UTILITIES & ENERGY SERVICES
TEXAS A&M UNIVERSITY

Design Standard

Utility Metering

This section specifies the requirements for metering devices and other metering components associated with the measuring and reporting of utilities consumption.

Detailed specifications follow.

PART 1 - GENERAL

1.01 WAGES Panel:

A. A Schneider Electric 9788TAMUWAGESHMI metering panel, of the appropriate input capacity, will be provided by the Div. 26 Contractor, complete with all microprocessors, software, programming, point data base, trends, terminal strips, and regulated power supply with battery backup.

B. The WAGES panel will require temperature and flow sensor wiring from the panel to sensors located in the primary supply and return piping on the Chilled Water, Heating Hot Water, and Domestic Hot Water, to be included as part of the BAS Contractor's responsibilities.

C. The WAGES panel will require flow meter wiring from Domestic Cold Water, Irrigation Water, and Steam. Provide all wiring from the flow tubes to the flow transmitter, and from the flow transmitters to the WAGES panel.

D. This WAGES panel will require a dedicated 110 volt, 20 amp, single phase standby electric circuit source.

E. **The WAGES panel will require a category 6 Ethernet cable. The project shall provide a dedicated Ethernet network connection between the WAGES panel and the Campus Metering Software. The BAS Contractor is responsible for coordinating the network drop (s) required for integration to the Campus Metering Software and will not receive final payment for the project until the Metering system is fully integrated and accepted by TAMU Utilities & Energy Services (UES). Prior to any Commodity being energized or supplied to the project, the metering must be in place, set up, integrated into the UES metering software, and logging correct consumption data in the UES metering software database. All meter connections, and set up configuration, must be approved and documented by a UES metering representative**.

F. The WAGES system will require start-up & integration to the Campus Metering and Analytical Software, by the Schneider Electric Square D Vendor.

G. A meeting between the TAMU UES and the BAS contractor will be held as early as possible, prior to purchase of any material, to review the installation, integration, and finalize panel and wiring locations.

H. The WAGES panel is used only when campus chilled or heating water is servicing the facility. In the event that a building will receive Heating Hot Water (HHW) and Chilled Water (CHW) from the University thermal system, the building shall be required to have a common data collection point.

1.02 Chilled Water, Heating Hot Water, Domestic Hot Water Supply, Domestic Hot Water Return, Domestic Cold Water, and Irrigation Water Flow Tubes and Transmitters

A. Acceptable Water Flow Meters and Remote Transmitters:

1. Rosemount Series 8705 Magnetic Flowmeter Flow Tube with Rosemount 8712E Remote Mount Magnetic Flow Meter Transmitter.
2. Yokogawa AXF Magnetic Flow Meter with AXFA11G Magnetic Remote Converter.
3. Siemens Mag 5100 W with MAG 5000/6000 Remote Transmitter.

B. The above Water Flow Meters and Remote Transmitters shall be, or equal/better to the specifications below:

1. The Flow Tube and Transmitter shall be calibrated to each other and shall be flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.
2. Accuracy: Includes the combined effects of linearity, hysteresis, repeatability, and calibration uncertainty. ±0.15% of rate ±1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of at least ±0.2% of rate.
3. Each Flow Tube shall be sized specifically for the pipe and flow in which it is to be installed and to ensure flow velocity is within 2 to 20 ft./s.
4. A calibration certificate shall be provided from the manufacture.
5. Class 150 carbon steel flanges, Teflon (PTFE) or EDPM lining, and Type 316L stainless steel or Hastelloy C electrodes.
6. Transmitter: 115Vac/1ph/60hz power supply, NEMA 4X enclosure, 4 – 20 ma output, battery-backup totalizer, and local operator interface.
7. Ambient Temperature Limits: -20 to 140deg.f.
8. Humidity Limits: 0 to 95% RH to 120deg.f.
9. Safety Approvals: FM Class 1 Division 2 for non-flammable; CSA Class 1 Division 2.

C. Alternate Meters for Domestic Cold Water and Irrigation.

1. When it is not appropriate to install magnetic flow meters for Domestic Cold Water (DCW), or irrigation (IRR), the meters must be AWWA.

1.03 STEAM

A. Acceptable Steam Flow Meters

1. Rosemount 3051 SFP Integral Orifice Plate / Flowmeter MultiVariable Transmitter and Flowmeter.
2. Yokogawa Digital YEWFLO Multivariable DY-MV.
3. Siemens Sitrans FX300 Vortex Multivariable Flow Meter.

B. The above Steam Flow Meter shall be, or equal/better to the specifications below:

1. The Flow Meter and Transmitter shall be calibrated to each other and shall be flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.
2. Accuracy: ±1%.
3. Long Term Stability: 10-year stability.
4. Warranty: 15-year limited warranty.
5. Measurements Available: Mass, Volumetric, and Energy Flow, Totalized Flow, Differential Pressure, Static Pressure (Gage and Absolute), Process Temperature.
6. Calculations Available: Fully Compensated Mass and Energy Flow, Direct Process Variable Output.
7. Output: 4-20 mA.
8. A calibration certificate shall be provided from the manufacture.
9. Meter must be installed per the manufactures specifications and must be field verified by campus personnel. Approval from the campus must be obtained before sizing the flow meter to ensure it is within allowable flow ranges.

1.04 IMMERSION TEMPERATURE SENSORS AND THERMOWELLS

A. Acceptable Immersion Temperature Sensors and Thermowells

1. Dwyer Series TTE Explosion Proof RTD Temperature Probe with Dwyer Series W 316 Stainless Steel Thermowells.
2. Rosemount.
3. Honeywell.

B. The above Immersion Temperature Sensors shall be equal/better to the specifications below:

1. Temperature Sensor: RTD using a Pt1000, or Pt 100.
2. Output Temperature Ranges: User selectable any range between -30 to 250 deg.f. with minimum span of 40 deg.f.
3. Temperature Limits: Ambient: 0 – 158 deg.f. Process: -30 to 250 deg.f.
4. Accuracy: Transmitter: +/- 0.1%F.S. Probe: +/- 0.3% F.S.
5. Thermal Drift Effects: +/-0.02% deg.C max.
6. Response Time: 250 ms.
7. Wetted Materials: 316 Stainless Steel.
8. Process Connection: ½" male NPT.
9. Conduit Connection: ½" female NPT.
10. Probe Length: 2" to 18" depending on model.
11. Pressure Limits: 2000 PSI.
12. Power Requirements: 10 to 35 VDC.
13. Output Signal 4-20mA.
14. Display: 2 lines X 8 character LCD.
15. Enclosure Rating: NEMA 4X (IP66) and explosion proof for Class I , Groups B, C, D; Class II, Groups E, F, G; Class III.
16. Agency Approvals: FM, CE.

C. Thermowells shall be equal/better to the specifications below:

1. Hardware: 316SS Sheath.
2. Taper/Bore: Straight/0.260.
3. Inside Threads: ½ NPSF.
4. Process Connections: ½" NPT.
5. Mounting: Threaded.
6. Lag: None.
7. Sheath O.D. Base/Taper: ½" Straight.
8. Length: From 4" to 24" as needed to fit Temperature sensor length required for tip of probe to be in center of piping.

PART 2 - ELECTRICAL METERING SPECIFICATIONS

2.01 SUMMARY

A. This section provides information on acceptable electric meters and associated devices for metering electrical systems and components, including Current Transformers (CT's) Potential Transformers (PT's), Fuse Blocks, Fuses, Shorting Blocks, enclosures, Ethernet Communications, meter capabilities, and integration into the Campus Metering Software.

B. Refer to the Construction Documents for meter locations.

2.02 WORK INCLUDED

A. The Electrical Contractor will provide Electric Meters of the type and capabilities required to meter all electrical power serving the project.

2.03 ELECTRICAL METERING

A. **All metering requirements vary with the size, design, scope, and complexity of the project. The correct meter will require review of the project scope by a UES meter representative**.

B. Acceptable Manufactures:
   1. Schneider Electric Series.
   2. Siemens (Model #s only):
      a. Access 9200
      b. Access 9200 (Modbus)
      c. Access 9300
      d. Access 9330
      e. Access 9340
      f. Access 9350
      g. Access 9360
      h. Access 9500
      i. Access 9500 RTU
      j. Access 9510
      k. Access 9510 RTU
      l. Access 9600
      m. Access 9610
      n. Access 9700

C. The Electric Meter shall be equal/better to the specifications below:
   1. Digital electric meters connected to the UES metering software via Ethernet shall be capable integration into the Schneider Power Monitoring Expert (PME) Server Software.
   2. All Electric Meters shall certified revenue accuracy as per ANSI C12.20 0.2% Accuracy Class. ANSI C12.1 and other C12 Standards apply.
   3. Current Transformers (CT's) shall be 0.3% Accuracy Class.
   4. Voltage Transformers shall be 0.3% Accuracy Class and the Secondary Voltage shall be 115V.
   5. The Electric Meter shall directly accept any voltage input from 120-480 VAC.
   6. When connected via the network to the Campus PME Server Software, the Meter shall provide logging, trending, and alarming information.
   7. The Electric Meter shall provide, at a minimum, the following metered values:
      a. Real Power (kW), three-phase total.

b. Real Energy (kWh), three phase total.
c. Current, per phase & three-phase total.
d. Voltage, per phase & three-phase total, phase-to-phase & phase-neutral.
e. Real Power (kW), per phase & three-phase total.
f. Reactive Power (kVAR), three phase total.
g. Apparent Power (kVA), three phase total.
h. Power Factor, per-phase & three-phase total.
i. Real Energy (kWh), three phase total.
j. Real Power Demand (kWd) readings, three phase total, present & peak.

8. All setup parameters required by the Electric Meter shall be stored in nonvolatile memory and retained in the event of a control power interruption.
9. The Electric Meter may be applied in three-phase, three- or four-wire systems as well as single phase.

D. The Electrical Contractor will furnish and install all components but not limited to all Conduit, wire, CT's, PT's, fuse blocks and fuses, shorting blocks, Ethernet gateways, communication wiring between meters, remote displays, and all enclosure panels.

E. Submit for approval, appropriate product data cut-sheets for all material/ components intended for use prior to beginning work.

F. All Electric Meters to be installed, calibrated and adjusted by trained instrument technicians. The Electrical Contractor will be responsible for all work performed by their subcontractors.

G. Submit engineering/wiring drawings and receive approval prior to beginning work. These drawings shall be submitted in a timely manner to provide sufficient time to review drawings so as not to hold up the project.

H. **The project shall provide a dedicated Ethernet network connection between the Electrical Meters and the Campus Metering Software. The Electrical Contractor is responsible for coordinating the network drop (s) required for integration to the Campus Metering Software and will not receive final payment for the project until the Metering system is fully integrated and accepted by TAMU Utilities & Energy Services (UES). Prior to any Commodity being energized or supplied to the project, the metering must be in place, set up, integrated into the UES metering software, and logging correct consumption data in the UES metering software database. All meter connections, and set up configuration, must be approved and documented by a UES metering representative**.

I. Provide one-line drawings showing the location of all meters. Drawings must be in the format acceptable to TAMU Utilities & Energy Services (UES).

J. All wiring shall be in conduit (1/2" minimum). All active Ethernet switches, hubs, and routers required for the communication between BAS panels shall be Electrical Contractor-provided and installed. The conduit/wiring system required for electric metering shall be a complete, separate, independent system. Conduit sharing with other unrelated electrical systems is not permitted. All conduit shall enter electrical enclosures from the bottom of the panel or enclosure.

K. The electrical metering will require start-up & integration to the Campus Metering Software, by the Schneider Electric Square D Vendor. A meeting between the TAMU UES and the Electrical Contractor will be held as early as possible, prior to purchase of any material, to review the installation and finalize panel and wiring locations.

2.04 RELATED WORK

A. If the Electrical Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

2.05 SYSTEM VERIFICATION – PROCEDURE TO BE FOLLOWED

A. Provide minimum 2 week written notice for all inspections.

B. Prior to energizing any electrical switchgear or Main Distribution Panel, and upon completion of all mounting and terminations, and wiring into and out of the electric meter and enclosures the TAMU Project Inspector & UES representative shall inspect and approve this work. The Electrical Contractor shall make his representative(s) available and coordinate with the TAMU Project Inspector & UES representative during this inspection process. At the successful conclusion of this inspection, the Electrical Contractor shall provide a written report stating all work is complete. Electrical Contractor, General Contractor and TAMU Project Inspector & UES representative shall sign. This should be filed with Project Commissioning/ Startup documents.

C. Upon such approval, the Electrical Contractor shall be allowed to energize the electrical systems approved.