

STANDARD SPECIFICATIONS

SECTION 15150

METERS

PART 1 - GENERAL

A. Description

This section describes the purchase, materials, installation and testing of meter assemblies.

B. Related Work Specified Elsewhere

All related work specified elsewhere, or in other codes or standards, will be as last revised, unless a specific date of issuance is called out in opposition to later revision date(s).

Other sections of the technical specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

- 1. Structure Excavation: 02200
- 2. Concrete: 03300
- 3. Precast Concrete Vaults: 03462
- 4. Painting and Coating: 09900
- 5. Ductile-Iron Pipe and Fittings: 15056
- 6. Copper, Brass, and Bronze Pipe, Fittings, and Appurtenances: 15057
- 7. Manual Valves: 15100
- 8. Flexible Pipe Couplings and Expansion Joints 15162

C. Approved Manufacturers

- 1. Displacement Type - 5/8 inch through 2-inch
Invensys SR-I
- 2. Turbine Meters
Invensys Series "W"
- 3. Compound Meters
Invensys SRH
- 4. Propeller Meters
Invensys

5. Fire Service Meter Assembly
Invensys Fireline
6. V-Cone Flow Meters
McCrometer V-cone flow meter

D. Residential Meters

1. The developer shall deposit an amount with the District for furnishing meters and meter boxes. The unit price of the installation will be established by the District per the development Agreement.
2. The developer shall expose and set to grade all angle meter stops prior to requesting meters.
3. The developer is responsible for the installation of the meter box, angle meter stop, meter and customer service valve.
4. Prior to occupancy, the District will, upon finding the installation to be acceptable, record all meter account information and padlock the curb stop in the off position. The developer will subsequently be relieved of any additional responsibility for consumption or service charges for this service.
5. Subsequent applications for permanent service shall be made in accordance with the District's Rules and Regulations.

E. By-Pass Line

1. A by-pass line shall be installed on all meter assemblies 3-inch and larger. A by-pass line is not required on irrigation services, or as determined by the District.
2. A lockable valve shall be installed in all by-pass lines.
3. A by-pass line may be required on smaller installations which require continuous service.

PART 2 - MATERIALS

A. General

1. All meters shall be new and of current manufacture design.
2. All parts of the meters of the same size and model shall be interchangeable.

B. Registers

1. The registers on all meters shall have straight reading dials with full sweep test circles.
2. All registers are to be calibrated to read in cubic feet.
3. All registers are to be direct read. This may require the stamping of a zero or zeros on the register dial face. The last two digits including the zero or zeros stamped on the register

dial face shall be easily distinguishable from the balance of the digits either by contrast of white numbers on black or red numbers on white.

4. Registers for positive displacement, compound, and turbine meters are to be hermetically roll sealed.
5. Register gears shall be self-lubricating molded plastic unless stated otherwise. Register gears for propeller meters may be bronze.
6. Registers for positive displacement and turbine meters shall not have replaceable change gears.
7. Registers shall be driven by a magnetic coupling.
8. All register lenses shall be tempered glass.
9. All registers shall be provided with low flow detectors.
10. All registers shall be oriented to read from the inlet side of the meter.
11. The register must be attached to the meter case by a bayonet attachment. The register assembly shall be able to mount any of four positions. On positive displacement meters the standard mount position shall read from the meter inlet side.

C. Remote Reading Device

1. Meter shall be equipped with touch-read registers manufactured by Invensys when designated by the District representative.
2. All meters 3-inch and larger and double check detector check meters shall be supplied with a remote read meter transceiver unit (MXU). The MXU is to be delivered to the District inspector.

D. Stainless Steel Hardware

All bolts, nuts, capscrews, studs, and washers shall be Type 316 stainless steel ASTM A 193 B8M for bolts, and ASTM A 194 8M for nuts.

E. Displacement Type Meters (5/8 inch through 2 inch)

1. Meters shall conform to the material and performance requirements of AWWA C700, as most recently revised, and as specified herein.
2. The manufacturer shall furnish certified results for each meter showing that it has been tested for accuracy of registration and that it complies with accuracy and capacity requirements of AWWA C700 when tested in accordance with AWWA Manual M6.
3. All meters body components resisting pressure shall be bronze.
4. All register boxes and covers shall be synthetic polymer or bronze.
5. Casing bolts shall be stainless steel or bronze.

- 6. All internal hardware shall be stainless steel.
- 7. 5/8-inch through 1-inch meters shall have external straight threads. 1½-inch and 2-inch meters shall have flanges on ends.
- 8. The face to face length and maximum profile height of the meter shall be as described below:

Meter Size (inches)	Face-to-Face Dimension (inches)	Maximum Profile Height Centerline Inlet to Register Cover (inches)
5/8	7-1/2	3-1/4
3/4	9-1/2	3-1/4
1	10-3/4	3-1/4
1-1/2	13	4-1/4
2	17	5

- 9. All meters shall have plastic or stainless steel internal strainers.
- 10. All registers and register boxes shall be secured to the main casing by acceptable tamper-proof means. Safety wiring of standard bolts and screws is NOT considered an acceptable method of tamper-proofing.
- 11. The serial number of each meter shall be imprinted on the register box cover, and the main case.
- 12. Register shall be removable without reducing pressure or removing the main case from the installation.
- 13. All positive displacement meters shall be supplied with the following warranty, which shall not be prorated under any conditions:
 - a. All meters shall be guaranteed to maintain new-meter accuracy ($\pm 1\frac{1}{2}\%$) for five years.
 - b. All measuring chambers and disks or pistons shall be guaranteed against malfunction for fifteen years.
 - c. All registers shall be guaranteed for twenty-five years.

F. Turbine Meters (1½-inch and larger)

- 1. All meters shall conform with AWWA C701 Class II and the requirements specified herein.
- 2. The manufacturer shall furnish certified test results for each meter showing that it has been tested for accuracy of registration and that it complies with accuracy and capacity requirements of AWWA C701 when tested in accordance with AWWA Manual M6.
- 3. Turbine meters shall have all bronze main cases.

4. Straightening vanes shall be provided in the main case of all meters.
5. A calibration adjusting vane located in the measuring chamber shall be provided on all meters.
6. All rotors shall be thermoplastic with graphite bearings (PTFE) rotating on a stainless steel or tungsten carbide shaft.
7. All motion shall be transmitted from the rotor to the register through a magnetic coupling.
8. All register boxes and covers shall be bronze.
9. All registers and register boxes shall be secured to the measuring chamber by acceptable tamper-proof means. Safety wiring of standard bolts and screws is NOT considered an acceptable method of tamper-proofing.
10. All turbine meters shall be equipped with strainers. The strainer body and cover shall be cast bronze for meters 2-inch through 6-inch. Ductile iron will be permitted only on 8-inch and larger or fire service strainers. All ductile iron strainers shall be epoxy lined in accordance with Section 09900. All strainers shall be furnished with bronze or stainless steel screens with an effective open area at least double the area of the meter. On metered fire service installations, a U.L. approved strainer with an effective open area at least 4 times the equivalent open area of the meter will be required.
11. All measuring chamber, strainer cover, and flange bolts shall be Type 316 stainless steel.
12. The serial number of each meter shall be imprinted on the register cover, and the main case.
13. All meter registers shall be provided with a remote touchread devices.

G. Compound Meters (3-inch and larger)

1. All meters shall conform with AWWA C702 and the requirements specified herein.
2. The manufacturer shall furnish certified test results for each meter showing that it has been tested for accuracy of registration and that it complies with accuracy and capacity requirements of AWWA C702 when tested in accordance with AWWA Manual M6.
3. Compound meters shall have all bronze main cases.
4. All compound meters shall have flanged connections.
5. A test plug shall be provided in the outlet side of the main case of all meters.
6. The measuring chamber shall be capable of operating within the specified AWWA accuracy limits without recalibration when transferred from one main case to another.
7. A calibration adjusting vane located in the measuring chamber shall be provided on all meters.
8. All rotors shall be thermoplastic with graphite bearings rotating on a stainless steel shaft.

9. All motion shall be transmitted from the rotor to the register through a magnetic coupling. Worm gears will NOT be permitted.
10. All register boxes and covers shall be bronze, or synthetic polymer.
11. All registers and register boxes shall be secured to the measuring chamber by acceptable tamper-proof means. Safety wiring of standard bolts and screws is NOT considered an acceptable method of tamper-proofing.
12. All compound meters shall be equipped with strainers. The strainer body and cover shall be bronze for 2-inch through 6-inch meters. Ductile iron will be permitted only on 10-inch and larger or fire service strainers. All ductile iron strainers shall be epoxy lined in accordance with Section 09900. All strainers shall be furnished with bronze or stainless steel screens with an effective open area at least double the area of the meter.
13. All measuring chamber, strainer cover, and flange bolts shall be Type 316 stainless steel.
14. The serial number of each meter shall be imprinted on the register cover, and main case.
15. All meter registers shall be provided with a remote touchread devices.

H. Fire Line Meter Assembly

1. A fire line meter assembly may be required for residential structures and commercial and industrial installations where separate fire service installations are not provided.
2. Fire line meter assemblies shall be furnished as complete units by the manufacturer. Each fire line meter assembly shall consist of a U.L. approved strainer with a stainless steel strainer basket, a turbine meter sized for fire flow, a positive displacement or turbine meter sized for maximum demand without fire flow, positive displacement meter piping, lockable ball valves to isolate the positive displacement meter, a check valve downstream of the positive displacement meter, and an internally weighted or spring loaded check valve adjusted to open prior to exceeding the maximum flow range of the positive displacement meter. The positive displacement meter piping shall extend from the outlet of the strainer to the downstream side of the swing check valve.
3. Each fire line meter assembly shall be constructed of components conforming to the appropriate sections of these specifications.
4. Cast iron or steel components shall be epoxy lined and coated per Section 09900.
5. Each fire line meter assembly shall conform the AWWA C703 and shall be U.L listed, and shall be F.M. approved for fire service use.
6. All meter registers shall be provided with a remote touchread devices.

I. Propeller Meters

1. All propeller meters shall conform with AWWA C704 and the requirements specified herein.
2. The main casing may be steel or cast-iron and shall be epoxy lined and coated.

3. The main casing may be flanged or plain end as specified by the Director of Engineering.
4. Meter head shall be mounted on a flanged connection for easy removal of all interior parts from the pipe tee without disturbing the connections to the pipeline.
5. The drive mechanism shall be by means of stainless steel gears and shafting or flexible cable drives.
6. All meters shall be polyethylene propellers.
7. Bronze gear boxes on the propeller drive shafts are required.
8. Each meter tube shall be equipped with straightening vanes mounted immediately preceding the propeller.

J. Totalizer - Transmitter

1. The totalizer - transmitter shall be furnished with all necessary mounting hardware for operation from the meter.
2. The transmitter shall have integrally mounted electronic circuitry to convert to both a true 2-wire 4-20 Ma DC output linear to flow rate and a true 2-wire scaled pulse.
 - a. The 4-20 Ma DC output shall operate from an external regulated 18-30 VDC power supply with load capacity of 575 ohms at 28 VDC. The accuracy of the 4-20 Ma output shall be better than +/- 0/5% of scale.
 - b. The pulse output shall operate from an external regulated 10-30 VDC power supply which can be either the 4-20 Ma DC power supply or a separate power supply. The pulse circuit voltage drop across the transmitter shall be 3 VDC or less. Each pulse shall represent the volume of the least significant totalizer digit.

K. Precast Vaults

Precast meter vaults and boxes shall conform with Section 03462 and the standard drawings.

L. Copper, Brass, and Bronze Pipe, Fittings, and Appurtenances

All service connection and by-pass piping shall conform with Section 15057.

M. Ductile-Iron Pipe and Fittings

All piping for meter assemblies 3-inch and larger shall conform with Section 15056.

N. Manual Valves

1. All valves shall conform with Section 15100.
2. All valves on by-pass lines shall be lockable in the closed position. On 3-inch and larger by-pass lines, resilient seat gate valves with hand wheels and a chain and lock are permitted.

O. V-Cone Meter

1. Meter:

The meter shall be a V-cone differential pressure producing flow meter. It shall have a primary flow element of constant area installed in the pipe the meter measures. The primary element, and support members shall be constructed of 316 stainless steel, and shall be epoxy coated. The primary elements with rotating or moving parts in the flow stream are not acceptable.

The meter shall have an accuracy of 0.5% of the actual flow within the designated flow range. The meter shall not require more than a total of seven (7) pipe diameters of straight run included in the length of the meter.

The meter tube shall be constructed of carbon steel, schedule 40 pipe, with ANSI 150-pound flanges. The tube shall be epoxy lined and coated with 15 mils of Keysite 740.

The support member shall be capable of maintaining the cone's orientation in flows up to 20 foot per second. The upstream pressure taps shall be 1/2 inch female NPT, and downstream pressure taps shall sense pressure at the centerline of the flow stream.

2. Flow Transmitters:

Flow transmitters shall have diaphragms and drain valves made of 316 stainless steel, with bolts and flanges of Cadmium Plated Carbon Steel, housed in NEMA 4 enclosures. The fill fluid shall be silicone oil.

The accuracy shall be within 0.25% of calibrated span for a range of 20% to 100% of flow including the combined effects of linearity, hysteresis and repeatability.

The flow transmitter shall have a range as specified by the district and shall provide a 4-20 MA DC output with adjustable damping proportional to flow rate.

The flow transmitters shall be Rosemount Smart family Model 1151. Transmitter shall be supplied with 3-valve manifolds No. 01151-150-0001. Transmitter shall be adjusted and calibrated by the meter manufacturer.

V-cone meter and transmitter shall be supplied as a unit. The unit shall be factory tested and calibrated. Certified test results shall be furnished with each assembly.

PART 3 - EXECUTION

A. Meter Installations

1. All residential meters shall be installed by the contractor per MNWD standard drawings W-1, W-2 or W-3.
2. All 3-inch and larger meter installations shall conform with MNWD standard drawings W-4, or W-5.

B. Excavation and Backfill

Excavation and backfill for the meter installation shall be in accordance with Section 02200.

C. Service Piping

1. All piping for service lines and by-pass lines up to 2-inch shall be installed in conformance with Section 15057.
2. The piping for all service installations 3-inch and larger shall be in accordance with Section 15056 and the applicable standard drawing.

D. Test Tap

On services 3 inches and larger, a 2-inch service saddle or welded coupling and corporation stop shall be installed on the spool downstream of the meter. The tap shall be located a minimum of three (3) pipe diameters downstream of the meter. On propeller meter installations, the location of the test tap will be determined by the District representative.

E. Meter Vault

All precast concrete meter vaults shall be installed in accordance with Section 03462 and the MNWD standard drawings W-1 through W-5.

F. Concrete Work

All thrust blocks, foundations, and supports shall be of the sizes shown in the applicable standard drawings and conform with Section 03300.

G. Valves

All valves installed shall conform with the Section 15100.

H. Painting and Coating

1. All exposed and buried piping shall be painted or coated in accordance with Section 09900.
2. The meter reading lids on all recycled water services shall be painted in accordance with Section 09900.

I. Testing

1. All meter services shall be hydrostatically pressure tested during the testing of pipeline in accordance with Section 15042.

END OF SECTION