

NC State University Design and Construction Guidelines

Division 23 Energy Management

1.0 Purpose

- A. The following guidelines provide the methodology and requirements to assure that designs meet NC State Energy Management (EM) standards for campus utility metering. The guidelines include general requirements, utility meter specifications, the sub-metering policy and meter removal requirements.

2.0 General Requirements

- A. All meters shall be integrated to the NC State campus network V-LAN via Modbus TCP/IP and made available to EM data historian.

NOTE: Meters must communicate DIRECTLY to the EM data historian. Meters shall not communicate to the data historian through any other platforms including but not limited to: building automation systems (BAS), electrical SCADA system "SCADA" or central plant SCADA "ICONICS". The BAS can use outputs from the meters if available. EM will approve exceptions on a case-by-case basis.

- B. Metering system components such as flow meters, temperature or pressure sensors may be used as a control point for a building automation system.
- C. Meters shall be installed as per manufacturer's specifications.
- D. Installing contractor shall validate the performance and accuracy of the meter and provide a report to EM confirming each meter's validation testing.
- E. Contractor shall provide manufacturer and calibration documentation to EM.
- F. Final acceptance will be by EM and will be based upon the meter operating in the design range, under normal operation, and reporting acceptable data to the EM data historian. Meters will not be accepted if it is determined it is not operating or reporting data as specified.
- G. Piped utility meters shall be installed with isolation valves and drain valves. A 20 mesh 316 stainless steel strainer shall be provided with select piped meters including positive displacement and turbine types used for city water and condensate.
- H. Meters shall be installed five (5) feet or lower above the finished floor.

3.0 Materials & Standards

- A. Chilled Water Metering
 - 1. Meter shall be a Flexim Fluxus F721E Energy strap-on ultrasonic with supply and return temperature sensors.
 - a. Thermo-wells (316 SS) shall not be mounted closer than 10 pipe diameters upstream or five (5) pipe diameters downstream from the meter's flow element.
 - b. Note: If the BAS requires a flow output that is not available through the Flexim ultrasonic, a Rosemount magnetic flowmeter is an acceptable alternative to installing an additional Flexim ultrasonic.
- B. Electric Metering
 - 1. Meter shall be a Nexus 1262 for building transformer installations.
 - 2. CAT5 cable for integration must go through a surge protector.
 - 3. Meter shall be a Nexus 1272 for substation installations.
 - 4. Sub-meters shall be Shark 200 meters or a Nexus 1262. See 'Sub-metering Policy' below for requirements.

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5. Communications: 10/100BaseT, Rapid Response Ethernet.
 6. Meter shall be capable of accepting up to four (4) input pulses.
 7. Run (1) one inch conduit with CAT5 cable from meter base to nearest mechanical or electrical room for integration. Do not run the conduit to the telecom room, as NCSU Energy Systems does not have access to those areas.
 8. Meter bases should be pre-wired with test switches, fuses and fuse blocks.
- C. Domestic Cold Water Metering
1. Meter shall be:
 - a. Neptune Compound Truflo for variable flow, 2" pipe and above.
 - b. Neptune Turbine for constant flow, 2" pipe and above.
 - c. Neptune Positive Displacement for smaller than 2" pipe.
 2. Meter shall record water usage in units of gallons. Pulse count should be one pulse per meter multiplier. For example, a meter multiplier of 100 gal shall have a pulse count of 1 pulse per 100 gal.
 3. Meters shall be equipped with a pulse output and be integrated to the campus network via one of the methods listed below.
 - a. ZENNER Stealth Reader Meter Interface Unit. This option is typically used for outdoor or vault locations.
 - b. EtherMeter SCADA meter gateway (model EM-100). EtherMeter must be enclosed in a NEMA rated panel with a din-rail and back panel. Dimensions should be 15.7" x 11.7" x 6.3" with a clear cover for indoor applications. Enclosure must be supplied with a 40W, 24VDC power supply.
 - c. Through a steam or chilled water meter with a KEP flow computer (See steam meter section below). The KEP provides auxiliary inputs that can count pulses. This option is used only when there is a steam or chilled meter nearby with a KEP.
 4. A water meter shall be provided for systems that make-up water including but not limited to cooling tower or domestic hot water make-up.
 5. Include a bypass with isolation valves.
- D. Reclaimed Water Metering
1. Meter shall be Badger Recordall series for reclaimed water.
 2. Meter shall have a purple measuring chamber lid for reclaimed water system designation.
 3. Meters shall be equipped with a pulse output and be integrated to the campus network via one of the methods listed below.
 - a. ZENNER Stealth Reader Meter Interface Unit. This option is typically used for outdoor or vault locations.
 - b. EtherMeter SCADA meter gateway (model EM-100). EtherMeter must be enclosed in a NEMA rated panel with a din-rail and back panel. Dimensions should be 15.7" x 11.7" x 6.3" with a clear cover for indoor applications. Enclosure must be supplied with a 40W, 24VDC power supply.
 - c. Through a steam or chilled water meter with a KEP flow computer (See steam meter section below). The KEP provides auxiliary inputs that can count pulses. This option is used only when there is a steam or chilled meter nearby with a KEP.
 4. Include a bypass with isolation valves.

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- E. Natural Gas Metering
 1. Meter shall be a Sierra QuadraTherm model 780i inline thermal mass flow meter.
 2. Meter shall be programmed to output both flow and totalization.
- F. Steam / Steam Condensate Metering
 1. Building shall have either a steam or a steam condensate meter installed, not both unless specified by EM.
 2. Steam metering shall be used when steam condensate metering will not capture total building consumption. Examples of such scenarios include use of steam for humidification or in autoclaves.
- G. Steam Metering
 1. Meter shall be Veris Accelabar differential pressure flow meter.
 2. Meter shall be aggressively sized to permit capture of the entire steam flow range, from low to high, (steam metering is frequently used for billing). The low to high flow range must be correctly identified. EM will assist the Designer by providing steam use data on existing comparable buildings when possible. This same procedure applies where an existing meter is being repurposed for a revised steam load.
 3. Accuracy: +/-0.5% of rate.
 4. Transmitter signal: 0-20 or 4-20mA.
 5. 316 stainless steel body.
 6. For process pressures above 80 psi use ANSI B16.5 cast iron - class 300 flanges. For process pressures 80 psi and below use ANSI B16.5 cast iron - class 150 flanges
 7. Differential pressure (DP) transmitter is to be a direct mount to the Veris Accelabar meter with a 3-valve manifold.
 8. All pressure/temperature transmitters shall be provided with HART communications.
 9. Provide Kessler Ellis Product (KEP) SYS762 package flow computer, including NEMA 1 enclosure, computer, Modbus RTU to Ethernet converter, capable of accepting 4 additional pulse inputs, 24VDC power supply and UPS power supply for energy calculations.
 - a. Note: The KEP can also be used to integrate any meter using a pulse output i.e. water meters.
 10. Include a bypass with isolation valves
- H. Steam Condensate Metering
 1. Meter shall be a Cadillac CMAG magnetic flow meter.
 2. Transducers temperature range shall meet 250F limit.
 3. Meter shall be installed after the condensate receiver.
 4. The meter must be installed as per manufacturers recommendations.
 5. Install swing check valve before the meter to prevent back flow.
 6. Flow computer shall totalize consumption in gallons.
 7. Include a bypass with isolation valves
- I. Sub-metering Policy
 1. Sub-metering shall only be installed for compliance with Senate Bill 668.
 2. Meters shall be installed to monitor whole building loads for chilled water, steam, electricity and domestic water.
 3. Sub meters shall be installed to measure electric plug loads, HVAC load and lighting load.

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4. EM will approve exceptions on a case-by-case basis.
- J. Meter Removal/Replacement Requirements
1. EM must be contacted PRIOR to any meter removals or replacements due to new construction, renovation or demolition.
 2. A meter shall not be powered down or removed without first recording a final reading.
 3. Return all decommissioned meters to EM.