SECTION 02425
WATER METERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS
- A. Water meters, sub-meters, irrigation meters and fire service meters.

1.2 MEASUREMENT AND PAYMENT
- A. Unit Prices:
  1. Measurement for water meters is on a unit price basis for installation of each meter type and size.
  2. Payment includes vault, piping and appurtenances necessary for complete installation of meter.
  3. Measurement for relocating and reinstalling meter with new box is on a unit price basis for each meter relocated and reinstalled.
  4. No separate payment for adjustment of meter or meter box unless otherwise shown in the Drawings.
  5. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
  1. If Contract is Stipulated Price Contract, payment for work is in this Section is included in Total Stipulated Price.

1.3 REFERENCES
- A. ASME – American Society of Mechanical Engineers.
  1. ASME B16.1 – Cast-Iron Pipe Flanges and Flanged Fittings.
- B. AWWA – American Water Works Association.
  1. AWWA C510 – Standard for Double Check Valve Backflow – Prevention Assembly.
  2. AWWA C700 – Standard for Cold-Water Meters – Displacement Type.
  3. AWWA C701 – Standard for Cold-Water Meters – Turbine Type for Customer Service.
  4. AWWA C702 – Standard for Cold-Water Meters – Compound Type.
  5. AWWA C703 – Standard for Cold-Water Meters – Fire Service Type.
  6. AWWA Manual M6 – Water Meters – Selection, Installation, Testing and Maintenance.
- C. CFTS – City of Friendswood Technical Specifications.

1.4 SUBMITTALS
- A. Conform to requirements of Section 01330 – Submittal Procedures.
- B. Submit written certification of calibration and test results.
- C. Submit manufacturer's certification that meters meet applicable

requirements of this Specification Section.

D. Submit accuracy registration test certification from manufacturer for each three inch (3 In) through ten inch (10 In) diameter meter.

1.5 QUALITY CONTROL

A. Submit manufacturer's warranty against defects in materials and workmanship for one year (1 Yr) from date of Substantial Completion.

B. Provide vendor's unconditional guarantee that performance of each meter meets applicable AWWA standards and AWWA Manual M6 as follows:

1. Displacement type: Ten years (10 Yrs) from installation or register registration specified in TABLE 4.1 – GALLON REGISTRATION in this Section, whichever comes first.
2. Turbine type: One year (1 Yr) from date of installation.
3. Compound type: One year (1 Yr) from date of installation.
4. Fire service type: One year (1 Yr) from date of installation.
5. Operations of hermetically sealed register, one inch (1 In) to two inch (2 In) diameter, shall be unconditionally guaranteed for fifteen years (15 Yrs).

C. Provide manufacturer's unconditional guarantee for each sealed register against leakage, fogging, discoloration and stoppage for fifteen years (15 Yrs) from date of installation.

D. Vendor shall replace meters that become defective within guarantee period with meters that comply with this Technical Specification. The City shall return defective meters to vendor at vendor’s expense. Meters repaired or replaced under this guarantee must meet accuracy limits for new meters upon receipt and accuracy limits for remaining period of guarantee for the original meter.

1.6 EASEMENT REQUIREMENTS

A. Install water meters and shut-off valves (stop boxes) in the City right-of-way line when possible.

B. When not possible to install water meters and shut-off valves (stop boxes) in the right-of-way, then install in utility easement, if available.

PART II: PRODUCTS

2.1 GENERAL

A. Provide meters of size as indicated on the Drawings, unless otherwise indicated.

B. Meters shall be Neptune. NO EXCEPTIONS.

C. Provide bolted split casings. Main casings of meters and external fasteners: Copper alloy with minimum seventy-five percent (75%) copper for one inch (1 In) to two inches (2 In), bronze or cast iron, hot-dipped galvanized or epoxy coating for three inches (3 In) and larger.

D. Straightening Vanes: Non-corrosive material compatible with case

material.

E. Intermediate gear train shall not come into contact with water and shall operate in suitable lubricant.

F. Registers:
   1. Lens: impact resistant.
   2. Register box: tamper resistant by means of tamper screw or plug.
   3. Register capacity of meters:
      a. One inch (1 In) meters: nine million nine hundred ninety-nine thousand nine hundred and ninety gallons (9999990 Gal). There shall be six (6) mobile and one (1) stationary digits. The last digit shall be stationary, white on black background. The tens and hundreds digits shall be mobile and white on a black background. The first four digits (millions to thousands) shall be black on a white background.
      b. Two inch (2 In) meters and larger: ninety-nine million nine hundred ninety-nine thousand nine hundred gallons (99999900 Gal). There shall be six (6) mobile and two (2) stationary digits. The last two digits shall be stationary, white on black background. The hundreds digit shall be mobile and white on a black background. The first four digits (tens of millions to thousands) shall be black on a white background.
   4. If used, Automatic Meter Reading (AMR), shall adhere to the following: provides pulse, contact closure, piezo switch or encoder generated output signal, compatible with the City's radio and telephone AMR systems. Provide minimum twelve foot (12 ft) wire when permanently connected to register. Register box: tamper resistant by means of tamper screw or plug: Register: permanently sealed, straight-reading, center-sweep test hand, magnetic driven, U.S. gallons.

G. Connections: one inch (1 In: threads at each end; one and one-half inches (1-1/2 In) to two inches (2 In): two (2) bolt oval flanges each end; three inches (3 In) and larger: flange at each end.
   1. Connections three inches (3 In) or larger shall be in a vault and shall have a by-pass.

H. Stamp manufacturer's meter serial number on outer case. Stamp manufacturer's meter serial number on outside of register lid when provided. Manufacturer's serial numbers shall be individual and not duplicated.

I. Meters: Provide approved meters equipped with AMR type register to connect to the City of Friendswood's AMR system, when required.

J. Manufacturing quality control shall permit successful interchangeability from one (1) meter to another of same size including registers, measuring chambers and units, discs or pistons as units, change gears, bolts, nuts and washers without affecting accuracy of new meter.

K. For water meter vaults provide:
   1. One-quarter inch (1/4 In) steel or aluminum with stainless steel hinge pins. Door shall open to ninety degrees (90°) and automatically lock in that position.
   2. Provide approved meter vault covers.

2.2 METER APPLICATIONS
A. Sizes one inch (1 In) to two inch (2 In) Meters: Displacement type [except for constant flow where two inch (2 In) turbine may apply].
B. Sizes three inch (3 In) and above Meters:
   1. Turbines:
      a. Processing plants
      b. Manufacturing facilities
      c. Lawn sprinkler systems
      d. Effluent water in treatment plants
      e. Booster (pump) stations
      f. Level controlled tank filling operations
      g. Fire hydrants (transients)
      h. Inter-systems sale or transfer
      i. Sewer credit/sub-meter
   2. Compounds:
      a. Multi-family dwellings
      b. Motels and hotels
      c. Hospitals
      d. Schools
      e. Restaurants
      f. Office buildings
      g. Dormitories, nursing homes, department stores, shopping malls and other commercial establishments

      Note: Provide fire service type meter for sizes larger than six inches (6 In).
   3. Fire Service Type: For designated fire protection lines. Provide proportional or compound type fire service meter assembly (AWWA C703) when customer elects to use combination of potable and fire protection services in lieu of separate domestic meters and fire services.

2.3 MATERIALS
A. Cold-Water Meters:
   1. Displacement Type: AWWA C700; sizes one inch (1 In) up to and including two inches (2 In); oscillating disc or piston of magnetic drive type; bolted split-case design, with either being removable.
   2. Turbine Type: AWWA C701; Class II; sizes three inches (3 In) through ten inches (10 In); flanged; straight-through measuring chamber; rotor construction: polypropylene or similar non-rubber material with specific gravity of approximately 1.0,

equipped with near frictionless replaceable bearings in turbine working against rotor shaft positioned thrust bearing. Transient/Fire Hydrant Meter Inlet: Female fitting for attachment to hose nozzle with National Standard Fire hose thread. Outlet: two inch (2 In) nipple with National Pipe Thread. Include restriction plate to limit flow through meter to four hundred gallons per minute (400 gpm) at sixty-five pounds per square inch (65 psi).

3. Compound Type: AWWA C702; sizes two inches (2 In) through six inches (6 In). Measuring chambers: For use in continuous operation; separate units of copper alloy [minimum eighty-four percent (84%) copper] or approved polymer material, inert in corrosive potable water; with centering device for proper positioning. Measuring pistons: Non-pilot type with division plates of rubber covering vulcanized to stainless steel or other approved material of sufficient thickness to provide minimum piston oscillation noise. Measuring discs: Flat or conical type, one piece, mounted on monel or 316 stainless steel spindle. Measuring chamber strainer screen area: Twice area of main case inlet.
4. Fire-Service Type: sizes four inches (4 In) through ten inches (10 In); turbine-type, compound type, proportional type; AWWA C703, with separate check valve conforming to AWWA C510. Determine size of fire meter by adding fire flow and domestic flow.

2.4 STRAINERS

A. Displacement Potable Water Meters one inch (1 In) through two inches (2 In): Self-straining by means of annular space between measuring chamber and external case or with strainer screens installed in meter. Provide rigid screens which fit snugly, are easy to remove, with effective straining area at least double that of main case inlet.
B. Potable Water Meters two inch (2 In) diameter and larger: Equip with separate external strainer with bronze body for diameters less than eight inches (8 In). Eight inch (8 In) diameter and larger may be cast iron, hot-dipped galvanized or epoxy coating. Strainers: Bolted to inlet side of meter, detachable from meter, easily removable lid. Strainer screen: Made of rounded cast bronze, stainless steel wire, having nominal screen size of three and one half (3-1/2) mesh-per-inch (U.S. Series) not less than forty-five percent (45%) clear area.
C. Provide separate approved external strainers (when required by meter manufacturer) approved for use in fire service metered connections by Underwriters Laboratories. Bodies: Cast iron or copper alloy. Ends: Flanged in accordance with ASME B16.1, Class 125. Provide stainless steel basket. Strainers shall be detachable from meter.

2.5 CONNECTIONS AND FITTINGS

A. Provide pipe for connections in accordance with Section 02215 – Ductile Iron Pipe (DIP) and Fittings and Section 02235 – Polyvinyl Chloride (PVC) Pipe. Use restrained joints and flanged joints only.
B. Fittings:
    1. For meters two inches (2 In) and smaller: Same type of fittings as Outlet End fittings for Curb Stop in accordance with Section 02430 – Water Tap and Service Line Installation.
    2. For meters three inches (3 In) and larger: Restrained ductile iron; push-on bell joints or mechanical joint fittings between water line and meter vault; Class 125 flanged inside meter vaults; cement mortar lined and sealed.

2.6 LAYING LENGTHS
A. Minimum laying lengths for meter and standard strainer shall be as shown on the Drawings.

PART III: EXECUTION

3.1 TAPPING AND METER SERVICE INSTALLATION
A. Refer to Section 02420 – Tapping Sleeves and Valves for tapping requirements.
B. Meter Service Line:
    1. Use pipe and fittings conforming to requirements of Section 02215 – Ductile Iron Pipe (DIP) and Fittings or Section 02235 – Polyvinyl Chloride (PVC) Pipe.
    2. Limit pulling and deflecting of joints to limits recommended by manufacturer.
    3. Make vertical adjustments with offset bends where room shall permit. Minimize number of bends.
    4. Provide minimum of ten (10) pipe diameters of straight pipe length upstream and downstream of meter vault.

3.2 METER FITTING HOOKUP
A. Support meter piping and meter, level and plumb, during installation. Support meters three inches (3 In) and larger with concrete at minimum of two (2) locations.
B. Use round flanged fittings inside meter box or vault except for mechanical joint to flange adapter. Provide full-face one-eighth inch (1/8 In) black neoprene or red rubber gasket material on flanged joints. Provide bolts and nuts made from approved corrosion-resistant material.
C. Tighten bolts in proper sequence and to correct torque.
D. Visually check for leaks under normal operating pressure following installation. Repair or replace leaking components.

3.3 METER BOX AND VAULT INSTALLATION
A. Conform to requirements of Section 02440 – Valve Boxes, Meter Boxes and Meter Vaults.

B. Perform adjustment to existing meter in accordance with Section 02440 – Valve Boxes, Meter Boxes and Meter Vaults.

C. Meters three inches (3 In) and larger shall be installed in a meter vault conforming to requirements of Section 02440 – Valves Boxes, Meter Boxes and Meter Vaults, and shall have by-pass installed.

3.4 TESTING

A. Accuracy registration tests shall be conducted in accordance with latest revision of AWWA standard for type and size of meter.

1. Tests shall be run by manufacturer prior to shipping to the City of Friendswood. Meters may be tested at random at the City's discretion.
2. Accuracy of displacement meters during guarantee period shall be as follows:
    a. Initial period: Eighteen months (18 Mos) from date of shipment or twelve months (12 Mos) from date of installation: ninety-eight and one-half percent (98.5%) to one hundred one and one-half percent (101.5%) at standard and minimum flow rates; ninety-eight percent (98%) to one hundred and one percent (101%) at low flow rates.
    b. Second period: AWWA new meter accuracy tested as specified in TABLE 4.2 – METER TEST FLOW RATE – 2ND PERIOD in this Section.
    c. Third period: AWWA new meter accuracy for standard flow rates and AWWA repair meter accuracy for minimum flow rate tested in TABLE 4.3 – METER TEST FLOW RATE – 3RD PERIOD.
3. Minimal acceptable accuracy in percent of low flow registration for turbine meters shall be as specified in TABLE 4.4 – MINIMAL ACCEPTABLE ACCURACY FOR METERS in this Section.

PART IV: TABLES

4.1 – GALLON REGISTRATION

Size (inch)	Registration (million gallons)
5/8, 3/4	1.5
1	2.5
1-1/2	5.0
2	10.5

4.2 – METER TEST FLOW RATE

GUARANTEE PERIOD			TEST FLOW RATE
Meter Size (inches)	Age of Meter (years)	Or Gallons (million*)	Rate (gpm)
5/8	>1 to <5	0.5	1/4
1	>1 to <5	1.0	3/4
1-1/2	>1 to <5	2.5	1-1/2
2	>1 to <5	5.5	2

* Total Registration

4.3 – METER TEST FLOW RATE – 3RD PERIOD

GUARANTEE PERIOD			TEST FLOW RATE
Meter Size (inches)	Age of Meter (years)	Or Gallons (million*)	Rate (gpm)
5/8	>5 to <10	1.5	1/4
1	>5 to <10	2.5	3/4
1-1/2	>5 to <10	5.0	1-1/2
2	>5 to <10	10.0	2

* Total Registration

4.4 – MINIMAL ACCEPTABLE ACCURACY FOR METERS

Meter Size (inches)	Minimum Flow (gpm)	% Accuracy Required
2	3	95
3	5	95
4	15	95
6	20	95
8	20	95
10	30	95

END OF SECTION