

## **PART 1 GENERAL**

### 1.1 DESCRIPTION

#### A. Purpose

1. This section covers building water meters and sub-meters for use on the UW Seattle Campus water systems.
2. This section applies to buildings that will also have steam or natural gas services and will require the installation of the Data Collection Controller.
3. For buildings without steam or natural gas, refer to section 23 05 19.61 – Building Water Meter - Standalone

### 1.2 QUALIFICATIONS

#### A. Approved manufacturers

1. Main Building Water Meter and Sub-Meters
  - a. Cadillac Meter – CMAG Magnetic Flow Meter
  - b. No exceptions
2. 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 23 09 13.11 – Data Collection Controller

### 1.4 REFERENCES

- A. Applicable codes, standards, and references codes, regulations and standards
  1. NSF/ANSI Standard 61
  2. NSF/ANSI Standard 372
  3. AWWA C700 Standards
  4. AWWA C701 Class 2 Standards
  5. State and local codes and ordinances
- 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
- B. Coordinate Operations and Maintenance training times with the Owner.
- C. Contractor shall provide a completed “Mechanical Meter Profile Report” form per Specification 23 08 00.11 Appendix A for each meter.

### 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 the UW Campus Utilities and Operations and Associated Maintenance Zone.
- B. Post installation meeting with UW Campus Utilities and Operations and Associated Maintenance Zone.
- 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 building water 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 Main Building Water Meter

- A. The following shall apply to all main building water meters as defined by this section:
  1. Water meter shall operate by electromagnetic induction principle.
    - a. Meter shall measure flow using Faraday's law.
    - b. Meter shall have a stable K-factor that is not influenced by external piping or mounting orientation.
    - c. Meter shall have uniform magnetic field flux distribution piping straight run and flow profiling.
    - d. Meter shall measure fluids with conductivity greater than or equal to 3.0 uS/cm<sup>2</sup>
    - e. Meter shall be capable achieving an accuracy of +/- 0.25% of the reading for liquids with a 1.5x pipe diameter from center of meter of straight pipe run up and downstream.

- f. Meter shall be capable of achieving an accuracy of +/- 0.50% of the reading for liquids without any piping straight run.
- g. Meter shall accept dedicated 120V AC power source.
- 2. Water meter shall have the following rangeability:
  - a. 300 to 1 turndown minimum at +/- 0.25% accuracy
  - b. 400 to 1 turndown minimum at +/- 0.50% accuracy
  - c. 500 to 1 turndown minimum at +/- 1.00% accuracy
- 3. Water meter shall measure and report the following quantities at a minimum:
  - a. Setup to record cubic feet.
- 4. 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
- 5. Water meter shall have digital display and totalization for local monitoring. The display can be integral or remote depending on meter installation and physical barriers/constraints around the meter.
- 6. Water meter shall have a minimum of 2 pulse and analog (4-20mA) outputs for remote monitoring.
- 7. Meter housing shall be NEMA 4X rated.
- 8. Meter shall be suitable for installations on pipes sizes from 0.5" to 48" diameters.
- 9. Meter shall be capable of measuring following flow:

Magmeter Body Size	Liquid Flow Range Table	
	Minimum Volumetric (gal/min) Range	Maximum Volumetric (gal/min) Range
0.5"	0.00-0.25	0.00-25.00
1"	0.00-0.75	0.00-75.00
1.5"	0.00-1.75	0.00-175.0
2"	0.00-3.00	0.00-300.0
3"	0.00-8.00	0.00-800.0
4"	0.00-12.50	0.00-1250.0
6"	0.00-25.00	0.00-2500.0
8"	0.00-50.00	0.00-5000.0
10"	0.00-75	0.00-7500.0

- 10. 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 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.

### **PART 3 EXECUTION**

#### **3.1 REQUIREMENTS**

##### **A. Application**

###### **1. Main Building Water Meter**

- a. Provide a main building water meter for each building served by the domestic water service. Meter shall be connected to the Data Collection Controller.

###### **2. Water Submeters**

- a. Provide water submeters for each of the following sub-systems:
  - 1) Reclaimed water (if provided at project's discretion),
  - 2) Rainwater harvest (if provided at project's discretion)
  - 3) Water subsystems where Facilities Services recharges self-sustaining departments
  - 4) Elsewhere as required to meet code or achieve rating system credits.
- b. Water submeters shall be connected to the UW data collection controller.

###### **3. Sewer Submeters**

- a. Provide water sub-meters in accordance with Specification 23 05 19.31 Sewer Sub-meter for each of the following sub-systems:
  - 1) Irrigation (Civil/Site)
  - 2) Irrigation (Mechanical/Building)
  - 3) Cooling Tower Makeup
  - 4) Cooling Tower Blowdown/Drain/Overflow

###### **4. Water Submeters Miscellaneous**

- a. Provide water sub-meters each of the following sub-systems:
  - 1) Hydronic closed loop makeup water connections
  - 2) Elsewhere as necessary to function as part of Building Automation System.
- b. Miscellaneous Water submeter to communicate to the Building Automation System (BAS).

##### **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 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 for service, repairs, and replacement.
    - c. Provide adequate pipe diameters upstream and downstream of installed meter. See Manufacturer's recommendations.
    - d. Water 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 water magnetic flow meter. 120VAC power shall be installed in dedicated conduit.
    - e. Each water meter shall have a dedicated Twisted Shielded Pair (TSP) cable installed for each 24VDC digital pulse out to the Data Collection Controller. The 24VDC digital pulse cable shall be installed in a dedicated conduit to the Data Collection Controller.
    - f. For Miscellaneous Water Submeters coordinate wiring requirements for the BAS with the Building BAS Vendor. Verify the meter pulse signal is sufficient to meet the Building BAS requirements.
    - g. 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.
    - h. Water meters shall be provided with shutoff valves and a full-sized bypass connection to allow for continuous service during periods of meter maintenance.
    - i. Provide appropriate installation kit based upon pipe material.
    - j. Provide adequate slack in flexible communication/power seal flex conduit to allow for the removal of the water meter.
  3. UW 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 manufacturer 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 120V circuit from the Data Collection Controller to the building water meter and sub-meters. 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 water meter and sub-meters. 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.
5. For Miscellaneous Water Submeters, coordinate with Building BAS Vendor for power and communication requirements.

D. Testing

1. Contractor to verify meter is reading accurately. Contractor shall present meter verification plan and gain approval from UW Campus Utilities 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 Mechanical Meter Integration and Commissioning

END OF SECTION