

**SECTION 22 05 19  
METERS AND GAUGES FOR PLUMBING PIPING**

SPEC WRITER NOTES:

1. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the Section and renumber the paragraphs.
2. The "Safe Drinking Water Act" (SDWA) was originally passed into law in 1974. It was amended several times. The "Reduction of Lead in Drinking Water Act" was passed in January 2011 and amends the SDWA to the new lead free standard to include NSF 61 and NSF 372.

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

SPEC WRITER NOTE: The meters described in this section are not for the purpose of quantifying energy and water consumption data with linkage to the Veterans Affairs advanced metering program. Advanced meters are indicated in specification Section 25 10 10, ADVANCED UTILITY METERING SYSTEM.

- A. This section describes the requirements for water meters and gauges primarily used for troubleshooting the system and to indicate system performance.
- B. A complete listing of common acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

SPEC WRITER NOTE: Coordinate with Division 23 for Legionella risk monitoring by BAS.

- C. //Components intended to be connected to BAS shall be furnished under Section 23 09 23 DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC for installation under this section.//

**1.2 RELATED WORK**

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- C. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- D. //Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.//
- E. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- F. //Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS. Requirements for commissioning, systems readiness checklist, and training.//

G. //Section 23 09 23, DIRECT DIGITAL CONTROL SYSTEMS FOR HAVC.//

H. Section 25 10 10, ADVANCED UTILITY METERING SYSTEM.

**1.3 APPLICABLE PUBLICATIONS**

SPEC WRITER NOTE: Make material requirements agree with requirements specified in the referenced Applicable Publications. Verify and update the publication list to that which applies to the project, unless the reference applies to all plumbing systems. Publications that apply to all plumbing systems may not be specifically referenced in the body of the specification but shall form a part of this specification.

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. American Society of Mechanical Engineers (ASME):
  - B40.100-2013.....Pressure Gauges and Gauge Attachments
  - B40.200-2008.....Thermometers, Direct Reading and Remote Reading
- C. American Water Works Association (AWWA):
  - C700-2015.....Cold Water Meters, Displacement Type, Bronze Main Case
  - C701-2015.....Cold Water Meters-Turbine Type, for Customer Service
  - C702-20115.....Cold Water Meters - Compound Type
  - C707-2010 (R2016).....Encoder-Type Remote-Registration Systems for Cold-Water Meters
- D. Institute of Electrical and Electronics Engineers (IEEE):
  - C2-2017.....National Electrical Safety Code (NESC)
- E. International Code Council (ICC):
  - IPC-2018.....International Plumbing Code
- F. National Fire Protection Association (NFPA):
  - 70-2020.....National Electrical Code (NEC)
- G. NSF International (NSF):
  - 61-2019.....Drinking Water System Components - Health Effects
  - 372-2016.....Drinking Water System Components - Lead Content

**1.4 SUBMITTALS**

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 19, METERS AND GAUGES FOR PLUMBING PIPING", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
  - 1. Water Meter.
  - 2. Pressure Gauges.
  - 3. Thermometers.
  - 4. Product certificates for each type of meter and gauge.
  - 5. BACnet communication protocol.
- D. Complete operating and maintenance manual shall including wiring diagrams, technical data sheets, information for ordering replaceable parts, and troubleshooting guide:
  - 1. Include complete list indicating all components of the system.
  - 2. Include complete diagrams of the internal wiring for each item of equipment.
  - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- E. //Completed System Readiness Checklist provided by the CxA and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//
- F. //Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//

**1.5 AS-BUILT DOCUMENTATION**

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" of Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

**PART 2 - PRODUCTS**

SPEC WRITER NOTE: Coordinate with the meter manufacturer for the selection of the best meter for the application.

**2.1 DISPLACEMENT WATER METER**

- A. For pipe sizes 50 mm (2 inches) and smaller, the water meter shall be displacement type, full size nutating disc, magnetic drive, sealed register, and fully conform to AWWA C700. Peak domestic flow shall be 2.2 L/s (34 gpm). The meter register shall indicate flow in liters (U.S. gallons).
- B. The water meter shall be rated for use at temperatures ranging from -40 degrees C (-40 degrees F) and 70 degrees C (158 degrees F) and operate at a working pressure of 1035 kPa (150 psig).
- C. The meter case, bottom caps, and register box lids shall be constructed from cast bronze.
- D. The meter shall register plus or minus 3 percent of the water actually passing through it at any rate of flow within the normal test flow limits specified in AWWA 700.
- E. The water meter shall conform to //NSF 61// //and// //NSF 372//.

SPEC WRITER NOTE: Turbine water meters shall be used for facilities with medium to high continuous flow rates. These meters are less accurate for consumption at low flows as compared to displacement and compound meters.

**2.2 TURBINE WATER METER**

- A. The water meter shall be Turbine type, Class II, in-line, horizontal axis, and fully conform to AWWA C701. Peak domestic flow shall be \_\_\_ L/s (\_\_\_ gpm). The meter Register shall indicate flow in liters (U.S. gallons).
- B. The water meter shall be rated for use at temperatures ranging from -40 degrees C (-40 degrees F) and 70 degrees C (158 degrees F) and operate at a working pressure of 1035 kPa (150 psig).
- C. The turbine case shall be constructed of cast bronze.
- D. The register box rings and lid shall be made of cast copper alloy containing not less than 75 percent copper. Forged or die cast copper alloy containing not less than 75 percent copper or a suitable synthetic polymer.
- E. The flow measuring turbine shall be made of a suitable synthetic polymer with specific gravity approximately equal to that of water. The

measuring turbine shall have sufficient dimensional stability to retain operating clearances at the full range of working temperatures.

- F. All external case closures, such as rings, clamps, screws, bolts, cap bolts, nuts and washers shall be designed for easy removal following lengthy service.
- G. The turbine meter shall have flanged ends and supplied with companion flanges, gaskets, and with bolts and nuts. The companion flanges shall be made of cast iron.
- H. The meter shall register plus or minus 3 percent of the water actually passing through it at any rate of flow within the normal test flow limits specified in AWWA 701.
- I. The water meter shall conform to //NSF 61// //and// //NSF 372//.

SPEC WRITER NOTE: Compound water meters shall be used for facilities with low, medium and high flow rates that require accuracy for consumption throughout all flow ranges.

### 2.3 COMPOUND WATER METER

- A. The compound water meter shall be a combination of a main line meter of the turbine type and a meter of appropriate size for measuring low rates of flow. The compound meter shall have an automatic valve mechanism for diverting low rates of flow through the bypass meter. Both metering devices shall be provided with registers contained in the same case. The operating characteristics shall fully conform to AWWA C702. Peak domestic flow rate shall be \_\_\_L/s (\_\_\_ gpm). The bypass meter flow rate shall be \_\_\_L/s (\_\_\_ gpm). Each Register shall indicate in liters (U.S. gallons).
- B. The water meter shall be rated for use at temperatures ranging from -40 degrees C (-40 degrees F) and 70 degrees C (158 degrees F) and operate at a working pressure of 1035 kPa (150 psig).
- C. The main case shall be made of copper alloy containing no less than 75 percent copper.
- D. The register box rings and lids shall be made of a cast copper alloy.
- E. The measuring chambers shall be made of a copper alloy containing not less than 84 percent copper.
- F. The measuring turbines shall be made of a suitable synthetic polymer with specific gravity approximately equal to that of water or stainless steel. The measuring turbines shall have sufficient dimensional stability to retain operating clearances at working temperatures.

- G. The turbine meter shall have flanged ends and supplied with companion flanges, gaskets, and with bolts and nuts. The companion flanges shall be made of cast iron.
- H. The meter shall register plus or minus 3 percent of the water actually passing through it at any rate of flow within the normal test flow limits specified in AWWA C702 except in the registration of flows within the changeover period from bypass meter to main meter.
- I. The water meter shall conform to //NSF 61// //and// //NSF 372//.

#### **2.4 WATER METER STRAINER**

- A. All meters shall be fitted with a factory installed integral strainer or bronze inlet strainer with top access. The strainer shall conform to AWWA C702.
- B. The water meter strainer shall conform to //NSF 61// //and// //NSF 372//.

SPEC WRITER NOTE: In addition to the advanced metering required in Section 25 10 10, ADVANCED UTILITY METERING SYSTEM, metering may also be required for monitoring specific domestic water usage and hot water recirculation flow rates and as verification of flow per the VA Design Guide, or any other project specific monitoring requirements.

#### **2.5 WATER METER PROGRAMMING**

- A. All meters 50 mm or DN 50 (2 inches) and greater shall be programmable with software supplied by the meter manufacturer.
- B. The software shall have a Microsoft based interface and operate on the latest Windows operating system. The software shall allow the user to configure the meter, troubleshoot the meter, query and display meter parameters, and configure data and stored values.
- C. The meter firmware shall be upgradeable through one of the communication ports without removing the unit from service.
- D. The meter shall include output for analog 4-20 milliamp signals and binary output.
- E. The meter shall have two dry contact relays outputs for alarm or control functions.

#### **2.6 WATER METER COMMUNICATION PROTOCOL**

- A. The meter shall use a native BACnet Ethernet communication protocol supporting //HTTP// //SMTP// //Modbus//. The communications shall be protected against surges induced on its communications channels.

**2.7 REMOTE READOUT REGISTER**

- A. All meters shall be equipped with a remote readout register in accordance with AWWA C707.

**2.8 PRESSURE GAUGES FOR WATER AND SEWAGE USAGE**

- A. ASME B40.100 all metal case 115 mm (4-1/2 inches) diameter, bottom connected throughout, graduated as required for service, and identity labeled. Range shall be 0 to 1380 kPa (0 to 200 psig) gauge.
- B. The pressure element assembly shall be bourdon tube. The mechanical movement shall be lined to pressure element and connected to pointer.
- C. The dial shall be non-reflective aluminum with permanently etched scale markings graduated in kPa and psig.
- D. The pointer shall be dark colored metal.
- E. The window shall be glass.
- F. The ring shall be brass or stainless steel.
- G. The accuracy shall be grade A, plus or minus 1 percent of middle half of scale range.
- H. The pressure gauge for water domestic use shall conform to //NSF 61// //and// //NSF 372//.

**2.9 THERMOMETERS**

- A. Thermometers shall be straight stem, metal case, red liquid-filled thermometer, approximately 175 mm (7 inches) high, 4 degrees C to 100 degrees C (40 degrees F to 212 degrees F). Thermometers shall comply with ASME B40.200.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Direct mounted pressure gauges shall be installed in piping tees with pressure gauge located on pipe at the most readable position.
- B. Valves and snubbers shall be installed in piping for each pressure gauge.
- C. Test plugs shall be installed on the inlet and outlet pipes of all heat exchangers or water heaters serving more than one plumbing fixture.
- D. Pressure gauges shall be installed where indicated in the drawings and at the following locations:
  1. Building water service entrance into building.
  2. Inlet and outlet of each pressure reducing valve.
  3. Suction and discharge of each domestic water pump or re-circulating hot water return pump.

- E. Water meter installation shall conform to AWWA C700, AWWA C701, and AWWA C702. Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein. New materials shall be provided.
- F. Remote readout register shall be mounted at the location indicated in the drawings or as directed by the COR.
- G. Thermometers shall be installed on the water heater inlet and outlet piping, thermostatic mixing valve outlet piping, and the hot water circulation pump inlet piping.
- H. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

SPEC WRITER NOTE: Coordinate with  
Division 23 for Legionella risk  
monitoring by BAS.

- I. //Install portable water temperature, pressure and flow meters provided under Section 23 09 23 DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC.//

### **3.2 FIELD QUALITY CONTROL**

- A. The meter assembly shall be visually inspected and operationally tested. The correct multiplier placement on the face of the meter shall be verified.

### **3.3 STARTUP AND TESTING**

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- C. //The CxA will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and CxA. Provide a minimum notice of 10 working days prior to startup and testing.//

### **3.4 //COMMISSIONING**

- A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.//

**3.5 DEMONSTRATION AND TRAINING**

- A. Provide services of manufacturer's technical representative for //4//  
// // hour//s// to instruct each VA personnel responsible in  
operation and maintenance of the system.
- B. //Submit training plans and instructor qualifications in accordance  
with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING  
SYSTEMS.//

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