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PART 1 GENERAL

1.1 DESCRIPTION

A. Purpose

1. This section covers steam condensate meters and steam condensate sub-meters for use on the UW Seattle campus, distribution steam system.
2. The steam condensate sub-meters shall be connected to the Data Collection Controller for integration into the campus Metering and Monitoring system. The analog signals from the condensate meters shall be terminated on the analog inputs as required by each manufacturer's documentation to provide accurate information to the campus metering and monitoring system. Data collection controller shall supply power to the steam condensate meter(s).

1.2 QUALIFICATIONS

A. Approved manufacturers

1. Steam Condensate Meters

- a. Central Station Steam Co. – Cadillac CMAG Magnetic Flow Meter, preferred for high steam loads
- b. Central Station Steam Co. – Cadillac CG Condensate Mass Meter (Bucket Meter), preferred for low steam loads
- c. No Exceptions

2. Conductivity Sensor

- a. Sensorex – CS675HTTC for up to 3" Pipe Size K=1/P1K
- b. Sensorex – CS676HTTC for 4" Pipe Size and 6" Pipe Size, K=1/P1K
- c. Or Approved Equal

3. Conductivity Transmitter

- a. Sensorex – CX-105
- b. Or Approved Equal

4. Temperature Transmitter

- a. Pyromation – RTD & transmitter: R1T185L483-004-SL-8HN31, T-440 385U-S (0-400°F)
- b. Or Approved Equal

5. Thermowell with Sensor

- a. Pyromation – S4D0408T2S
- b. Or Approved Equal

6. Twisted Shielded Pair (TSP)

- a. Belden 88760
- b. Or Approved Equal

1.3 RELATED SECTIONS

A. 01 91 00 – General Commission Requirements

B. Section 23 08 00.11 – Mechanical Meter Integration and Commission

C. Section 26 09 13.11 – Data Collection Controller

1.4 REFERENCES

A. Applicable codes, standards, and references codes, regulations and standards

1. ANSI B16.5 Class 150 RF
2. AWWA Class B
3. NEMA 4X/6P (IP66/IP67)
4. CSA
5. State and local codes and ordinances

B. Attachments and Details

1. 23 00 00 Attachment #1 – Mechanical Meter Schematic
2. 23 09 13.11 Attachment #2 – UW Campus Utilities ‘The Zett’ Data Collection Controller Typical Wiring Diagrams
3. Detail #1 – Cadillac CMAG Meter Installation

1.5 COORDINATION

- A. Coordinate design of utility services and associated mechanical systems in accordance with 23 00 00 Attachment #1 – Mechanical Meter Schematic and with Campus Utilities and Operations.
- B. Coordinate Operations and Maintenance training times with the Owner.
- C. See section 23 09 13.11 – Data Collection Controller for required coordination to establish communication with steam condensate metering devices via the Data Collection Controller to the campus Metering and Monitoring System over Facnet.

1.6 SUBMITTALS

A. Submittals shall only be approved by Campus Utilities and Operations (CEUO)

1. Submittals shall be in accordance with Conditions of the Contract and Division 01 Specification Sections.
2. Submittals shall be complete and provide all necessary details for full review of products and shop drawings against project design documents. Incomplete or partial submittals will be rejected and not reviewed.
3. Submit detailed and accurate system design drawings and/or shop drawings at time of product submittals that will be used for installation of equipment.
4. Submit detailed maintenance manuals and drawings, which include catalog information indicating the complete electrical and mechanical characteristics.
5. Submit dimensioned cross-sectional drawings (manufacturer’s data sheets are acceptable).
6. Submit finished meter tests – Manufacturer’s Certified Test Reports showing accuracy tests
7. Submit a completed “Worksheet: Mechanical Meter Schedule” form per Specification 23 08 00.11 Appendix A

1.7 OPERATIONS AND MAINTENANCE (O&M) MANUALS

- A. Operations and Maintenance Manuals shall be in accordance with Conditions of the Contract and Division 01 Specification Sections.
- B. Operations and Maintenance Manuals shall include catalog information indicating complete electrical and mechanical characteristics.
- C. Manufacturer's Certified Test Reports
- D. Manufacturer's drawings of meter wiring diagram.

1.8 MEETINGS

- A. Pre-installation conference
 - 1. The Contractor shall request a pre-installation conference with UW Meter Shop (Shop 69) before project begins construction.
- B. Attend meetings with the Owner and/or Owner's Representative as required to resolve any installation or functional problems.

PART 2 PRODUCTS

2.1 GENERAL

- A. These steam condensate meter and sub-meter specifications are in accordance with the Owner's policy to construct permanent installations with long life, coupled with maximum reliability and safety.

2.2 STEAM CONDENSATE METER

- A. The following shall apply to the steam condensate meters and sub-meters installed on the UW Seattle campus:
 - 1. Steam condensate meter shall operate by electromagnetic induction principle.
 - a. Meter shall accept 120V AC power source, originating from the Data Collection Controller.
 - 2. Steam condensate meter shall measure and report the following quantities at a minimum:
 - a. Instantaneous and totalized flow
 - 3. Meter fluid temperature range
 - a. 14°F to 248°F with integral electronics, PFA liner, and Hastelloy C electrodes
 - b. 14°F to 356°F with remote electronics, PFA liner, and Hastelloy C electrodes
 - 4. Steam condensate meter shall have digital display and totalization for local monitoring, display shall be mounted at easy reading level (4'-5') above finished floor (AFF).
 - 5. Steam condensate meter shall have a minimum of 2 pulse and analog (4-20mA) outputs for remote monitoring
 - 6. Meter housing shall be NEMA 4X rated.
 - 7. Meter shall be suitable for installations on pipes sizes from 0.5" to 48" diameters.
 - 8. Meter Body
 - a. The meter will consist of a full-bore body with encapsulated and rigidly retained set of coils.

- b. The meter body shall be constructed of 316 stainless steel, and rated for a maximum allowable non-shock pressure and temperature for steel pipe flanges, according to ANSI B16.5.
- c. The meter body end connections shall be carbon steel or 316 stainless steel flanged, according to ANSI B16, Class 150 and AWWA Class B standards.
- d. The meter body shall be available in ANSI Class 150 or Class 300 ratings.

2.3 ACCESSORIES

A. Conductivity Sensor

- 1. Capable of operating in fluid temperature of 0°F to 356°F
- 2. Constructed of ¾" NPT stainless steel body and pins
- 3. 6" PTFE coated wire leads
- 4. Maximum operating pressure of 250 psig
- 5. Shall supply a K=1/P1K signal

B. Conductivity Transmitter

- 1. Shall accommodate six (6) selectable conductivity ranges
- 2. Accuracy shall be +/- 1% of full scale reading in respective range
- 3. Housing shall be NEMA 4X
- 4. Capable of converting Pt1000 input signal into a 4-20 mA analog output signal.

C. Thermowell Temperature Sensor

- 1. Capable of operating in fluid temperature of -50°F to 356°F
- 2. Constructed of stainless steel or corrosion resistant material
- 3. 3-wire spring loaded element capable of transmitting a Pt100 signal
- 4. ¼" Sheath diameter
- 5. Head mounted RTD transmitter capable of converting Pt100 input signal into a 4-20 mA analog output signal and an upscale burnout
- 6. Shall have stainless steel ½" x ½" NPT hex nipple 1" length fittings to thermowell

D. Thermowell

- 1. Shall be standard duty.
- 2. Shall be ¾" pipe size.
- 3. Constructed of stainless steel.
- 4. Shall accept a ½" NPT connection

2.4 DATA COLLECTION CONTROLLER

- A. Refer to Section 23 09 13.11 Data Collection Controller

PART 3 EXECUTION

3.1 REQUIREMENTS

- A. Application

1. Main or total building steam condensate meter shall be provided and installed as a complete steam condensate meter system including accessories to measure flow, conductivity, and temperature in the main steam condensate pipe service.
2. Sub-meters shall be provided and install as required by code and rating system credits per project.

B. General installation

1. Identification and Labeling
 - a. Reference section 23 05 53 Identification of Mechanical Piping and Equipment
 - b. All wiring and devices shall be properly labeled in accordance with system diagrams and wiring details to identify device tag, name, and purpose.
 - c. Wire labels shall be machine made shrink type labels and match wire designations on the instrumentation drawings.
 - d. Field devices including flow meters, conductivity/temperature transmitters and sensors, shall be labeled with Brother P-touch or equal.
 - e. Label in accordance with other sections of this specification.
2. Installation
 - a. Only personnel qualified and experienced in this type of work shall make connections.
 - b. The installation of meters shall be done with care to avoid damage.
 - 1) Meters showing damage after installation shall be replaced.
 - 2) Meters shall have adequate clearance to service, repairs, and replacement.
 - 3) Data collection cabinets hung improperly shall be properly secured and all paint scratches shall be touched up.
 - c. Provide adequate pipe diameters upstream and downstream of installed meter. See Manufacturer's recommendations.
 - d. On gravity flow applications, installation of a loop seal is required. Install per Detail #1 – Cadillac CMAG Installation Detail.
 - e. Condensate magnetic flow meters are powered from Data Collection Controller. Install a dedicated 120VAC circuit per Specification 23 09 13.11 to the Data Collection Controller to provide 120VAC power to the steam condensate magnetic flow meter. 120VAC power shall be installed in dedicated conduit.
 - f. CG Condensate Mass Meters (Bucket Meter) are self-powered and do not require dedicated 120VAC circuit from the Data Collection Controller.
 - g. Each meter shall have a dedicated Twisted Shielded Pair (TSP) cable installed for each 24VDC digital pulse out to the Data Collection Controller.
 - h. Conductivity and temperature transmitters and sensors are powered by 24VDC, supplied from the Data Collection Controller.
 - i. Each steam condensate conductivity or temperature transmitter shall have dedicated Twisted Shielded Pair (TSP) cable installed to transmit the 4-20 mA signal to the Data Collection Controller. Signal cable shall be installed in dedicated low voltage conduit.
 - j. A dedicated conduit shall be installed for the data cabling per manufacturer requirements.

- k. Meters shall be installed such that the display can be easily read and accessible. Meter display shall be mounted at an easily read height (4'-5') above finished floor (AFF). A shield shall be installed if display is installed in direct sunlight.
 - l. Installation of full-size bypass and necessary shutoff valves is required to allow for continuous building service during periods of meter maintenance.
 - m. Provide appropriate installation kit based upon pipe material.
 - n. See Attachment #1 for typical wiring configuration.
 - 3. UW Campus Utility and Operations will check the Contractor's work to ensure the accuracy of the installation.
 - a. The Contractor shall arrange with the Owner for the times when Owner's services will be required, and under no circumstances shall the Contractor connect to the existing system without Owner's knowledge.
 - b. The proper connection of the wires and cables to other systems as specified is entirely the responsibility of the Contractor.
 - c. Contractor shall not energize meter until Campus Utilities and Operations or Campus Utilities and Operations' representative has inspected wiring.
 - 4. Install meters per manufacturer's recommendations.
 - 5. Meter shall be UL Listed from manufacture or shall be field listed.
- C. Mounting and electrical connections
 - 1. In accordance with manufacturer's installation instructions.
 - 2. Rigid-style GRC or IMC conduit must be used for installations in utility tunnels, utility vaults, or building service entrances. EMT conduit is only permissible in mechanical rooms and inside buildings. EMT fittings shall be compression type. All conduits must use threaded conduit style junctions (LB, LR, LL, C, TEE, etc.) with no unused/open hubs or Knockout holes (No 4" sq., etc). LFMC liquid-tight flexible metallic conduit shall be used when transitioning from conduit to device.
 - 3. Install a dedicated 120VAC circuit from the Data Collection Controller to each steam condensate flow meter. 120V circuit shall be THWN or XHHW insulation and installed in a ¾" conduit. A conduit is to be used when transitioning from conduit to the device. From conduit to device, use ½" LFMC with enough slack to allow for the removal of the device.
 - 4. Install 24VDC circuits from the Data Collection Controller to the steam condensate conductivity and temperature transmitters. 24V circuit shall be TSP and installed in a ¾" conduit. A conduit is to be used when transitioning from conduit to device. From conduit to device, use ½" LFMC with enough slack to allow for the removal of the device.
- D. Testing
 - 1. Contractor to verify meter is reading accurately.
 - 2. Contractor to submit testing plan to UW Campus Utilities and Operations for review.
 - 3. Contractor shall supply all test equipment and meters to verify accuracy of meter reading.
- E. Integration and Commissioning
 - 1. See section 23 08 00.11 Mechanical Meter Integration and Commissioning

END OF SECTION