

**CITY OF BAKERSFIELD
DOMESTIC WATER DIVISION
WATER METER SPECIFICATIONS**

5/8" x 3/4", 1", 1-1/2", and 2" Displacement Meters
3", 4", and 6" Compound Meters
2" Turbine Meters
2", 3", 4", and 6" Strainers



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**CITY OF BAKERSFIELD
DOMESTIC WATER DIVISION
WATER METER SPECIFICATIONS**

Bidder's Responsibility to Conform to Specifications: It is the responsibility of each bidder to carefully examine these specifications and become familiar with the requirements set forth herein.

General Conditions: All meters (excluding the meter registers) shall be subject to repair or replacement by the manufacturer in the event of failure of materials and/or faulty workmanship within a minimum of 12 consecutive months from the date of initial installation by the City.

All meter registers shall be designed and constructed in a manner whereby no dirt, dust, water, moisture, or other foreign matter makes contact with the register. All registers shall be free of condensate and/or fogging. All meter registers failing to meet any of the requirements specified herein shall be subject to repair and/or replacement by the manufacturer at no cost to the City for a minimum period of 180 consecutive months from the date of initial installation.

All meters supplied shall include the appurtenant equipment necessary for a normal installation (see Materials).

Affidavit of compliance: The City requires an affidavit from either the vendor or the manufacturer setting forth the fact that the meters being furnished comply with all applicable requirements of these specifications.

Basis for rejection: Meters not complying with all requirements of these specifications shall be rejected.

Rejected Meters - the manufacturer shall replace or satisfactorily correct, at its own expense, all meters rejected for failure to comply with these specifications.

Workmanship and Materials - The manufacturer shall repair or replace, without charge, those parts in which a defect has developed upon their return to the manufacturer or upon proper proof of defect, except that this warranty shall not apply if the meter has been modified by the use of replacement parts not produced by the manufacturer of the meter.

COLD-WATER METERS - DISPLACEMENT TYPE

5/8" x 3/4", 1", 1-1/2" and 2" Size

TYPE: Small meters shall be as follows or shall be approved-equals **prior** to submitting bids:

- 5/8" x 3/4" Size -** Badger Recordall Model 25S AWWA
Schlumberger Industries, Inc. /Neptune Trident 10, SeBiloy model
Hersey Model 400 Series IIS, SeBiloy model

- 1" Size -** Badger Recordall Model 70 AWWA
Schlumberger Industries, Inc. /Neptune Trident 10, SeBiloy model
Hersey Model 400 Series IIS, SeBiloy model

- 1-1/2" -** Badger Recordall
Schlumberger Industries, Inc. /Neptune Trident 8, SeBiloy model
Hersey Model MCT, MCTII, or 500 Series IIS, SeBiloy model

- 2" -** Badger Recordall
Schlumberger Industries, Inc. /Neptune Trident 8
Hersey Model MCT, MCTII, or 500 Series IIS

Positive displacement meters furnished hereunder shall be full-size nutating-disc, magnetic drive, sealed register, cold water meter and shall fully comply with the requirements of AWWA C700, unless otherwise specified hereunder. **No oscillating-piston style meters will be accepted.**

MATERIALS:

Cases 5/8" x 3/4", 1", 1-1/2":

The main case of the meter shall conform to the specifications on page 1 and 2 under the General Conditions section, bottom caps shall be cast all-bronze or SeBiloy model, excepting register boxes, and register-box lids which shall be bronze, SeBiloy or an approved plastic material. Meter cases constructed of plastic will not be accepted.

Cases 2":

The main case of the meter shall be cast all-bronze, including bottom caps, excepting register boxes, and register-box lids which shall be bronze or an approved plastic material. Meter cases constructed of plastic will not be accepted.

Register Box Rings and Lids:

Register box rings and lids shall be made of a copper alloy containing not less than 57 percent copper, or all bronze, or an approved suitable synthetic polymer.

Water meter specifications (continued)

Measuring Chambers:

Measuring chambers shall be made of a copper alloy containing not less than 85 percent copper and suitable amounts of tin, lead, and zinc or of a suitable synthetic polymer.

Discs:

Discs shall be made of vulcanized hard rubber or a suitable synthetic polymer with specific gravity approximately equal to that of water. They shall have sufficient dimensional stability to retain operating clearances at working temperatures of up to 80°F and not warp or deform when exposed to operating temperatures of 100°F.

Measuring Chamber Diaphragms:

Measuring chamber diaphragms shall be made of Monel, phosphor bronze, stainless steel, hard rubber, or a suitable synthetic polymer.

Spindles, Thrust Rollers, and Thrust-Roller Bearing Plates:

Spindles, thrust rollers and thrust-roller bearing plates shall be made of Monel, phosphor bronze, stainless steel, hard rubber, or a suitable synthetic polymer.

Intermediate Gear Trains:

Frames, gears, and pinions shall be made of a suitable copper alloy, other suitable non-corrosive metals, or other suitable materials.

External Case Closure Fasteners: (casing bolts, studs, nuts, screws, and washers)

External fasteners shall be made of a copper alloy containing not less than 57 percent copper, stainless steel, or steel treated to resist corrosion. Fasteners for no pressure assemblies may be made of a suitable synthetic polymer.

All external case closures, such as rings, clamps, screws, bolts, cap bolts, nuts and washers shall be designed for easy removal following lengthy service.

Water Meter Coupling: - 5/8" x 3/4"

A water coupling shall be composed of one meter coupling nut, one meter coupling tail piece (straight), and one rubber-type washer for meter coupling. The meter coupling tailpiece and nut shall be of a copper alloy containing not less than 57 percent copper. The coupling nut shall have internal straight pipe threads conforming to ANSI B2.1. Pitch diameter shall be that shown on AWWA Standard C700. The coupling tailpiece shall have external taper pipe threads conforming to ANSI B2.1. And an internal diameter that is approximately equal to the nominal thread size of the tailpiece. Lengths and thread sizes shall be those listed in AWWA Standard C700.

One water meter coupling and one additional rubber-type washer for meter coupling (total of 2 rubber-type washers) shall be provided with each meter.

Water meter specifications (continued)

Companion Flanges: - 1-1/2" and 2"

Companion flanges shall be made of cast iron.

GENERAL DESIGN:

Pressure Requirements:

Meters supplied under this specification shall operate without leakage or damage to any part at a working pressure of 150 p.s.i.

Accessibility:

All 1-1/2" and 2" meters shall be designed for easy removal of all interior parts without disturbing the connections to the pipeline.

Registration Accuracy:

Meters shall meet the following requirements for accuracy with water of a temperature of less than 80°F.

Normal Flow Limits - At any rate of flow within the normal test flow limits specified on AWWA Standard C700, the meter shall not register less than 98.5 percent and not more than 101.5 percent of the water that actually passes through it.

Minimum Test Flow - At the minimum test flow rate specified in AWWA Standard C700, the meter shall not register less than 95 percent and not more than 101 percent of the water that actually passes through it.

Markings:

The size, model, and direction of flow through the meter shall be marked permanently on the outer case of all meters. All meters shall have manufacturer's serial numbers stamped on the meter main case and top of the reading lid.

Register Boxes:

The name of the manufacturer shall be marked permanently in the lid of the register box. The serial number of the meter shall be imprinted on the lid and well as the main case.

DETAIL DESIGN:

Cases:

All meters shall have an outer case with separate, removable measuring chambers. Cases shall not be repaired in any manner. The inlet and outlet shall have a common axis. A meter case shall include the top case and bottom case, or main case and bottom plate whichever is applicable. Connection flanges shall be parallel.

Water meter specifications (continued)

Connections:

Meter case connections for 5/8 x 3/4-inch, and 1-inch meters shall be meter casing spuds on both ends. Spuds shall have external straight threads conforming to ANSI B2.1. As far as the specifications apply. Pitch diameters shall be those shown in AWWA Standard C700.

Main case connections for 1-1/2" and 2" meters shall be oval-flanged on both ends.

Flanges shall be faced and drilled and shall be of the oval type. The drilling shall be on a horizontal axis; the number of bolt holes and the diameters of the bolt holes and bolt circle shall be as listed in AWWA Standard C700.

Two oval companion flanges, gaskets, bolts and nuts shall be provided with each meter. Companion flanges shall be faced, drilled, and tapped in conformance with ANSI B2.1. Dimensions shall be those listed in AWWA Standard C700. Companion flanges shall be cast iron.

Registers:

Registers shall be straight-reading, and shall read in cubic feet. The register shall be equipped with a center-sweep test hand with the test circle located on the periphery of the register and graduated in 100 equal parts, with each tenth graduation being numbered. Register construction shall conform to all applicable requirements of AWWA Standard C700.

Register Boxes:

The lid shall be recessed and shall overlap the register box in order to protect the lens. The lens shall be held securely in place.

Intermediate Gear Trains:

Intermediate gear trains may be mounted on the measuring chamber, in the upper main casing, or when not exposed to water, combined with or adjacent to the register gearing.

Oil-enclosed type - Gear trains exposed to water shall be of the oil-enclosed type, shall have a separate housing or form housing with the main casing or measuring chamber, and shall operate in a suitable lubricant.

Magnetic coupled drives - When intermediate gear trains are located in the water compartment of the meter the revolutions of the train output spindles shall be transmitted to the registers by means of magnetic couplings through the meter cases. When the intermediate gear trains are located in the register compartments, the disc nutations shall be transmitted by magnetic couplings.

Measuring Chambers:

The measuring chambers shall be self-contained units, smoothly finished, firmly-seated, and easily removed from the main cases, and shall not be cast as part of the main cases. The measuring chambers shall be so secured in the main cases that the accuracy of the meter will not be affected by any distortion of the cases that might occur when operating with a pressure less than 150 psi.

Water meter specifications (continued)

Discs:

Discs shall be smoothly finished, disc plated, whether flat or conical, shall be either reinforced or equipped with thrust rollers. Discs may be one piece or composed of a plate with two half balls. The disc spindles shall be fastened securely. The disc nutations shall not exceed the quantities listed in AWWA Standard C700.

Strainers:

All meters shall be provided with strainer screens installed in the meter. Strainer screens shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least double that of the main case inlet.

Seal Wire Holes:

Register box screws and inlet and outlet coupling nuts, if furnished, shall be drilled for seal wires. Seal wire holes shall not be less than 3/32 inches in diameter.

Water meter specifications (continued)

COLD-WATER METERS - COMPOUND TYPE

2", 3", 4", and 6" Size

TYPE:

Compound meters shall be as follows or shall be approved-equals **prior** to submitting bid:

2", 3", 4", and 6" Size - **Badger Recordall Models**
 Schlumberger Industries, Inc. /Neptune Trident
 Sensus Technologies, Inc. SRH or SRM Model
 Hersey MCTII Models

Compound meters shall consist of a combination of a main-line meter of the turbine type for measuring high rates of flow 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 with registers shall be contained in the same case.**

Must conform to American Water Works Association (AWWA) standard C702 and the operating and physical characteristics shall conform to those specified within AWWA 702.

MATERIALS:

Cases:

The main case of the meter shall be made of a copper alloy containing not less than 75 percent copper.

Register Box Rings and Lids:

Register box rings and lids shall be made of a cast copper alloy containing not less than 75 percent copper, forged or die cast copper alloy containing not less than 57 percent copper or a suitable synthetic polymer.

Measuring Cages or Chambers:

Measuring cages or chambers shall be made of a copper alloy containing not less than 84 percent copper and suitable amounts of tin, lead, and zinc or of a suitable synthetic polymer.

Measuring Turbines, Pistons and Discs:

Turbines, pistons and discs shall be made of vulcanized hard rubber or a suitable synthetic polymer with specific gravity approximately equal to that of water. They shall have sufficient dimensional Stability to retain operating clearances at working temperatures of up to 80°F and not warp or deform when exposed to operating temperatures of 100°F.

Disc and Turbine Spindles:

Measuring chamber spindles shall be made of phosphor bronze, stainless steel, Monel, ceramic, or suitable synthetic polymer.

Water meter specifications (continued)

Intermediate Gear Trains:

Frames, gears and pinions of intermediate gear trains exposed to water shall be made of copper alloy containing not less than 85 percent copper and suitable amounts of tin, lead, and zinc, or suitable synthetic polymer. When not exposed to water, intermediate gear trains may be made of a suitable synthetic polymer.

External Fasteners:

(casing bolts, studs, nuts, screws, and washers)

External fasteners shall be made of a copper alloy containing not less than 57 percent copper, stainless steel, or steel treated to resist corrosion by a process to be approved by the City. Fasteners for no pressure assemblies may be made of a suitable synthetic polymer.

All external case closures, such as rings, clamps, screws, bolts, cap bolts, nuts and washers shall be designed for easy removal following lengthy service.

Companion Flanges:

Companion flanges shall be made of cast iron.

Automatic Valves:

The valve weights shall be of lead or of a copper alloy containing not less than 75 percent copper, or of a copper alloy shell loaded with lead. The valve and supplemental hinge pins or spindles shall be of a copper alloy containing not less than 75 percent copper, stainless steel, or Monel, and all valve and supplemental weight hinge bearings shall be bushed with hard rubber or bronze or other suitable bushing material. If the valve contains a clapper, it shall be faced with a removable semi-hard seat. Valve seats shall be made of a copper alloy containing not less than 75 percent copper and suitable amounts of tin, lead, and zinc.

GENERAL DESIGN:

Pressure Requirements:

Meters supplied under this specification shall operate without leakage or damage to any part at a working pressure of 150 p.s.i.

Accessibility:

All compound meters shall be designed for easy removal of all interior parts without disturbing the connections to the pipeline.

Registration Accuracy:

Meters shall meet the following requirements for accuracy with water of a temperature of less than 80°F.

Normal Flow Limits - The meter shall not register less than 97 percent and not more than 103 percent of the water actually passed through it at any rate of flow within the normal test flow limits specified in AWWA Standard C702, except in the registration of flows within the changeover from bypass meter to main meter.

Water meter specifications (continued)

Changeover Flow - The beginning of the changeover is when the accuracy of registration falls below 97 percent due to the operation of the automatic valve mechanism, and the end of changeover is when accuracy of registration again reaches 97 percent. The registration of these changeover rates of flow shall not be less than 90 percent and not more than 103 percent. The difference in the rate of flow at the beginning and at the end of the changeover shall not exceed the figures listed in AWWA Standard C702.

Minimum Test Flow - There shall not be less than 95 percent of actual flow recorded when a test is made at the minimum test flow shown in AWWA Standard C702.

Markings:

The size, model, and direction of flow through the meter shall be cast or stamped in the outer case of all meters.

Register Boxes - The name of the manufacturer shall be permanently impressed on the lid of the register box. The serial number of the meter shall be imprinted on the lid.

DETAIL DESIGN:

Main Case:

All meters shall have an outer case with separate, removable measuring chambers. Cases shall not be repaired in any manner. The inlet and outlet shall have a common axis. Connection flanges shall be parallel.

External Case Screw, Bolts, Nuts and Washers:

All external screws, bolts, cap bolts, nuts and washers shall be designed for easy removal after lengthy service.

Main Case Connections:

All main case connections shall be flanged. The bolt holes shall comply with AWWA Standard C702.

2-inch Meters - The flanges for 2-inch meters shall be oval. The drilling of oval flanges shall be on the horizontal axis.

Meters larger than 2-inch - The flanges for 3-inch, 4-inch, and 6-inch meters shall be of the round type, faced and drilled, and shall conform to ANSI B16.1 for bronze pipe flange, Class 125.

Companion Flanges:

Companion flanges of the same size and type as the meter flanges shall be provided, and gaskets, nuts, and bolts shall be provided. Round companion flanges shall be faced, drilled, and tapped in accordance with ANSI B2.1 and shall conform to ANSI B16.1 for cast-iron pipe flange, Class 125. All companion flanges shall comply with AWWA Standard C702, for drilling, diameter, and thickness specifications.

Water meter specifications (continued)

Tapped Bosses:

All meters shall be provided with tapped bosses in the top of the case near the outlet for field testing purposes.

Registers:

Registers shall be straight reading and shall read in cubic feet (cu.ft.). Except for those instances when test conditions require the use of a different register the register that is furnished with the meter shall be the same register that was on the meter when it was tested for accuracy.

The register lock and side gears shall be fastened securely to the number wheel discs and hubs. The tumbler pins shall mesh accurately at the turnover points with the lock and side gears of the adjacent number wheels. Both main and pinion shafts shall be so secured in the register frame and/or register plates that they cannot get out of position. The pinion shaft shall be so designed that there is no possibility of its bending and allowing the pinion to skip the turnover point. The numerals on the number wheels shall not be less than 3/16 in. in height and should be readable at a 45-degree angle from vertical.

Registers that are hermetically sealed shall have gears and pinion which shall run free on fixed shafts or be fixed on shafts that run free in the register frame and/or register plates and shall be constructed so that they cannot be unmeshed.

The registers shall have a center-sweep test hand with a test circle located on the periphery of the register and graduated in 100-equal parts, each tenth graduation numbered. The maximum quantity indicated by a single revolution of the test hand and the minimum capacity of the register shall be as listed in AWWA Standard C702.

The maximum indication on the test circle and the minimum register capacity of the bypass unit shall be in accordance with the approved AWWA Standard for the type of meter used as the bypass unit.

Coordinator Registers - The meter may be equipped with a coordinator so that the readings of both sections can record on a single register. The register construction shall conform to previously mentioned requirements, and the maximum quantity indicated by a single revolution of the test hand and the minimum capacity of the register shall conform to AWWA Standard C702.

Register Boxes:

The lid shall be recessed and shall overlap the register box to protect the lens.

Intermediate Gear Trains:

Intermediate gear trains may be mounted on the measuring chamber or cage or in the main casings. When not exposed to water, they may also be combined with or adjacent to the register gearing. Gear trains exposed to water shall be of the oil-enclosed type, shall have separate housings or shall form housings with the main casings or measuring chambers, and shall operate in a suitable lubricant. Gear trains made of noncorrosive metals or synthetic polymers may be exposed to water.

Water meter specifications (continued)

Measuring Chambers or Cages:

The main-line section chambers or cages shall be self-contained units firmly seated and easily detached and removed from the main case. Chambers or cages with turbines that have revolving spindles shall have removable bearings for such spindles. Chambers or cages with stationary spindles on which the turbines revolve shall provide rigid centrally located fastenings for the spindles. The spindles shall be removable. The main-line section chamber or cages shall be interchangeable in all meters of the same size, make, and model.

Bypass Chamber - The bypass chamber shall be of a type covered by an approved AWWA Standard. The chamber shall be a self-contained unit, firmly seated and easily removed from the case, and shall not be cast as part of the outer case. The chamber shall be secured in position in the outer case so that any slight distortion of the case which might occur under 150 p.s.i. pressure will not affect the accuracy of the meter.

Measuring Turbines and Discs:

Measuring turbines that have revolving spindles shall rotate on spindles supported by bushings or replaceable bearings. Turbines that rotate on stationary spindles also shall have bushings or replaceable bearings. The plates of disc pistons whether flat or conical, shall have metal reinforcements or shall be equipped with thrust rollers.

Magnetic Coupled Drives:

When intermediate gear trains are located in the water compartment of the main or bypass section of the meter, the revolutions of the train output spindles shall be transmitted to the registers by means of magnetic couplings through the meter case. When intermediate gear trains are located in the register compartments, the revolutions shall be transmitted by magnetic coupling.

Automatic Valves:

The automatic valve shall be of a type suitable for such purpose. It shall close by force. The weight of the valve and any supplemental force imposed on it shall offer sufficient resistance to the incoming water to divert all small rates of flow through the bypass meter until such time as the rate of flow through the meter is great enough to ensure efficient operation of the main measuring section. Valve hinge pins or spindles shall be bushed. Valve sets shall be of bronze or other corrosion resistant material, shall have a satisfactory width of face, and shall be held firmly in place. A clapper or swing type valve shall be provided with a removable semi-hard seat.

Bypass Meter:

The physical and operating characteristics and dimensions of the bypass meter shall be in accordance with the approved AWWA standard for the type of meter used as the by-pass.

Strainers:

Strainers, if provided, shall be rigid, shall be easily removed and shall have an effective straining area at least double that of the water main-case inlet.

Seal Wire Holes:

Register box screws shall be drilled for seal wires. Seal wire holes shall be not less than 3/32 inch in diameter.

Water meter specifications (continued)

COLD-WATER METER - TURBINE TYPE

2" Size

TYPE:

Turbine meters shall be as follows or shall be approved-equals **prior** to submitting bid:

2" Size - **Badger Recordall II Models**
 Schlumberger Industries, Inc. /Neptune Trident Turbine
 Sensus Technologies, Inc. Series "W" Model
 Hersey MHR Model
 Kent Model T-3000

Turbine meters furnished hereunder shall be Class II, in-line, horizontal-axis, high velocity type and shall fully conform to the requirements of AWWA C701, except as otherwise specified herein. The 2" turbine meter shall have oval flanged ends and shall be supplied with one companion flange, gaskets, with bolts and nuts as specified herein.

MATERIALS:

Cases:

All turbine main cases shall be bronze. No exceptions will be allowed.

Strainers:

All turbine meters, if furnished with strainers shall have top access. Cases for 2" strainer shall be bronze. Strainer plates for all sizes shall be 18-8 stainless steel or bronze.

Register Box Rings and Lids:

Register box rings and lids shall be made of a cast copper alloy containing not less than 75 percent copper, forged or die cast copper alloy containing not less than 57 percent copper or a suitable synthetic polymer.

Measuring Cages or Chambers:

Measuring cages or chambers shall be made of a copper alloy containing not less than 84 percent copper and suitable amounts of tin, lead, and zinc or of a suitable synthetic polymer.

Measuring Turbines, Pistons and Discs:

Turbines, pistons and discs shall be made of vulcanized hard rubber or a suitable synthetic polymer with specific gravity approximately equal to that of water. They shall have sufficient dimensional stability to retain operating clearances at working temperatures of up to 80°F and not warp or deform when exposed to operating temperatures of 100°F.

Disc and Turbine Spindles:

Measuring chamber spindles shall be made of phosphor bronze, stainless steel, Monel, ceramic, or suitable synthetic polymer.

Water meter specifications (continued)

Intermediate Gear Trains:

Frames, gears and pinions of intermediate gear trains exposed to water shall be made of copper alloy containing not less than 85 percent copper and suitable amounts of tin, lead, and zinc, or suitable synthetic polymer. When not exposed to water, intermediate gear trains may be made of a suitable synthetic polymer.

External Fasteners:

(casing bolts, studs, nuts, screws, and washers)

External fasteners shall be made of a copper alloy containing not less than 57 percent copper, stainless steel, or steel treated to resist corrosion by a process to be approved by the City. Fasteners for no pressure assemblies may be made of a suitable synthetic polymer.

All external case closures, such as rings, clamps, screws, bolts, cap bolts, nuts and washers shall be designed for easy removal following lengthy service.

Companion Flanges:

Companion flanges shall be made of cast iron.

GENERAL DESIGN:

Pressure Requirements:

Meters supplied under this specification shall operate without leakage or damage to any part at a working pressure of 150 p.s.i. Pressure drop through turbine meters and strainers, when operated within specified normal flow limits, shall not exceed the characteristics outlined in AWWA C701.

Accessibility:

All turbine meters shall be designed for easy removal of all interior parts without disturbing the connections to the pipeline. Turbine meters shall have readily accessible change gears, adjustable vanes or other approved means to adjust meter registration. Such adjustment feature shall be an integral part of the removable, rotor/register assembly and not of the main or bottom case of the meter.

Registration Accuracy:

Meters shall meet the following requirements for accuracy with water of a temperature of less than 80°F.

Normal Flow Limits - The meter shall not register less than 97 percent and not more than 103 percent of the water actually passed through it at any rate of flow within the normal test flow limits specified in AWWA Standard C702, except in the registration of flows within the changeover from bypass meter to main meter.

Turbine meters shall be designed to allow prolonged operation at or near the upper limit of the specified normal flow range without premature degradation of registration accuracy or other evidence of undue wear. Meters shall also be capable of accepting sudden increases in flow at high rates of flow without decoupling of the register.

Water meter specifications (continued)

**COLD-WATER METER STRAINERS
2", 3", 4" and 6" Size**

General: All strainers furnished shall have top access. Cases for 2", 3", 4" and 6" strainers shall be bronze. Strainer plates for all sizes shall be 18-8 stainless steel or bronze.

All strainers shall conform to AWWA Standard C702.