

**SECTION 15965**  
**BUILDING METERING**  
**(Indianapolis Campus Only)**

**A. PURPOSE**

1. The general purpose of this standard is to provide minimal criteria for utility metering equipment for new IUPUI facilities.
2. The purpose of this metering system is twofold:
  - a. Provide a means for internal cost allocation of utility consumption and for verification of utility company charges.
  - b. Provide Campus Facility Services--Energy Management with a way to measure consumption and to identify increases or reductions in consumption.

**B. GENERAL**

1. Each new building or major building expansion shall have metering requirements discussed with Energy Management. Utilities to be monitored are electricity, steam, and chilled water. Consult electrical standards Division 16 for requirements pertaining to electrical metering.
2. Each utility will use the specified metering equipment and schemes as primary measuring devices and will electronically transmit the signal to either a specified multifunction electronic controller tied into the campus-wide building automation system through an Ethernet data highway or to a designated Internet IP address via Ethernet connection.

Each utility will use the University specified metering equipment and schemes as primary measuring devices. These metering devices will electronically transmit metering data to a multifunction controller, building automation system or campus Ethernet system as specified by the University. Metering devices or multifunction controllers that transmit data to the building automation system shall use communications protocols that are compatible with Johnson Controls Metasys, Siemens Apogee, and ION Enterprise.

Communications shall be compatible with the Building Automation System installed in the building. Coordinate with Building Automation for data highway path, or with existing UITS communication infrastructure.

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**C. MATERIALS**

1. Steam

- a. Flow Meter:
  - 1) Vortex shedding type for whole-building applications. For circumstances with lesser flow, orifice plate type may be acceptable.
- b. Temperature Sensors:
  - 1) RTDs shall be "Ultra Precision" type, 100 Ohm Platinum or 1000 Ohm Nickel with accuracy of +/- 0.1%.
- c. Pressure Sensors:
  - 1) Variable capacitance type, 4-20mA output, over pressure to 2000 psi, immune to humidity, accuracy +/- 0.25% of span.
- d. Flow Computer
  - 1) Flow computer capable of monitoring and recording Mlbs, therms, demand rate, flow rate and totalized readings, temperature and pressure parameters, performing compensation, and non-volatile memory storage. Communication shall be by RS 485. Like KEP SuperTrol.

2. Chilled Water

- a. Flow Meter:
  - 1) Minimum accuracy and repeatability of +/- 1% over a flow range of 1 to 30 feet per second.
  - 2) For entire building metering applications--Inline, magnetic-type flow sensor with remote transmitter as manufactured by ABB or Krohne.
  - 3) For low flow or less than entire building metering applications—Insertion, turbine type with electronic impedance sensing impeller as manufactured by Onicon.

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- b. Flow Computer
    - 1) Flow computer capable of monitoring and recording ton-hrs, demand rate, flow rate and totalized readings, temperature and pressure parameters, performing compensation, and non-volatile memory storage. Communication shall be by RS 485. Like KEP SuperTrol.
  
  - c. Temperature Sensors:
    - 1) RTDs "Ultra Precision" type, 100 Ohm Platinum or 1000 Ohm Nickel with accuracy +/- 0.1% resistance tolerance.
3. Natural Gas
  - b. Utilize host utility metering with shared signal.
4. Domestic Water
  - c. Utilize host utility metering with shared signal.

**D. EXECUTION**

- 1. All conduits shall be labeled and conform to Section 16110 of the Electrical Standards.
- 2. All BAS signal circuits shall use Belden 9318 or Belden 9365 or equal. Ethernet communication shall be fiber optic or twisted pair copper.
- 3. All BAS signal wiring will cross line voltage wiring at a 90-degree angle or be no closer than 12 inches from power circuits.
- 4. Signals that can be provided from Utility company meters are preferred.
- 5. Fuse all potential transformer leads to test switches.
- 6. All equipment shall be mounted and wired to provide ease in troubleshooting, calibrating, and testing and shall not be mounted more than six feet above finished floor.

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7. Careful attention shall be given to metering circuits to minimize burdens on instrument transformers and to maximize metering system accuracy..
8. Inline flow-meters shall be installed with upstream and downstream shutoff valves at each end of the metering run with a full-size bypass line with a shutoff valve. Valves shall be rising stem gate valves.
9. All flow-meters must be installed with an adequate length of straight pipe upstream and downstream of the meter as required by the manufacturer's installation instructions.
10. All flow-meter sizes shall be selected based on anticipated full operating load being 75-90% of the meter maximum rating at the given pressure.
11. If the flow-meter size is smaller than the line size (this is typically true), the reducers must be on the meter sides of the shutoff valves, such that the shutoff valves are the line size. Eccentric reducers shall not be used at meter locations on the chilled water system.
12. Install the steam pressure and temperature compensation taps upstream of the upstream shutoff valve or downstream of the downstream shutoff valve.
13. Thermowells should be installed with tips at the center of the pipe on 4" and larger pipes. On 3" pipes, the well should be installed at a 45° angle from centerline of pipe pointing upstream. On smaller pipes, install well in elbows.
14. Install the steam pressure transmitter with a wet-leg loop.
15. Obtain approval of all instrument sizing and calibrations from University Energy Management to assure consistent applications.
16. Insertion flow-meter shall be installed through a full port Crane ball valve (or approved equal) for isolation. Meter should be installed (preferably) within a 45° angle from top vertical pipe. The meters must never be installed below horizontal.
17. Install the chilled water flow-meter in the return line whenever possible.

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18. Install the chilled water RTD well at least 10 pipe diameters downstream of the flow-meter (outside of the meter run).