Mechanical – Purchase Specs

23 05 19.11 Steam Condensate or Hot Water Meter – Purchase Spec

PART 1 – GENERAL

1.02 DESCRIPTION

A. Purpose

1. This section covers steam condensate meters, steam condensate sub-meters and hot water sub-meters for use in the Owner's steam systems.

1.03 QUALIFICATIONS

A. Approved manufacturers

1. Steam Condensate Meters and Sub-Meters
    a. Central Station Steam Co. – Cadillac Magnetic Flow Meter, no exceptions allowed
2. Hot Water BTU Sub-Meter
    a. Btu Meter
        i. Central Station Steam Co. – Cadillac Heatx-2 BTU Meter, no exceptions allowed
    b. Flow Meter
        i. Central Station Steam Co. – Cadillac Magnetic Flow Meter, no exceptions allowed
3. Conductivity Sensor
    a. Sensorex – CS675HTTC for 3” C and smaller conduit
    b. Sensorex – CS676HTTC for 4” C and 6” C
    c. Or Approved Equal
4. Conductivity Transmitter
    a. Sensorex – Con500
    b. Or Approved Equal
5. Temperature Transmitter
    a. Pyromation – 440 Series
    b. Or Approved Equal
6. Thermowell with Sensor

a. Pyromation – R1T185L
b. Or Approved Equal

7. Twisted-pair shielded cable

a. Belden 88760
b. Or Approved Equal

1.04 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

1.05 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

1.06 COORDINATION

A. Coordinate Operations and Maintenance training times with the Owner.
B. Coordinate the quantity and location of Facility Network (Facnet) Ethernet ports with Campus Engineering & Operations and UWIT. Contractor shall provide a completed "Mechanical Meter Profile Report" form per Specification 23 08 00.11 Appendix A for each meter.

1.07 SUBMITTALS

A. General

1. Submittals shall be in accordance with Conditions of the Contract and Division 01 Specification Sections.
2. Submit detailed maintenance manuals and drawings, which include catalog information indicating the complete electrical and mechanical characteristics.
3. Submit dimensioned cross-sectional drawings (manufacturer's data sheets are acceptable).
4. Submit finished meter tests – Manufacturer's Certified Test Reports showing accuracy tests

1.08 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.

1.09 MEETINGS

A. Pre-installation conference

1. The Contractor shall request a pre-installation conference with the UW Engineering Services and UW Power Plant Personnel for steam projects

B. Attend meetings with the Owner and/or Owner's Representative as required to resolve any installation or functional problems.

PART 2 – PRODUCTS

2.02 GENERAL

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

2.03 STEAM CONDENSATE METER

A. The following shall apply to the steam condensate main meters and sub-meters installed on the UW Campus:

1. Steam condensate meter shall operate by electromagnetic induction principle.
    a. Meter shall accept 120V AC power source.
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
5. Steam condensate meter shall have a minimum of 2 pulse and analog (4-20mA) outputs for remote monitoring
6. Meter electronics shall be housed in a NEMA 4X enclosure.
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.

2.04 HOT WATER BTU SUB-METER

A. The following shall apply to hot water BTU sub-meters installed on the UW Campus:

1. BTU meter shall be provided with two temperature sensors.
    a. Temperature sensors shall have a differential temperature accuracy of +/- 0.15 degree F over the calibrated range
2. BTU meter shall have the following accuracy:
    a. +/- 1.0% of reading from 2 to 20 ft/sec
    b. +/- 0.02 ft/sec below 2 ft/sec
3. BTU meter shall be capable of receiving a 0-15V pulse input from a flow meter.
4. BTU meter shall accommodate fluid temperature range
    a. 32°F to 200°F Standard
    b. 120°F to 300°F Optional
5. BTU meter shall have digital display and totalization for local monitoring. Local display shall include supply temperature, return temperature, gallons per minute (GPM), btu/hr, gallons and btu (dual mode).
6. BTU meter shall have an isolated solid state dry contact for energy totalization.
7. Meter electronics shall be housed in a NEMA 4X enclosure.
8. Meter shall be suitable ambient temperatures of -20 to 140° F.
9. Meter shall be provided with memory retention of program parameters in the event of a power loss.
10. BTU meter shall accommodate a 120V AC source.
11. BTU meter shall have a RJ45 port with BACNet IP communication protocol.
12. BTU meter shall have 2 4-20mA analog inputs available.

2.05 HOT WATER FLOW SUB-METER

A. The following shall apply to the hot water flow sub-meters installed on the UW Campus:

1. Meter shall operate by electromagnetic induction principle.
    a. Meter shall accept 120V AC power source.
2. 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. Meter shall have digital display and totalization for local monitoring
5. Meter shall have a minimum of 2 pulse and analog (4-20mA) outputs for remote monitoring
6. Meter electronics shall be housed in a NEMA 4X enclosure.
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.

2.06 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

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 Pt100 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

2.07 STEAM CONDENSATE AND HOT WATER DATA COLLECTION CONTROLLER

A. Refer to Section 26 09 13.11 Data Collection Controller

PART 3 – EXECUTION

3.02 REQUIREMENTS

A. Application

1. Main 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 installed as required by code and rating system credits per project.

B. General installation

1. Identification

a. Reference section 23 05 53 Identification of Mechanical Piping and Equipment

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.

i. Meters showing damage after installation shall be replaced.
ii. Meters shall have adequate clearance to service, repairs, and replacement.
iii. 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. Each hot water BTU sub-meter shall have dedicated CAT5E communication cable installed to connect the meter to the facility network. Install communication cable in rigid conduit.
e. Meters shall be installed such that the display can be easily read. A shield shall be supplied if display is in direct sunlight.
f. On gravity flow applications, install a loop seal.
g. Each steam condensate meter shall have a dedicated twisted-pair shielded cable installed for each 24VDC digital pulse out to the data collection controller.

h. Each steam condensate conductivity or temperature transmitter shall have dedicated twisted-pair shielded cable installed to transmit the 4-20 mA signal to the data collection controller.
i. Meters shall be installed such that the display can be easily read.
j. Provide shutoff valves and a bypass connection to allow for continuous service during periods of meter maintenance.
k. Provide appropriate installation kit based upon pipe material.
l. See Attachment #1 for typical wiring configuration.

3. UW's Power Plant Department 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 Owner 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

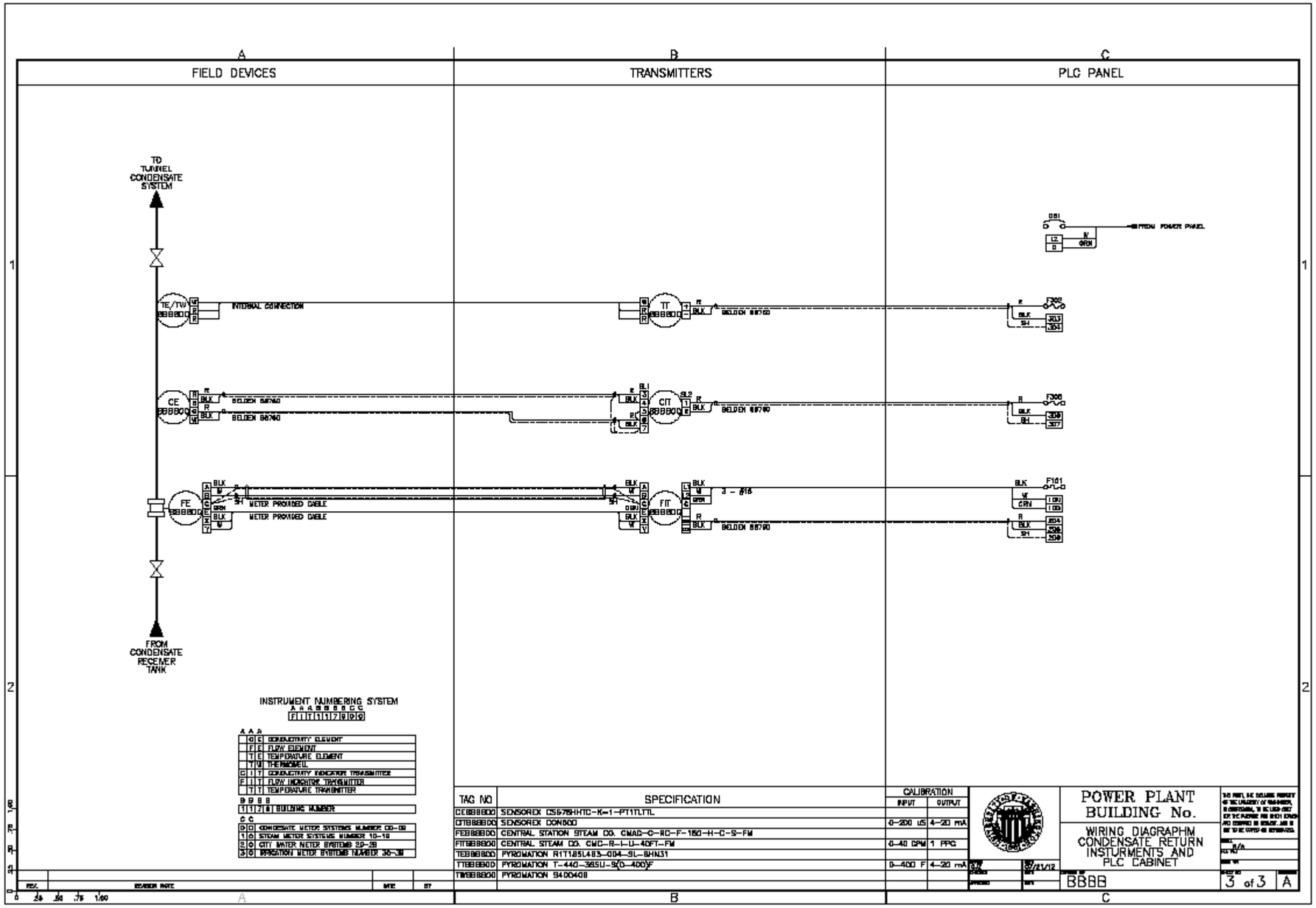
1. In accordance with manufacturer's installation instructions.
2. Install a dedicated 120V circuit per Specification 26 09 13.11 to the Data Collection Controller to provide low-voltage power to the steam condensate meter and transmitters.
3. Install 24V circuits from the Data Collection Controller to the steam condensate meter and transmitters.
4. Install 24V circuits from the hot water Btu Meter to flow meter and transmitters.
5. 24V circuit shall be THWN or XHHW insulation and installed in a GRC/IMC conduit. A 'C' condulet is to be used when transitioning from conduit to device. Flexible conduit shall be jacketed metallic "sealtite" style with enough slack to allow for the removal of the device.

D. Testing

1. Contractor to verify meter is reading accurately.

E. Integration and Commissioning

1. See section 23 08 00.11 Mechanical Meter Integration and Commissioning


A
FIELD DEVICES
B
TRANSMITTERS
C
PLC PANEL
TO TUNNEL CONDENSATE SYSTEM
FROM CONDENSATE RECEIVER TANK
TE/TW
CE
FE
TT
CIT
FIT
INTERNAL CONNECTION
METER PROVIDED CABLE
BELDEN 88760
BELDEN 88770
3 - #18
INSTRUMENT NUMBERING SYSTEM
A A A B B B C C
F I T 1 1 7 0 0
A A A
C E CONDUCTIVITY ELEMENT
F E FLOW ELEMENT
T E TEMPERATURE ELEMENT
T W THERMOWELL
C I T CONDUCTIVITY INDICATOR TRANSMITTER
F I T FLOW INDICATOR TRANSMITTER
T I T TEMPERATURE TRANSMITTER
B B B
1 1 7 BUILDING NUMBER
C C
0 0 CONDENSATE METER SYSTEMS NUMBER 00-09
1 0 STEAM METER SYSTEMS NUMBER 10-19
2 0 CITY WATER METER SYSTEMS 20-29
3 0 IRRIGATION METER SYSTEMS NUMBER 30-39
TAG NO
SPECIFICATION
CALIBRATION
INPUT
OUTPUT
CEBBBBDD SENSOREX CS675HHTC-K=1-PT1TLTTL
CITBBBBDD SENSOREX CDN500
FEBBBBDD CENTRAL STATION STEAM CO. CMAD-C-RC-F-150-H-C-S-FM
FITBBBBDD CENTRAL STEAM CO. CMC-R-I-U-40FT-FM
0-40 GPM
1 PPG
TEBBBBDD PYROMATION R1T185L483-004-SL-BHN31
TTBBBBDD PYROMATION T-440-365U-S(D-400)F
0-400 F
4-20 mA
TMBBBBDD PYROMATION S4DD408
POWER PLANT BUILDING No.
WIRING DIAGRAPHM CONDENSATE RETURN INSTURMENTS AND PLC CABINET
BBBB
3 of 3
A
REV.
REVISION NOTE
DATE
BY
A
B
C