct mounted, bimetal type with adjustable angle feature for 360° rotation and 180° angle adjustment. Hermetically sealed, 5" diameter case of welded stainless steel construction with external adjustment. Thermometer shall have a bimetal coil, plastic window, white dial with black markings. Stem Length of 6", or adjust length to be minimum 3" from insulation, 1/2" NPT stem connection.

- B. Manufacturers:
 - 1. Ashcroft, Dresser Industries, Instrument Div. #50EL60E series.
 - 2. Trerice #B85600 series

2.3 THERMOMETER WELLS

- A. Brass threaded thermometer wells for all piping systems, pressure rated to match piping system design pressure; with 2" extension for insulated piping and threaded cap nut with chain permanently (material to match well material) fastened to well and cap.

2.4 PRESSURE GAGES

- A. General use, ASME B40.1, Grade 2A, phosphor bronze bourdon tube type, bottom connection. Phenolic case, 4-1/2" diameter, with 1/2" NPS brass connector. White coated aluminum background, with permanently etched black markings. Accuracy shall be $\pm 1/2\%$ of range span. The scale range for all gages shall be 2 times the operating pressure. All gages in liquid systems shall be vibration resistant (Plus performance or silicone filled).

- B. Manufacturers:
 - 1. Ashcroft, Dresser Industries, Instrument Div.
 - a. Steam systems: #45-1279-04L
 - b. Liquid systems: #45-1279-04L-XLL
 - 2. Trerice
 - a. Steam systems: #450B45TRL500PSI series
 - b. Liquid systems: #450BG45TRL500PSI series

2.5 TEST PLUGS

- A. *Test Plugs shall be nickel plated brass body, with 1/4" or 1/2" NPS fitting and two self sealing valve type core inserts, suitable for inserting a probe assembly from a dial type thermometer or pressure gage. Test plug shall have gasketed and threaded cap with retention chain and body of length to extend beyond insulation. Pressure rating shall be 500 psig.*

- B. *Core Material: Conform to the following for fluid and temperature range:*
 - 1. *-30 °F to 275 °F: EPDM.*

- C. *Manufacturers:*
 - 1. *MG Piping Products Co.*
 - 2. *Peterson Equipment Co., Inc.*
 - 3. *Sisco, A Spedco, Inc. Co.*
 - 4. *Trerice (H.O.) Co.*
 - 5. *Watts Regulator Co.*

~~2.5.2.6~~ 2.5.2.6 PRESSURE GAGE ACCESSORIES

- A. Connectors:
 - 1. Steam systems: Provide 1/2" NPS iron pig tail siphons.
 - 2. Water systems, steel: 1/2" NPS steel (for steel pipe) or brass (for copper pipe) nipple, length to allow minimum 3" beyond insulation cover.

- B. Snubber
 - 1. Steel piping systems: 1/2" stainless steel, Ashcroft #112S, or Ashcroft #112B, 1/2" brass, for copper piping systems

2. Provide a 1/2" ball or needle valve, carbon steel for steel piping systems or bronze for copper piping systems.

2.62.7 STEAM CONDENSATE METERS

- A. Gravity type condensate meters shall be constructed of a metal housing with a volumetric measuring drum and a self powered totalizer. Casing shall be cast iron with a copper metering drum. System shall be designed for operating temperature of 350° at 100% humidity.
 1. Cadillac Condensate Meters as manufactured by Claussen Engineering, Camas WA
- B. Pressure type condensate meters shall be a brass housing with an internal impeller capable of withstanding hot temperatures (220° F). The meter shall be self-powered not requiring power from an external source and have a self contained gauge. Provide a pulse output for remote meter reading.
 1. Niagra series MTX, model 421, with model 860 infrared pulser.

2.72.8 ULTRASONIC FLOW METERS

- A. The flow-energy meter shall be a clamp-on, dual channel transit-time design precluding the requirement of penetrating into the pipe. The dual channel operating mode shall be capable of acting as an energy meter using two strap on temperature sensors and a flow meter. The unit shall be able to calculate and display chilled water use in ton-hours. The flowmeter shall be completely microprocessor based. The flowmeter shall employ technology to insure operation on liquids with solids and or bubbles.
- B. The flowmeter shall provide automatic transducer spacing utilizing a mounting track (ruler scales not acceptable). . The flowmeter shall have the ability to indicate flow & energy rate, flow velocity, total energy, T1, T2 & delta T, signal strength for both channels or paths. The flowmeter shall be equipped with an integral front panel keypad and multifunction display with the ability of displaying both channels and paths simultaneously. In addition, the flowmeter shall provide self and application diagnostics to isolate any fault conditions to either equipment failure or abnormal process conditions. The flowmeter shall have full HELP menu routines corresponding to all levels of programming and operation.
- C. The flow-energy meter electronics shall be housed in a NEMA 4X enclosure and powered by 115VAC, 60Hz. One isolated 4 to 20 maDC and one 0 to 5000 Hz pulse output proportional to flow shall be provided for each channel or the average of both paths. In addition, using an open communications protocol such as Lon Works, Modbus, or BACnet the unit shall provide one 0 to 10 volt or 4-20mA output and four alarm relays assignable to flow velocity, liquid sonic velocity, signal strength or liquid aeration. An internal datalogger shall be provided to allow storage of all measured and calculated variables and alarms. A bi-directional RS-232 connection shall be provided to allow remote programming and interrogation.
- D. The flow-energy meter shall have an accuracy of +/-1% of flow over a +/-40 fps flow range. Repeatability shall be 0.1% of flow with a flow sensitivity of 0.001 fps at any flow rate including no flow conditions. Turndown shall be at least 1:200.
- E. By use of either transit-time or Doppler modes of operation, the flowmeter shall be capable of measuring all liquids in full sonically conductive pipes. Flowmeters that simply offer stand alone transit-time or Doppler measurement modes are not acceptable. The flow meters shall be able to be used on steel pipes up to sch 80 and PVC pipes up to sch 80 thickness.

- F. Supply and return temperature measurement shall be via platinum matched RTD'S.
- G. Energy calculation shall be integral to the meter and shall utilize the feed temperature for mass calculation.
- H. Flowmeters shall be:
 - 1. Controlotron model 1010EDN
 - 2. Panametrics model AT868

2.82.9 LOW PRESSURE DROP FLOW METERS

- A. Pitot tube type design sensing upstream total pressure and downstream static pressure. Meter shall have very low pressure drop.
 - 1. Bell & Gossett Circuit Sensor
 - 2. Taco Sentinel

PART 3 – EXECUTION

3.1 THERMOMETERS INSTALLATION

- A. Install thermometers in vertical and tilted positions to allow reading by observer standing on floor.
- B. Install thermometer wells in piping tee where thermometers are indicated, in vertical position. Fill well with oil or graphite and secure cap.

3.2 INSTALLATION OF PRESSURE GAGES

- A. Install pressure gages in piping tee with pressure gage valve, located on pipe at most readable position.
- B. Install snubbers in liquid piping systems, siphons in steam piping systems.

3.3 CONNECTIONS

- A. Install meters and gages piping adjacent to machine to allow servicing and maintaining of machine.
- B. Install test plugs in stems of all thermometers and pressure gages.*

3.4 CONDENSATE METERS

- A. Install gravity type meters in systems that do not have condensate pumps.
- B. Install pressure type meters in systems with condensate pumps.
- C. All condensate meters shall have a valved bypass.

3.5 ULTRASONIC FLOW METERS

- A. Install ultrasonic flow meters in chilled water systems at building entrances.

3.6 LOW PRESSURE DROP FLOW METERS

- A. Comply with manufacturer's written recommendations for unrestricted pipe upstream and downstream of the meter.

END OF SECTION 15130