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PART 1 GENERAL

1.1 DESCRIPTION

A. Purpose

1. This section covers natural gas meters and sub-meters for use on the UW Seattle Campus natural gas systems, including UW and PSE natural gas systems.
2. Confirm with Campus Utilities and Operations which natural gas system (UW or PSE) project will be connecting to and how to apply this section.

1.2 QUALIFICATIONS

A. Approved manufacturers

1. UW Gas Main Meter for up to 1 1/2" pipe size
 - a. American Meter – AL-1000
 - b. Or approved equal
2. UW Gas Main Meter for 2" or Larger
 - a. American Meter
 - b. Dresser Measurement
3. UW Gas Sub-Meter
 - a. Onicon – F-5500
 - b. Or approved equal
4. Earthquake (EQ) Valve
 - a. KOSO California Valve
5. Twisted Shielded Pair (TSP) Cable
 - a. Belden 88760
 - b. Or approved equal
6. PSE Gas Meter
 - a. Provided by PSE
7. Earthquake Valve
 - a. Pacific Seismic Products (formerly KOSO)
8. Twisted Shielded Pair (TSP)
 - a. Belden 88760
 - b. Or Approved Equal

1.3 RELATED SECTIONS

- A. 01 91 00 – General Commission Requirements
- B. 23 08 00.11 – Mechanical Meter Integration and Commissioning
- C. 23 09 13.11 – Data Collection Controller

1.4 REFERENCES

- A. Applicable codes, standards, and references codes, regulations and standards
 1. ANSI B109.1 Diaphragm-Type Gas Displacement Meters (under 500 cubic feet per hour capacity)

2. ANSI B109.2 Diaphragm-Type Gas Displacement Meters (500 cubic feet per hour and over)
3. ANSI B109.3 Rotary-Type Gas Displacement Meters
4. UL 61010-1 Electrical Equipment for Measurement, Control and Laboratory Use
5. NEMA 4X/6P (IP66/IP67)
6. State and local codes and ordinances
7. Gas Distribution Integrity Management Program (DIMP)

B. Attachments and Details

1. 23 00 00 Attachment #1 – Mechanical Meter Schematic

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. Contractor shall coordinate with UW Campus Utilities and Operations and hire 3rd Party Contractor for natural gas design at the cost of the project.
- C. For any natural gas sub-meter, coordinate with department and maintenance zone.
- D. Coordinate Operations and Maintenance training times with the Owner.
- E. Submit a completed “Worksheet: Mechanical Meter Schedule” form per Specification 23 08 00.11 and add to Submittals.

1.6 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

1.7 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 Shop 69 (meters) and Shop 43 (utilities) before the project begins construction.

2. The Contractor shall request a pre-installation conference with the UW Department and/or maintenance zone for natural gas sub-meter projects.
- B. Post installation meeting with UW Campus Utilities and/or Maintenance Zone to review meter installation before activation.
- C. 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 gas meter specifications are in accord with the Owner's policy to construct permanent installations with long life, coupled with maximum reliability and safety.

2.2 GAS METER

- A. The following shall apply to the UW gas meters installed on the UW Campus:
 1. Gas meter shall use a hybrid analog/digital thermal mass flow sensing method.
 2. Gas meter shall have the following accuracy for natural/propane gas:
 - a. +/- 1.0% of reading from 500 to 7000 SFPM
 - b. +/- 2.0% of reading from 100 to 500 SFPM
 3. Gas meter shall be wet calibrated in a flow laboratory. A certificate of calibration shall accompany each meter.
 4. Gas meter shall have an overall flow range of 5 to 35,000 SFPM.
 5. Gas meter shall accommodate fluid temperature range of -40 to 200° F
 6. Gas meter shall have digital display for local monitoring
 7. Gas meter housing shall be NEMA 4X rated. Meter electronics shall be mounted remotely when direct wiring is not feasible.
 8. Gas meter shall be suitable for ambient temperatures of 0 to 150° F.
 9. Gas meter connections shall be as follows:
 - a. Diaphragm style meters shall be threaded, up to 425 million cubic feet per hour
 - b. Rotary meters shall have meter body flanges, for greater than 425 million cubic feet per hour.
 10. Gas meter shall be capable of operating at a maximum pressure of:
 - a. Diaphragm meters: 10 PSIG max
 - b. Rotary Meters: 290 PSIG max
 11. Gas meter shall accommodate a delivery pressure of 10 inches of water column.
 12. Gas meter shall have a maximum pressure drop of 0.5" w.c. in pipe sizes above 1-1/2" diameter, and less than 0.9" w.c. for pipe diameters of 1-1/2" and below.
 13. Gas meter shall have a pulse output.
 14. Gas meter shall be constructed of die cast aluminum, diaphragms shall be made of Buna-N rubber.

2.3 Earthquake (EQ) Valve

- A. Earthquake valve body shall be threaded or have flanges based upon installation

requirements.

- B. Earthquake valve shall have a manual reset
- C. Shall have a visual open-close indicator
- D. Shall close within five (5) seconds when subjected to a horizontal, sinusoidal oscillation with the following characteristics:

	Peak Acceleration	Period
1.	0.7G	0.13 Seconds
2.	0.4G	0.2 Seconds
3.	0.3G	0.4 Seconds
4.	0.25G	1.00 Seconds

- E. The valve shall not close when subjected for five (5) seconds to each of three horizontal, sinusoidal oscillations with the following characteristics:

	Peak Acceleration	Period
1.	0.4G	0.1 Seconds
2.	0.2G	0.2 Seconds
3.	0.15G	0.4 Seconds
4.	0.1G	1.00 Seconds

PART 3 EXECUTION

3.1 REQUIREMENTS

A. 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 shall be labeled with Brother P-touch or equal.
- e. Label in accordance with other sections of this specification.

2. Installation

- a. Only OQ personnel qualified in natural gas and experienced in this type of work shall make connections in the outdoor distribution.
- b. All personnel working on interior gas lines shall be Seattle Mechanical Natural Gas qualified and experienced in this type of work.
- c. 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.

- d. Provide adequate pipe diameters upstream and downstream of installed meter. See Manufacturer's recommendations.
 - e. Rotary meters shall have a strainer installed before the intake of the meter.
 - f. Each gas meter shall have dedicated Twisted Shielded Pair (TSP) communication cable installed to connect the meter's 24VDC digital pulse out to the Data Collection Controller.
 - g. Meters shall be installed such that the odometer can be easily read.
 - h. Earthquake (EQ) Valve shall be attached to the building in the horizontal or vertical piping assembly. The EQ Valve shall not be installed free standing on the gas line.
 - i. Provide appropriate installation kit based upon pipe material.
 - j. Gas Sub-Meters shall be installed per Maintenance Zone requirements and manufacture installation requirements.
 - k. Provide adequate slack in flexible conduit to allow for the removal of the gas meter.
 - l. All natural gas meters and associated piping shall be painted to protect from corrosion. Contractor to touchup any exposed metal after installation as required. Any tool marks from installation shall be filed down.
- 3. UW Campus Utilities 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 their 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. In the event the connections cannot be made as specified, the Contractor shall make the necessary corrections at his own expense.
- 4. Install meters per manufacturer's recommendations.
- 5. Meter shall be UL Listed from manufacture or shall be field listed.
- B. 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 24VDC circuits from the Data Collection Controller to the natural gas meter. 24V circuit shall be TSP and installed in a 3/4" conduit. A conduit is to be used when transitioning from conduit to device. From conduit to device, use 1/2" LFMC with enough slack to allow for the removal of the device.
- C. Earthquake Valve Mounting
 - 1. In accordance with manufacture's installation instructions.

D. Testing

1. Contractor to verify meter is reading accurately. Contractor shall present meter verification plan and gain approval from UW Campus Utility and Operations and/or associated maintenance zone on meter reading verification.
2. Contractor to submit meter accuracy report of verified meter reading.
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 Meter Integration and Commissioning

END OF SECTION