GENERAL CONDITIONS FOR
5/8” x 3/4”, 1” and 2” Cold Water Meters
Lead-Free Standards

I. CONTRACT PERIOD

The period of this contract will be for One Year from date bid is awarded. This contract may be renewed for up to **THREE (3) Years** from the initial award date upon the agreement of both parties. Bid price will remain firm during the period of the contract.

II. DELIVERY

Deliveries shall be made within seven (7) working days from the date of order. The vendor shall notify Water Plant Operator or Shelby County Water Services personnel (the person who ordered the product) of any problems in meeting the mandatory seven (7) working day deadline and the vendor must schedule specific delivery day and time with personnel if the deadline is not met. Excessive failure to deliver within seven (7) working days shall be grounds for rejection of the vendor for future purchases, at the sole discretion of Shelby County.

Rejection of an unacceptable delivery method shall not excuse the vendor from the seven (7) working day delivery requirement.

All quoted prices shall include delivery charges (including, but not limited to, shipping charges and surcharges). Deliveries shall be made to the following addresses:

Shelby County Field Operations – Westover
82 Big Oak Circle
Westover, AL 35185

Shelby County Field B2 Office
10610 Old Hwy 280
Chelsea, AL 35043

III. BILLING

Invoice payments shall be based solely on quantity of items received and the vendors stated bid price. Product shall be billed in ***items received*** and all prices shall include shipping. ***Shelby County Water Services does require a Purchase Order for every order placed.*** Shelby County Water Services is tax exempt (tax exempt #63-6001694).

All invoices shall be billed to:

Shelby County Water Services
200 West College Street, Room 145
Columbiana, AL 35051
ap-water-landfill@shelbyal.com

IV. ESTIMATED ANNUAL USE

Products will be ordered on an *AS NEEDED* basis. Estimated quantities for products are on attached bid documents.

V. BID QUALIFICATIONS

All BIDDERS must submit product information with bids. Information to be submitted must show the product proposed meets all the specifications listed below and list **ALL EXCEPTIONS** to the specifications in a separate document.

Shelby County Water Services

THE UNDERSIGNED OFFERS THESE PRICES, TERMS, AND DELIVERY AS PER BID GENERAL CONDITIONS AND SPECIFICATIONS:

NAME OF COMPANY: _____

BY: (Please Print): _____

SIGNATURE: _____

COMPANY ADDRESS: _____

_____

PHONE: _____

E-MAIL: _____

BIDS SUBMITTED ARE FIRM AND NO CLAIMS FOR ERRORS WILL BE MADE AFTER BIDS ARE OPENED AND SUBSEQUENT THEREOF.

Sworn to and subscribed before me this

the_____day of_____,_____.

_____,Notary Public

My Commission Expires:_____

VENDOR NAME: _____

SHELBY COUNTY WATER SERVICES
BID FOR 5/8” X 3/4”, 1”, 2” COLD WATER METERS

GROUP 1 BID ITEM	MAKE OR MANUFACTURER	MODEL #	ESTIMATED ANNUAL QTY NEEDED	UNIT PRICE EACH (DELIVERED)	TOTAL COST
5/8" x 3/4" Badger Bronze M25 with High Resolution Encoder for Touch Read or Approved Equal			**250**		
1" Badger Bronze M70 with High Resolution Encoder for Touch Read or Approved Equal			**250**		
2" Badger Bronze M170 with High Resolution Encoder for Touch Read or Approved Equal			**25**		
2” Badger E-Series Ultrasonic Meter for Fire Service or Approved Equal			**10**		
2” Badger E-Series Ultrasonic Meter for Standard Service or Approved Equal			**10**		
TOTAL COST FOR GROUP 1					

GROUP 2 BID ITEM	MAKE OR MANUFACTURER	MODEL #	UNIT PRICE EACH (DELIVERED)	Percent Discount
HR-E Encoder w/ Twist-Tight connector for M25 Meter or Approved Equal				
HR-E Encoder w/ Nicor connector for M25 Meter or Approved Equal				
HR-E Encoder w/ Twist-Tight connector for M70 Meter or Approved Equal				
HR-E Encoder w/ Nicor connector for M70 Meter or Approved Equal				
HR-E Encoder w/ Twist-Tight connector for M170 Meter or Approved Equal				
HR-E Encoder w/ Nicor connector for M170 Meter or Approved Equal				
Change Twist-Tight connector to Nicor connector on HR-E Encoders				
% Discount from List Price for Complete Meters and Accessories not listed in this bid.				
% Discount from List Price for Meter Parts not listed in this bid.				

In the event of discrepancies, Unit Prices shall govern.

BID SPECIFICATIONS FOR
5/8” x 3/4” and 1” Cold Water Meters Displacement Type – Magnetically Drive Lead-Free Standards

SECTION 1 – SCOPE
This specification covers cold water meters in sizes 5/8” x 3/4" and 1" and the materials and workmanship employed in their fabrication. The displacement meters must be of the type known as nutating disc meters, which are positive in action in that the discs displace or carry over a fixed quantity of water for each nutation of the disc when operated under positive pressure. Meters will meet and exceed all standards of the latest revision of AWWA C700/C710.

SECTION 2 – SIZE, CAPACITY, AND LENGTH
Along with the operating and physical characteristics, the nominal size, capacity ratings, related pressure loss limits and length of the meters are shown in Exhibit “A”, Tables 1 and 2. Meters supplied under this specification shall operate without leakage or damage to any part at a working pressure of 150 psi.

SECTION 3 – CASES

3.1 Meters shall comply with the lead-free requirements as defined by the 2014 provisions of the Safe Drinking Water Act. The definition of “lead-free” shall be not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

3.2 All 5/8” x 3/4" and 1" meters shall have a top and bottom meter case closure made of a lead-free copper alloy containing not less than 75% copper.

3.2 Main cases shall be capable of withstanding a hydrostatic burst pressure of 600 psi. The bottom closure for the copper alloy housing will be copper alloy bottom for 5/8” through 1” meters.

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

3.4 The size, model, and direction of flow through the meters shall be molded/cast in the topside of all meter outer cases.

SECTION 4 – EXTERNAL CLOSURE SCREWS, BOLTS, NUTS, AND WASHERS
All external closures shall be designed for easy removal after long services and shall be made of a suitable synthetic polymer or corrosion resisting stainless steel.

SECTION 5 – REGISTERS
All meters shall be so designed as to permit, at purchaser's option; the use of either a straight reading permanently sealed local register or an absolute encoder register for connection to a Touch Read metering system. The registration reading shall be U.S. gallons. The register shall not be in contact with the water being measured. The register device shall be so designed to permit removal and exchange without removal of the meter from the service installation or

interruption of service water supply. The register shall be tamper protected through the use of a tamper-resistant Torx® seal screw or optional proprietary tamper-proof screw that requires a special drive bit to remove the screw. Plastic push pin or plastic tamper devices that need to be destroyed in order to remove the register will not be accepted.

5.1 High Resolution Absolute Encoder Register

A. The high resolution absolute encoder shall consist of an 8-dial mechanical local register combined with frictionless light emitting diode (LED) technology to sense the position of the eight numbers wheels for electronic reading purposes. The high resolution encoder shall utilize the industry standard ASCII protocol for connectivity to an approved endpoint.

B. The encoder's electronic reading shall be obtained through a frictionless form of encoding technology that utilizes optical sensing to determine the position of each number wheel. Absolutely no slide wires, contacts or load fire spring mechanisms will be allowed.

The encoder output shall provide an eight digit reading for AMR/AMI endpoints (number of digits sent to the reading software is dependent on the endpoint that is connected). The encoder output for touch applications shall have the factory-programmed option of 4, 5, 6, 7 or 8 digits. The electronic output of the encoder should be factory programmable to a 5 dial reading to meet the reading resolution of the utility.

Signal output shall be the industry standard ASCII format and signal type shall be three- wire synchronous for AMR/AMI endpoints or two-wire asynchronous for touch endpoints.

Encoder shall provide meter size and unit of measure and factory programmed serial number as part of the encoder message.

C. The high resolution encoder shall not be in contact with the water being measured. The encoder shall be designed to assemble to the meter with a four-position bayonet and seal screw fastening. The bayonet mount positions the encoder in any of four orientations on a water meter for visual reading convenience. The high resolution encoder shall be designed to permit removal and exchange without removal of the meter from the service installation or interruption of service water supply.

The encoder shall be tamper protected through the use of a tamper-resistant Torx® seal screw or optional proprietary tamper-proof screw that requires a special drive bit to remove the screw. Plastic push pin or plastic tamper devices that need to be destroyed in order to remove the encoder will not be accepted. The encoder shall be designed to assemble to the meter with a four-position bayonet and seal screw fastening. The encoder must be provided with a factory installed Twist Tight connector compatible with Touch pad endpoint or a standard fixed base/cellular endpoint as provided by the meter manufacturer. Twist tight connector shall provide a waterproof connection between the encoder and the Touch pad or other endpoints.

D. The meter size and units of registration, U.S. gallons shall be designated on the encoder dial face. Every encoder shall utilize a flow indicator for leak detection and shall display it in red for U.S. Gallons.

E. The encoder shall be encased in a housing, which shall consist of a glass lens and

a non-corrosive metal bottom, which are permanently sealed with adhesive material.

The enclosure must be weatherproof, UV-resistant and permanently sealed to withstand harsh environments and provide moisture resistance in flooded or submerged pit applications. The permanent seal between the glass lens and non-corrosive metal bottom of the encoder enclosure shall utilize an adhesive seal without the use of gaskets and shall meet or exceed all applicable requirements of AWWA Standard C706 and C707. Absolutely no gasketed seals will be allowed. The encoder shall remain fog-free of moisture.

The name or logo of the manufacturer shall be permanently molded and the serial number shall be imprinted on the lid of the encoder box. The lid and shroud components shall overlap to protect the lens and optional identification of the serial number inside the lid. Register box enclosures and lids shall be made of engineering thermoplastic or other suitable synthetic polymer.

F. The encoder shall be factory programmed and shall contain a standard or customer specified eight-digit serial number. Electronic read data shall be provided using an industry standard ASCII protocol.

G. The encoder must be permanently sealed to provide moisture resistance to flooded pit or submerged conditions. The permanent seal between the glass lens and non-corrosive (metal) bottom shall utilize an adhesive seal without the use of gaskets. Absolutely no gasketed seals will be allowed.

H. It is the preference of the County that the absolute encoder register offered is constructed of scratch resistant glass face, non-corrosive metal bottom, and adhesive seal. The encoder shall have a lid/shroud that covers the glass face for added protection and optional identification of serial number. Absolutely no oil filled encoder register shall be accepted.

SECTION 6 – MEASURING CHAMBERS

The measuring chambers, 5/8” x 3/4" and 1", shall be self-contained units, made of a dimensionally stable reinforced thermoplastic, molded without secondary machining, firmly seated, easily removed from the main cases and shall not be a part of the main case. Both halves of the measuring chamber and the internal element shall be marked with the manufacturer’s symbol or name. The chamber shall be of two-piece snap joint and be secured in the main casing so that the accuracy of the meter will not be affected by any distortion of the cases when operating at pressures to 150 psi. Control of disc spindle motion shall be by means of a cone shape structure molded as an integral part of the chamber. Measuring chamber diaphragms shall be an integrally molded part of the measuring chamber halves.

SECTION 7 – DISCS

The measuring disc shall be of the nutating type, made of a suitable engineering thermoplastic polymer with specific gravity approximately equal to that of water, molded without secondary machining. The disc shall have sufficient dimensional stability to retain operating clearances at working temperatures to 80°F and not warp or deform when exposed to operating temperature to 100°F and shall be equipped with a thrust roller. The disc nutations shall not exceed the quantities given in Exhibit “A”, Table 1.

SECTION 8 – STRAINERS

All meters shall include components that provide a strainer/screen function, molded out of a thermoplastic material.

SECTION 9 – ACCURACY AND PERFORMANCE

All meters shall contain a factory test label, which documents the accuracy at high, medium and low flow. The meters shall meet the following requirements for accuracy:

9.1 At any flow rate within normal test flow limits specified in Exhibit “A”, Table 1, the meter shall register not less than 98.5% and not more than 101.5% of the water actually passed through the meter.

9.2 At the minimum test flow rate specified in Exhibit “A”, Table 1, the 5/8" and 5/8"x3/4" meters shall register not less than 98.5% and not more than 101.0% of the water actually passed through the meter.

9.3 At the minimum test flow rate specified in Exhibit “A”, Table 1, the 1” meter shall register not less than 95% and not more than 101.0% of the water actually passed through the meter.

EXHIBIT "A"

TABLE 1 – METER PERFORMANCE CHARACTERISTICS

Meter Size Inches / mm	Required Safe Maximum Operating Capacity (GPM)	Maximum Pressure Loss At AWWA Safe Maximum Operating Capacity (PSI)	Recommended Maximum Rate For Continuous Operations (GPM)	Minimum Test Flow (GPM)	Normal Test Flow Limits (GPM)	Maximum Number of Disc Nutation's:	
						Per 1 Gallon	Per 1 Cubic Foot
5/8"x3/4" Bronze M25	25	4.9 @ 20 GPM	15	1/4	1/2 – 25	49.59	370.9
1" Bronze M70	70	6.5 @ 50 GPM	50	3/4	1-1/4 - 70	11.7	87.5

TABLE 2 – DIMENSIONAL DESIGN LIMITS FOR METERS

			Meter Housing Spuds Pitch Diameter	
Meter Size (Inches)	Meter Length Threaded Spud Ends (Inches)	Meter Spuds Nominal Thread Size (Inches)	Minimum (Inches)	Maximum (Inches)
5/8"x3/4"	7-1/2"	1"	1.227	1.237
1"	10-3/4"	1-1/4"	1.563	1.573

TABLE 3 – MAXIMUM INDICATION ON INITIAL DIAL AND MINIMUM REGISTER CAPACITY

Meter Size (Inches)	Maximum Allowable Indication of Initial Dial			Minimum Allowable Capacity of Register, Millions		
Local Register or Absolute Encoder Register	Cu. Ft.	Gallons	M3	Cu. Ft.	Gallons	M3
5/8"x3/4"	1	10	0.1	1	10	0.1
1"	1	10	0.1	1	10	0.1

BID SPECIFICATIONS FOR
2” Cold Water Meters
Displacement Type – Magnetically Drive
Lead-Free Standards

SECTION 1 – SCOPE
This specification covers 2" cold water meters including the materials and workmanship employed in their fabrication. The displacement meters must be of the type known as nutating disc meters, which are positive in action in that the discs displace or carry over a fixed quantity of water for each nutation of the disc when operated under positive pressure. Only 2” meters manufactured within the continental limits of the United States shall be acceptable. Meters will meet and exceed all standards of the latest revision of AWWA C700.

SECTION 2 – SIZE, CAPACITY, LENGTH AND PRESSURE
Along with the operating and physical characteristics, the nominal size, capacity ratings, related pressure loss limits and length of the meters are shown in Exhibit “B”, Tables 1 and 2. Meters supplied under this specification shall operate without leakage or damage to any part at a working pressure of 150 psi.

SECTION 3 – CASES

3.1 Meters shall comply with the lead-free requirements as defined by the 2014 provisions of the Safe Drinking Water Act. The definition of “lead-free” shall be not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

3.2 All 2" meters shall have a top and bottom meter case closure made of a copper alloy containing not less than 75% copper.

3.3 Main cases shall be capable of withstanding a hydrostatic burst pressure of 600 psi. The housing shall be designed so that at a working pressure of 150 psi, any distortion will not affect the accuracy of the meter.

3.4 As an option, a 1” NPT test plug port shall be available in the outlet side of the meter.

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

3.6 The size, model, and direction of flow through the meters shall be cast in the top side of all meter outer cases.

SECTION 4 – EXTERNAL CLOSURE SCREWS, BOLTS, NUTS, AND WASHERS
All external closures shall be designed for easy removal after long services and shall be made of a suitable synthetic polymer or corrosion resisting stainless steel.

SECTION 5 – REGISTER BOXES
The name of the manufacturer shall be permanently cast or molded in the lid of the register box. The lid/shroud shall be recessed and overlap the register box to protect the lens. The serial number of the meter shall be imprinted on the lid. Register box enclosures, rings and lids shall be made of an engineering thermoplastic or other suitable synthetic polymer.

SECTION 6 – MEASURING CHAMBERS
The measuring chambers, 2", shall be self-contained units, made of a dimensionally stable, reinforced thermoplastic, molded without secondary machining, firmly seated, easily removed from the main cases and shall not be a part of the main case.

Both halves of the measuring chamber and the internal element shall be marked with the manufacturer's symbol or name.

The chamber shall be of two-piece snap joint and be secured in the main casing so that the accuracy of the meter shall not be affected by any distortion of the cases when operating at pressures to 150 psi.

Control of disc spindle motion shall be by means of a cone and support structure molded as an integral part of the chamber top. The support structure shall also serve to position the lower drive pawl, magnet shaft, and magnet assembly which transmit disc nutation's to the register.

All chambers shall be equipped with a removable, reversible thrust roller insert, inserted into the wall of the chamber. The bearing surface of the insert shall be at least 1/5 the thickness of the outside diameter of the thrust roller head. The chamber magnet shaft shall be stainless steel (thermoplastic chamber magnet shafts are not acceptable). Measuring chamber diaphragms shall be an integrally molded part of the measuring chamber halves.

SECTION 7 – REGISTERS
See Section 5 of "5/8" x 3/4" and 1" Cold Water Meters" Standard Specifications for register/encoder requirements.

SECTION 8 – DISCS
The measuring disc shall be of the nutating type, made of a suitable engineering thermoplastic polymer with specific gravity approximately equal to that of water, molded without secondary machining. The disc shall have sufficient dimensional stability to retain operating clearances at working temperatures to 80°F and not warp or deform when exposed to operating temperature to 100°F and shall be equipped with a thrust roller and a stainless steel disc spindle, and the disc nutation's shall not exceed the quantities given in Exhibit "B", Table 1.

SECTION 9 – STRAINERS
All meters shall be provided with strainer screens of rigid molded thermoplastic material which fit snugly, are easy to remove, and have an effective straining area at least double that of the main-case inlet.

SECTION 10 – REGISTRATION ACCURACY
When tested with potable water at a minimum temperature of 80°F, at any rate of flow within the normal test flow limits specified in Exhibit "B", Table 1, the meter shall register not less than 98.5% and not more than 101.5% of the water actually passed through the meter. At the minimum test flow rate, the meter shall register not less than 95% and not more than 101.0% of the water actually passed through the meter.

SECTION 11 – ACCURACY AND METER PERFORMANCE
All meters shall contain a factory test label, which documents the accuracy at high, medium and low flow.

EXHIBIT "B"

TABLE 1 – METER PERFORMANCE CHARACTERISTICS

Meter Size Inches / mm	Required Safe Maximum Operating Capacity (GPM)	Maximum Pressure Loss At AWWA Safe Maximum Operating Capacity (PSI)	Recommended Maximum Rate For Continuous Operations (GPM)	Minimum Test Flow (GPM)	Normal Test Flow Limits (GPM)	Maximum Number of Disc Nutation's:	
						Per 1 Gallon	Per 1 Cubic Foot
2" Hex NPT	170	8.6 @ 160 GPM	100	1-1/2	2-1/2-170	3.64	27.2
2" Elliptical	170	8.6 @ 160 GPM	100	1-1/2	2-1/2-170	3.64	27.2

TABLE 2 – DIMENSIONAL DESIGN LIMITS FOR METERS

	Meter Length			Pitch Diameter	
Meter Size Inches	Threaded Spud Ends Inches	Flanged Ends Inches	Nominal Thread Size Inches	Minimum Inches	Maximum Inches
2" Hex	15-1/4"	-------	2"*	2.253"*	2.296"
2"	-------	17"	-------	-------	-------

* Internal Threads

TABLE 3 – MAXIMUM INDICATION ON INITIAL DIAL AND MINIMUM REGISTER CAPACITY

Meter Size Inches	Maximum Allowable Indication of Initial Dial			Minimum Allowable Capacity of Register, Millions		
Local Register or Absolute Encoder Register	Cu. Ft.	Gallons	M3	Cu. Ft.	Gallons	M3
2"	10	100	1	10	100	1

BID SPECIFICATIONS FOR
2” Cold Water Ultrasonic Meters
For Fire Service
Lead-Free Standards

SECTION 1 – SCOPE
This specification covers 2” Ultrasonic Meters and the materials and workmanship employed in their fabrication. The meters must be listed by Underwriters Laboratories as meeting UL Subject 327B, Inferential Type Residential Water Flow Meters. The meters must have red lids signifying fire service application, and display the Underwriters Laboratories (UL) logo or emblem. The meter must utilize ultrasonic measurement technology and have no moving parts within the meter.

SECTION 2 – METER DESCRIPTION
The basis for measurement is the use of ultrasonic signals sent consecutively in forward and reverse directions of flow. Velocity is determined by measuring the time difference between the measurement in the forward and reverse direction. Flow totalization can then be calculated from the measured flow velocity using water temperature and pipe diameter. The meter is all electronic with totally potted circuitry, display and battery. There are no moving parts to wear or replace and meter and register are sealed, non-removable and protected from tampering.

Meters shall comply with the lead-free requirements as defined by the 2014 provisions of the Safe Drinking Water Act. The definition of “lead- free” shall be not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

SECTION 3 – SIZE, CAPACITY, AND LENGTH
Along with the operating and physical characteristics, the nominal size, capacity ratings, related pressure loss limits, and length of the meters are those shown in Exhibit “C”, Table 1 and 2. Meters supplied under this specification shall operate without leakage or damage at a working pressure of 175 psi.

SECTION 4 – METERING TUBE
The housing shall be designed so that at a working pressure of 175 psi, any distortion will not affect the accuracy of the meter. Metering tube shall not be repaired in any manner. The flow direction and meter size shall also be cast in the meter tube and the inlet and outlet shall have a common axis.

SECTION 5 – METERING INSERT
The ultrasonic metering insert shall be self-contained within the meter flow tube, seated, and not removable. The insert shall be secured to the main case, providing a method of minimizing turbulence and cleaning the reflectors, so that the accuracy of the meter will not be affected by any distortions of the case when operating at a pressure of 175 psi. The metering insert shall be made of engineered thermoplastic and stainless steel and the ultrasonic transducers shall be wetted components that extend through the meter tube and shall have a surface of stainless steel.

SECTION 6 – ELECTRONIC METER AND REGISTER
The electronic circuit shall be micro-processor based and include a non-replaceable battery, and non-volatile memory capable of storing all programmable data and accumulated data. The circuit shall control the ultrasonic transducers. No field programming or calibration shall be necessary. The entire meter circuit and related components shall be fully potted and sealed from water

intrusion. No components shall require service or replacement over the life of the meter. For reliability, the use of inductive coil technology shall not be permitted with an electronic residential meter.

SECTION 7 – REGISTER BOXES

The name or logo of the manufacturer shall be permanently molded and the serial number shall be imprinted on the lid of the register box. The lid and shroud components shall overlap to protect the lens. Register box enclosures and lids shall be made of engineering thermoplastic or other suitable synthetic polymer.

SECTION 8 – REGISTER/DISPLAY

8.1 The Register shall be encased in an integral non-corrosive plastic housing, with the electronics, display, and battery completely potted within. It must be permanently epoxy sealed to provide moisture resistance to flooded pit or submerged conditions. The permanent seal between the lens and non-corrosive plastic housing shall utilize an adhesive seal without the use of gaskets.

8.2 The Register shall be an integral part of the meter assembly. The register must be available as factory pre-wired to an inline Twist Tight connector that can be used to connect to a Touch Read Pad or another endpoint type.

8.3 The Register shall consist of an electronic local display combined with electronic circuitry to provide a high resolution absolute encoder output. This electronic register assembly shall transmit a signal through properly shielded (grounded) transmission wire for AMR/AMI connectivity.

8.3.1 The High Resolution Absolute Encoder Register option shall use an industry ASCII protocol. Capable of sending a 9-digit encoder output to the endpoint as well as extended status messages. Resolution being sent to the reading software is based on the output of the endpoint.

8.4 The display shall be a straight reading, permanently sealed electronic LCD with digits 0.28 inches high. The display will contain 9 digits plus a decimal point and display consumption, units of measure, rate of flow and alarm information. The digital display shall provide a totalized consumption resolution to 0.1 gallons, 0.01 cubic feet, or 0.001 cubic meters for 2” meters. The maximum indication on the dial and the minimum allowable capacity of the register shall comply with Table 3.

8.5 The size, model, and direction of flow through the meters shall be permanently visible on the topside of all meter displays. The units of registration, U.S. gallons, cubic feet, or meters cubed shall also be designated on the Register display. The enhanced resolution of the totalized flow display can be utilized as a flow indicator for leak detection.

8.6 The Register shall have a lid that covers the display face for added protection and optional identification of serial number.

SECTION 9 – REGISTRATION ACCURACY

Specified in Exhibit “C”, Table 1, at any flow rate within normal test flow limits, the meter shall register not less than 98.5% and not more than 101.5% of the water actually passed through the meter. At the minimum test flow rate, the meter shall register not less than 97.0% and not more than 103.0% of the water actually passed through the meter.

SECTION 10 – PERFORMANCE REQUIREMENTS

All meters shall meet the following performance standards, shown in Exhibit “C”.

EXHIBIT "C"

Table 1: Meter Performance Characteristics

Meter Size	Required Safe Maximum Operating Capacity	Maximum Pressure Loss At AWWA Safe Maximum Operating Capacity	Recommended Maximum Rate For Continuous Operations	Extended Low Flow	Normal Test Flow Limits
2"	150 gpm	4.7 psi @ 150 gpm	150 gpm	0.50 gpm	2…150 gpm

Table 2: Dimensional Design Limits for 2" Meters

Meter Size (Inches)	Lay Length (Inches)	Minimum Thickness at Bolt Hole (Inches)	Diameter of Bolt Circle (Inches)	Number of Bolt Holes	Diameter of Bolt Holes (Inches)
2"	17"	5/8"	4-1/2"	2	13/16"

Table 3: Maximum Indication on Initial Dial and Minimum Register Capacity

Meter Size	Maximum Allowable Indication of Initial Dial			Minimum Allowable Capacity of Register (Millions)		
Local Register or Electronic Encoder Register	Cu. Ft	Gallons	M3	Cu. Ft	Gallons	M3
2"	0.01	0.1	0.001	10,000,000	100,000,000	1,000,000

BID SPECIFICATIONS FOR
2” Cold Water Ultrasonic Meters
For Standard Service
Lead-Free Standards

SECTION 1 – SCOPE
This specification covers 2” E-Series Cold Water Ultrasonic Meters for non-fire service applications, and the materials and workmanship employed in their fabrication. The meter must utilize ultrasonic measurement technology and have no moving parts within the meter.

SECTION 2 – METER DESCRIPTION
The basis for measurement is the use of ultrasonic signals sent consecutively in forward and reverse directions of flow. Velocity is determined by measuring the time difference between the measurement in the forward and reverse direction. Flow totalization can then be calculated from the measured flow velocity using water temperature and pipe diameter. The meter is all electronic with totally potted circuitry, display and battery. There are no moving parts to wear or replace and meter and register are sealed, non-removable and protected from tampering.

Meters shall comply with the lead-free requirements as defined by the 2014 provisions of the Safe Drinking Water Act. The definition of “lead- free” shall be not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

SECTION 3 – SIZE, CAPACITY, AND LENGTH
Along with the operating and physical characteristics, the nominal size, capacity ratings, related pressure loss limits, and length of the meters are those shown in Table 1 and 2. Meters supplied under this specification shall operate without leakage or damage at a working pressure of 175 psi.

SECTION 4 – METERING TUBE
The housing shall be designed so that at a working pressure of 175 psi, any distortion will not affect the accuracy of the meter. Metering tube shall not be repaired in any manner. The flow direction and meter size shall also be cast in the meter tube and the inlet and outlet shall have a common axis.

SECTION 5 – METERING INSERT
The ultrasonic metering insert shall be self-contained within the meter flow tube, seated, and not removable. The insert shall be secured to the main case, providing a method of minimizing turbulence and cleaning the reflectors, so that the accuracy of the meter will not be affected by any distortions of the case when operating at a pressure of 175 psi. The metering insert shall be made of engineered thermoplastic and stainless steel and the ultrasonic transducers shall be wetted components that extend through the meter tube and shall have a surface of stainless steel.

SECTION 6 – ELECTRONIC METER AND REGISTER
The electronic circuit shall be micro-processor based and include a non-replaceable battery, and non-volatile memory capable of storing all programmable data and accumulated data. The circuit shall control the ultrasonic transducers. No field programming or calibration shall be necessary.

The entire meter circuit and related components shall be fully potted and sealed from water intrusion. No components shall require service or replacement over the life of the meter. For reliability, the use of inductive coil technology shall not be permitted with an electronic residential meter.

SECTION 7 – REGISTER BOXES

The name or logo of the manufacturer shall be permanently molded and the serial number shall be imprinted on the lid of the register box. The lid and shroud components shall overlap to protect the lens. Register box enclosures and lids shall be made of engineering thermoplastic or other suitable synthetic polymer.

SECTION 8 – REGISTER/DISPLAY

8.1 The Register shall be encased in an integral non-corrosive plastic housing, with the electronics, display, and battery completely potted within. It must be permanently epoxy sealed to provide moisture resistance to flooded pit or submerged conditions. The permanent seal between the lens and non-corrosive plastic housing shall utilize an adhesive seal without the use of gaskets.

8.2 The Register shall be an integral part of the meter assembly. The register must be available as factory pre-wired to an inline Twist Tight connector that can be used to connect to a Touch Read Pad or another endpoint type.

8.3 The Register shall consist of an electronic local display combined with electronic circuitry to provide a high resolution absolute encoder output. This electronic register assembly shall transmit a signal through properly shielded (grounded) transmission wire for AMR/AMI connectivity.

8.3.1 The High Resolution Absolute Encoder Register option shall use an industry ASCII protocol capable of sending a 9-digit encoder output to the endpoint as well as extended status messages. Resolution being sent to the reading software is based on the output of the endpoint.

8.4 The display shall be a straight reading, permanently sealed electronic LCD with digits 0.28 inches high. The display will contain 9 digits plus a decimal point and display consumption, units of measure, rate of flow and alarm information. The digital display shall provide a totalized consumption resolution to 0.1 gallons, 0.01 cubic feet, or 0.001 cubic meters for 1-1/2” and 2” meters. The maximum indication on the dial and the minimum allowable capacity of the register shall comply with Exhibit “D”, Table 3.

8.5 The size, model, and direction of flow through the meters shall be permanently visible on the topside of all meter displays. The units of registration, U.S. gallons, cubic feet, or meters cubed shall also be designated on the Register display. The enhanced resolution of the totalized flow display can be utilized as a flow indicator for leak detection.

8.6 The Register shall have a lid that covers the display face for added protection and optional identification of serial number.

SECTION 9 – REGISTRATION ACCURACY

Specified in Exhibit “D”, Table 1, at any flow rate within normal test flow limits, the meter shall register not less than 98.5% and not more than 101.5% of the water actually passed through the meter. At the minimum test flow rate, the meter shall register not less than 97.0% and not more than 103.0% of the water actually passed through the meter.

SECTION 10 – REJECTED METERS

The manufacturer shall repair or replace, at its option, without charge, all meters rejected for failure to comply with this specification.

EXHIBIT "D"

TABLE 1 – METER PERFORMANCE CHARACTERISTICS

Meter Size	Required Safe Maximum Operating Capacity	Maximum Pressure Loss At AWWA Safe Maximum Operating Capacity	Recommended Maximum Rate For Continuous Operations	Extended Low Flow	Normal Test Flow Limits
2" Elliptical	160 gpm	4.7 psi @ 160 gpm	160 gpm	0.50 gpm	1.5…160 gpm
2" Hex NPT	160 gpm	4.7 psi @ 160 gpm	160 gpm	0.50 gpm	1.5…160 gpm

TABLE 2 – DIMENSIONAL DESIGN LIMITS FOR METERS

Meter Size	Lay Length	Minimum Thickness at Bolt Hole	Diameter of Bolt Circle	Number of Bolt Holes	Diameter of Bolt Holes	Nominal Thread Size
2" Elliptical	17"	5/8"	4-1/2"	2	13/16"	-----
2" Hex NPT	15-1/4"	-----	-----	-----	-----	2"

TABLE 3 – MAXIMUM INDICATION ON INTIAL DIAL AND MINIMUM REGISTER CAPACITY

Meter Size	Maximum Allowable Indication of Initial Dial			Minimum Allowable Capacity of Register		
Local Register or Electronic Encoder Register	Cu. Ft	Gallons	M^3	Cu. Ft	Gallons	M^3
2"	0.01	0.1	0.001	10,000,000	100,000,000	1,000,000