PHYSICAL FACILITIES

2020 Consultant’s Handbook
Division 33 Utilities
0900 Utility Metering Equipment

1 Applicability
1.1 All piping, fittings, equipment, etc. from the exterior utility mains to the building valve located after the meter or, in the case of domestic water, the backflow preventer, is considered utility piping.
1.2 All piping after the valve described in paragraph 1.1 is considered interior piping.
1.3 All utilities serving a new building, existing building with new service, or remodeled building, will be metered as determined by Purdue Utilities.

2 General Equipment Placement
2.1 “Equipment” is defined as all utility meters, temperature sensors, pressure sensors and the Data Concentrator Control Panel (DCCP).
2.2 All newly installed equipment must be serviceable while standing on the floor with the centerline no higher than 48” above floor. Where that is not possible, discuss options with the University project engineer.
2.3 All equipment shall be installed with a definitive means of service and removal to exterior of building.
2.4 All equipment shall require at least 18” service clearance above, below, and on one side.
2.5 All equipment shall be supported as required by the manufacturer.
2.6 Meters shall be installed with the manufacturers recommended straight run of pipe, both upstream and downstream, based upon the meter manufacturer’s installation instructions for the size of the meter and any upstream and downstream obstructions that could affect meter operation and accuracy.

3 Chilled Water Meter Installations
3.1 Chilled water meters shall be in-line electromagnetic, owner furnished, and contractor installed.
3.2 Meters are to be installed in the return piping with a bypass. If the meter must be installed in the supply piping, consult Purdue University for approval prior to installation.
3.3 Meters should be installed in horizontal piping. If a vertical riser is the only location available for installation, the flow direction must be up.
3.4 All meters shall be sized for the load of the building and not necessarily matching service line size.
3.5 Manufacturers straight run requirements, accuracy requirements, and orientation must be met.

4 Domestic Water Meter Installations
4.1 Use metallic pipe from the building wall penetration to the backflow preventer. Pipe can be:
   • Ductile iron pipe with flanged fittings
   • Schedule 40 galvanized pipe with galvanized grooved-end fittings and couplings
   • Type L copper tube with rolled, sweat or press fittings
4.2 All domestic water meters shall include a bypass with a lockable valve.
4.3 Service valves 2½” and smaller shall be full-port ball valves.
4.4 Service valves 3” or larger shall be:
   • AWWA C500 or approved equal
   • Non-rising stem gate valve
   • Epoxy coated
   • Resilient seated
4.5 Domestic water meters shall be owner furnished, contractor installed, and shall be in-line electromagnetic installed in the building supply piping with a bypass.
4.6 Domestic water meters used for irrigation purposes are not required to have a bypass.
4.7 Manufacturers straight run requirements, accuracy requirements, and orientation must be met.
4.8 All domestic water meters shall be piped independent, and shall not be deductive to the building main meter. Irrigation and other services that will enter the storm drains shall have a separate, non-deductive meter.
4.9 All meters shall be sized for the load of the building and not necessarily matching service line size.
4.10 Connections to the piping shall be minimum ANSI class 150 flanges.
4.11 For installations in non-metallic pipe, external grounding rings will be required to be installed, bonded, and tied to an appropriate building grounding system.
4.12 Consult the Purdue University Utilities Distribution Mechanical Engineer if there is a concern with this meter technology and placement for the application.

4.13 Approved Manufacturers
- Endress + Hauser (coordinate the size and model number with Purdue University Energy and Utilities Engineering)

5 Steam Supply Meter and Steam Condensate Meter Installation

5.1 All new buildings, existing buildings with new steam services, and all remodeled buildings shall have both the steam supply and the steam condensate metered.

Note: This is to capture any steam used for humidification, sterilization etc. or find issues when steam condensate is being sent to drains.

5.2 Steam Condensate Meters
5.2.1 Steam Condensate meters shall be owner furnished, contractor installed, and shall be in-line vortex shedding.
5.2.2 Connections to the piping shall be minimum ANSI class 125 flanges.
5.2.3 Manufacturers straight run requirements, accuracy requirements, and orientation must be met.
5.2.4 All meters shall be sized for the load of the building and not necessarily matching service line size.
5.2.5 Approved Manufacturers
- Endress + Hauser (coordinate the size and model number with Purdue University)

5.3 Steam Supply Meters
5.3.1 Steam supply meters shall be owner furnished, contractor installed, and shall be vortex shedding or conditioning orifice plate.
5.3.2 Connections to the piping shall be flanged. Flange classes to be determined by service.
5.3.3 Manufacturers straight run requirements, accuracy requirements, and orientation must be met.
5.3.4 All steam supply meters should be installed with the transmitter/display head in the six-o’clock position, space permitting.
5.3.5 All meters shall be sized for the load of the building and not necessarily matching service line size.
5.3.6 The meter shall be capable of withstanding superheated steam temperature and pressure, as dictated by the service conditions.

5.3.7 The meter shall be capable of pressure and temperature compensation measuring with an integral temperature sensor and an integral, or remote-mounted pressure sensor wired to the meter transmitter.
5.3.8 The meter shall be factory calibrated.
5.3.9 Approved Manufacturers
- Endress + Hauser (coordinate the size and model number with Purdue University Energy and Utilities Engineering)

6 Steam Supply Meters in Distribution Mains
6.1 A self-averaging pitot tube is the preferred steam supply meter when measuring steam flowrate in distribution mains.
6.1.1 The meter should have the ability to be used in bi-directional flow without changing the sensor’s position or valves.
6.1.2 The transmitter should have a turndown range of 100:1.
6.1.3 The transmitter shall be NIST certified, shall have Modbus protocol communication or as approved by Purdue Utilities.
6.1.4 Transmitters shall be ±0.1% accurate or better and drift less than ±0.1% of URL over 8,000 hrs.
6.2 Approved Manufacturers
- Systems for Industry
- Cameron Measurement Systems
6.3 Coordinate the size and model with Purdue University Energy and Utilities Engineering

7 Chilled Water Temperature Sensors
7.1 Chilled water temperature sensors and thermowells shall be owner furnished and contractor installed.
7.2 Two sensors shall be installed, one in the supply line and one in the return line. They shall be installed outside the manufacturer’s straight run requirements of the meter.
7.3 Where chilled water service is 4” in diameter and smaller, a 2.5” thermowell shall be used.
7.4 Where chilled water service is 5” in diameter or larger, a 4” thermowell shall be used.
7.5 Approved Manufacturers
- Pyromation (coordinate the size and model
number with Purdue University Energy and Utilities Engineering)

8 Steam Condensate Temperature Sensors
8.1 Steam condensate temperature sensors and thermowells shall be owner furnished and contractor installed.
8.2 One sensor shall be installed, located downstream of the steam condensate meter outside of the manufacturer’s straight run requirements of that meter.
8.3 When a steam condensate line is 4” in diameter and smaller, a 2.5” thermowell shall be used.
8.4 When a steam condensate line is 5” in diameter or larger, a 4” thermowell shall be used.
8.5 Basis of Design
   ● Pyromation (coordinate the size and model number with Purdue University Energy and Utilities Engineering)

9 Chilled Water Pressure Sensors
9.1 Chilled water pressure sensors shall be owner furnished and contractor installed.
9.2 Two sensors shall be installed, one in the supply line and one in the return line. They shall be installed outside the manufacturer’s straight run requirements of the chilled water meter.
9.3 Approved Manufacturers:
   ● Coordinate the manufacturer, size, and model number with Purdue University Energy and Utilities Engineering

10 Electrical Meters
10.1 Reference Division 26 Section 0913 of these guidelines.

11 Data Concentrator Control Panel
11.1 The Data Concentrator Control Panel (DCCP) shall be owner furnished and contractor installed. A location must be identified on the design drawings for the DCCP in a location normally accessible to maintenance personnel (e.g. mechanical rooms).
11.2 Each DCCP will be provided with a wiring schematic. All metering equipment will be wired according to this document by the contractor.
11.3 Each wire to and from the DCCP shall be colored according to what is called out on the DCCP wiring schematic.

11.4 The wire from each piece of equipment connected to the DCCP shall be properly tagged on both ends of the wire. Each multi-conductor signal cable shall have a tag on both the outer sheath as well as each individual conductor within the cable.
   11.4.1 Each 24V power conductor shall be tagged according to the DCCP schematic.
   11.4.2 The tag on the outer sheath shall be the 14-character equipment identifier which can be found on the DCCP schematic.
     Example: 1088SC02ME0150
   11.4.3 The tag on each individual signal wire shall include the information as shown on the schematic which indicates where the conductor originates from the DCCP.
     Example: I:2.2+
   11.4.4 Each communication cable for the electrical meters shall be tagged with the correct meter number using the 14-character equipment identifier.
11.5 All utility meters (i.e. chilled water, domestic water, steam supply, steam condensate, and electric) and [pressure and temperature] sensor communications cables shall be routed in conduit to the identified DCCP location.
11.6 Each electromagnetic flow meter (i.e. chilled water and domestic water) as well as each electrical meter shall receive its own 24V power supplied by the DCCP according to the wiring schematic located in the DCCP.
11.7 Each electromagnetic flow meter will receive a 2-wire communication cable from the DCCP to each location.
11.8 Each vortex shedding meter and the pressure sensors will receive power and communication from a single 3-wire cable from the DCCP to each location.
11.9 Each temperature sensor will receive a single 3-wire cable from the DCCP to each location.
11.10 Each electrical meter will receive an Ethernet cable from the DCCP to each location.
11.11 There shall be separate dedicated electrical conduits for each of the various cables running to and from the DCCP as follows:
   ● There shall be a separate conduit for the 120VAC power from the source to the DCCP
   ● There shall be a separate conduit for the Ethernet communication from the BDF to the PIC in the DCCP
   ● There shall be one or more separate conduits (as needed) for the Power and
communication from the meters, pressure sensors, and temperature sensors to the DCCP

- Each of these conduits are all to be 1” or larger, as required. They shall not be overfilled to allow easy pulling of wire for future replacement.

11.12 A dedicated 120V circuit shall be routed and terminated at the DCCP by the contractor according to the schematic provided with the DCCP.

11.13 The contractor is responsible for terminating the wiring at the device-end of all field devices (meters, pressure sensors, temperature sensors).

11.14 At the DCCP-end, the contractor is to leave a six-foot coil of each field-device wiring for the owner to perform final terminations.

11.15 The DCCP shall not be energized by the contractor. The owner is responsible for the final check of wire terminations, energizing the DCCP, and commissioning of the DCCP.