

CITY OF MOAB
INVITATION TO BID
Neptune ARB Meters

The City of Moab is now accepting sealed bids for Neptune ARB Meters for the Water Department. Bid specs are available online at: www.moabcity.org or may be picked up at the Recorder's Office at the Moab City Offices, 217 East Center Street, Moab, Utah 84532.

All sealed bids must be turned in to the City of Moab Recorder's Office by 3:00 p.m. on Thursday, March 19, 2020 at 217 East Center Street, Moab, Utah 84532. Bids must be turned in on City of Moab's spec sheet. The City of Moab reserves the right to reject any and all bids; or waive any informality or technicality in any bid. For further information, please contact the Recorder's Office at (435) 259-5121 or visit our website at www.moabcity.org.

/s/ Sommar Johnson
City Recorder

Published in the Times Independent, March 5 and March 12, 2020.

MOAB CITY BID SPEC SHEET

CITY OF MOAB
 CITY RECORDER'S OFFICE
 217 EAST CENTER STREET
 MOAB, UT 84532

MOAB CITY WATER
 DEPARTMENT
 NEPTUNE ARB METERS
 AND RADIO TRANSMITTERS

***** DEADLINE FOR ALL BIDS IS THURSDAY, MARCH 19, 2020 AT 3:00 PM *****

ALL BIDS MUST BE TURNED INTO MOAB CITY OFFICES ON THIS BID SHEET.

Neptune ARB meters with pit receptacle compatible with the Advance Meter Reading System.

1	5/8" R-900i Pit Registers Only w/ built in radio w/ 6' Antenna	\$	Per Unit
1	5/8" X 3/4" T-10 Neptune Meter w/ R900i Pit Register w/ 6' Antenna	\$	Per Meter
1	1 R-900i Pit Registers Only w/ built in radio w/ 6' Antenna	\$	Per Unit
1	1 1/2" T-10 Neptune Meter w/R900i Pit Register w/ 6' Antenna	\$	Per Meter

1	1 1/2" R900i Pit Registers only w/ Built in radio w/6' Antenna	\$	Per Unit
1	2" T-10 Neptune Meter w/R900i Pit Register w/ 6' Antenna	\$	Per Meter
1	2" R900i Pit Registers only w/ Built in radio w/6' Antenna	\$	Per Unit
1	3" UME Compound w/R900i Registers w/ 20' Antenna	\$	Per Meter

1	3" R900i Pit Registers only w/ Built in radio w/6' Antenna	\$	Per Unit
1	4" UME Compound w/R900i Registers w/ 20' Antenna	\$	Per Meter
1	4" R900i Pit Registers only w/ Built in radio w/6' Antenna	\$	Per Unit

COLD WATER METERS / DISPLACEMENT TYPE MAGNETIC DRIVE 5/8"-2"

SPECIFICATIONS

GENERAL

All cold water meters (displacement type - magnetic drive 5/8" - 2") furnished shall be produced from an ISO 9001 manufacturing facility and conform to the "Standard Specifications for Cold Water Meters" C700 latest revision issued by AWWA or as otherwise stated.

LEAD FREE LEGISLATION

Federal changes are on the horizon governing the acceptable amount of lead in the drinking water system. Knowing that water meters have a life expectancy of approximately 20 years, the Utility wishes to ensure that meters purchased today will meet the Safe Drinking Water Act (SDWA) per NSF 372 that will become effective in January 2014 for the following reasons:

- The Utility wishes to assure the safety of its drinking water.
- The Utility wishes to safeguard its investment in metering infrastructure.
 - As of January 4, 2014 meter inventory that does not meet the SDWA (NSF 372) lead free requirements will have to be returned to the manufacturer or scrapped at a cost that the Utility is not willing to incur.
 - After January 4, 2014, any meters not in compliance with these requirements that are physically removed from service for testing or repair, cannot be re-installed and will have to be scrapped at a cost that the Utility is not willing to incur.

As a result, the Utility requires that all water meters submitted in this proposal be compliant with NSF/ANSI 61, Annex G and Annex F. Specifically:

- Meters shall be made of "lead free" alloy as defined by NSF/ANSI 61, Annex G and Annex F.

- Manufacturers shall provide a copy of a letter from the NSF on NSF letterhead documenting compliance with NSF/ANSI 61, Annex G which allows a maximum weighted average lead content level of 0.25% of the wetted surface area.
- Manufacturer shall provide a copy of a letter from the NSF on NSF letterhead documenting compliance with NSF/ANSI 61, Annex F which requires leaching of less than 5 µg/L in tests performed per the NSF/ANSI 61 test methodology for water with pH of 5 and pH of 10.
- Manufacturer will provide documentation that its US-based foundry uses only lead free materials in the manufacture of its water meters. This documentation shall be signed by an authorized officer of the company.

TYPE

Only magnetic-driven, positive displacement meters of the flat nutating disc type will be accepted because of enhanced low flow accuracy performance.

SIZE, CAPACITY, LENGTH

The size, capacity, and meter lengths shall be as specified in AWWA Standard C700 (latest revision). The maximum number of disc nutations is not to exceed those specified in AWWA C700 latest revision.

The meter maincase and cover shall be cast from NSF/ANSI 61, Annex G and Annex F certified lead free alloy containing a minimum of 85% copper. The serial number should be stamped between the inlet or outlet port of the maincase and the register. Maincase markings shall be cast raised and shall indicate size, model, direction of flow, and NSF 61 certification. Plastic maincases are not acceptable.

Maincases for 5/8" and 3/4" meters shall be of the removable bottom cap type with the bottom cap secured by four (4) bolts on 5/8" and 3/4" sizes. Intermediate meter maincases shall also be made of the same lead free brass material in size 2" with a cover secured to the maincase with eight (8) bolts. Meters with a frost plug, a screw-on design or no bottom cap shall not be accepted in 5/8" size. The 5/8" meters shall have a synthetic polymer or cast iron bottom cap option.

All lead free maincases shall be guaranteed free from manufacturing defects in workmanship and materials for the life of the meter.

All meters must be adaptable to a field programmable absolute encoder register without interruption of the customer's service.

BOLTS

All maincase bolts shall be of 300 series non-magnetic stainless steel to prevent corrosion.

DIRECT READ STANDARD REGISTER

The register shall be of the straight reading sealed magnetic drive type and shall contain six (6) numeral wheels. Registers must be roll sealed and dry. All direct reading register

cups shall be copper to prevent corrosion and be covered with a high strength, impact resistant flat glass lens to prevent breakage. The lens shall be positioned above the register box to allow for run off of debris. The register lid shall overlap the register box to protect the lens. The register retaining ring shall be designed to absorb impact from the register. Register boxes and lids shall be of high-strength synthetic polymer or approved equivalent. All registers shall have the size, model and date of manufacture stamped on the dial face. The dial shall have a red center sweep hand and shall contain one hundred (100) equally divided graduations at its periphery.

The register must contain a low flow indicator with a 1:1 ratio to disc nutation to provide leak detection.

Registers shall be secured to the maincase by means of a plastic tamper-proof seal to allow for inline service replacement. Register seal screws are only accepted when supplied with attached sealing wire to at least one bottom cap bolt with seal wire holes of not less than 3/32" in diameter.

Registers shall be guaranteed for at least ten (10) years. All meters will be guaranteed for one year on material and workmanship.

MEASURING CHAMBER

The measuring chamber shall be of a two-piece snap-joint type with no fasteners allowed. The chamber shall be made of a non-hydrolyzing synthetic polymer.

The control block shall be the same material as the measuring chamber and be located on the top of the chamber. The control block shall be located after the strainer.

The measuring chamber outlet port shall be sealed to the maincase outlet port by means of an "O" ring gasket.

The flat nutating disc shall be a single piece made from non-hydrolyzing synthetic polymer and shall contain a type 316 stainless steel spindle. The nutating disc shall be equipped with a synthetic polymer thrust roller located within the disc slot. The thrust roller head shall roll on the buttressed track provided by the diaphragm.

The chamber shall be warranted for ten (10) years against freeze damage if the meter has been equipped with a frost proof cast iron or synthetic polymer bottom cap.

STRAINERS

All meters shall contain a removable polypropylene plastic strainer screen. The strainer shall be located near the maincase inlet port, before the measuring chamber. The strainer shall also function as a device that holds the measuring chamber in place within the maincase. Straps or other types of fasteners shall not be accepted.

PERFORMANCE

To ensure accuracy, each meter must be accompanied by a factory test tag certifying the accuracy at the flows required by AWWA C700.

All meters shall be warranted as follows:

Size	Low Flow	Low Flow New Meter Accuracy	Low Flow Repaired Meter Accuracy
5/8"	1/8 gpm @ 95%	5 Yrs or 500,000 gallons	15 Yrs or 1,500,000 gallons
3/4"	1/4 gpm @ 95%	5 Yrs or 750,000 gallons	15 Yrs 2,250,000 gallons
1"	3/8 gpm @ 95%	5 Yrs or 1,000,000 gallons	15 Yrs or 3,000,000 gallons
1-1/2"	3/4 gpm @ 95%	2 Yrs or 1,600,000 gallons	12 Yrs or 5,000,000 gallons
2"	1 gpm @ 95%	2 Yrs or 2,700,000 gallons	12 Yrs or 8,000,000 gallons

Normal meter operating range shall be as follows:

Size	Accuracy Range ± 1.5%
5/8"	1/2 - 20 gpm
3/4"	3/4 - 30 gpm
1"	1 - 50 gpm
1-1/2"	2 - 100 gpm
2"	2-1/2 - 160 gpm

MANUFACTURER

Meters and meter parts shall be manufactured, assembled, and tested within the United States. Manufacturers may be required to provide proof of where and of what percentage of the meter register, chamber, and maincase is manufactured in the United States.

Manufacturers shall have a minimum of fifteen (15) years of field and production experience with all sizes and models quoted.

Manufacturers shall provide only one model of meter which complies with these specifications. Suppliers must have been manufacturing meters for at least one hundred (100) years.

SYSTEMS GUARANTEE

All meters shall be guaranteed upgradeable to the following Neptune systems without interruption of the customer's service.

- ProRead™ (ARB® VI) AutoDetect Absolute Encoder**
- E-Coder® (ARB VII) Solid State Absolute Encoder**
- R900®**
- FLOSEARCH® II**
- TRICON/E® 3**
- TRICON®**

REMOTE CAPABILITY OPTIONS

All meters shall be equipped with encoder remote registers per AWWA C707 and meet all AWWA C700 performance standards.

Acceptable meters shall be Neptune T-10 or approved equal.

COLD WATER METERS/COMPOUND TYPE SPECIFICATIONS

SPECIFICATIONS

GENERAL

All meters furnished shall be manufactured by a registered ISO 9001 quality standard facility. Acceptable meters shall have a minimum of fifteen (15) years of successful field use. All specifications meet or exceed the latest revision of AWWA C702.

LEAD FREE LEGISLATION

Federal changes are on the horizon governing the acceptable amount of lead in the drinking water system. Knowing that water meters have a life expectancy of approximately 20 years, the Utility wishes to ensure that meters purchased today will meet the Safe Drinking Water Act (SDWA) per NSF 372 that will become effective in January 2014 for the following reasons:

- The Utility wishes to assure the safety of its drinking water.
- The Utility wishes to safeguard its investment in metering infrastructure.
 - As of January 4, 2014 meter inventory that does not meet the SDWA (NSF 372) lead free requirements will have to be returned to the manufacturer or scrapped at a cost that the Utility is not willing to incur.
 - After January 4, 2014, any meters not in compliance with these requirements that are physically removed from service for testing or repair, cannot be re-installed and will have to be scrapped at a cost that the Utility is not willing to incur.

As a result, the Utility requires that all water meters submitted in this proposal be compliant with NSF/ANSI 61, Annex G and Annex F. Specifically:

- Meters shall be made of “lead free” alloy as defined by NSF/ANSI 61, Annex G and Annex F.
- Manufacturers shall provide a copy of a letter from the NSF on NSF letterhead documenting compliance with NSF/ANSI 61, Annex G which allows a maximum weighted average lead content level of 0.25% of the wetted surface area.
- Manufacturer shall provide a copy of a letter from the NSF on NSF letterhead documenting compliance with NSF/ANSI 61, Annex F which requires leaching of less than 5 µg/L in tests performed per the NSF/ANSI 61 test methodology for water with a pH of 5 and pH of 10.
- Manufacturer will provide documentation that its US-based foundry uses only lead free materials in the manufacture of its water meters. This documentation shall be signed by an authorized officer of the company.

TYPE

Compound meters shall consist of a combination of an AWWA Class II turbine meter for measuring high rates of flow and a nutating disc type positive displacement meter for measuring low rates of flow enclosed in a single maincase. An automatic valve shall direct flows through the disc meter at low flow rates and through the turbine meter at high flow rates. At high flow rates, the automatic valve shall also serve to restrict the flow through the disc meter to minimize wear.

OPERATING CHARACTERISTICS

The meters shall comply with the operating characteristics shown below:

Size	Normal Operating Range (gpm)	Maximum Continuous Flow (gpm)	Maximum Loss of Head at Max Cont Flow (psi)	Maximum Intermittent Flow (gpm)	Low Flow (gpm)
2"	1/2 - 200	160	8	200	1/8
3"	1/2 - 450	350	8	450	1/8
4"	1 - 1000	700	8	1000	1/2
6"	1 1/2 - 2000	1400	8.5	2000	3/4
6" x 8"	1 1/2 - 2000	2000	10.5	2000	3/4

SIZE

The size of meters shall be determined by the nominal size (in inches) of the opening in the inlet and outlet flanges. Overall lengths of the meters shall be as follows:

Meter Size	Laying Length
2"	15 1/4"
3"	17"
4"	20"
6"	24"
6" x 8"	55 3/8"

CASE AND COVER

The maincase and cover shall be cast from an NSF/ANSI 61, Annex G and Annex F certified lead free high copper alloy containing a minimum of 85% copper. The size, model, NSF certification and arrows indicating direction of flow shall be cast in raised characters on the maincase or cover. The covers all contain a stainless steel calibration vane for the purpose of calibrating the turbine measuring element while the meter is inline and under pressure. A test plug shall be located in the maincase or the cover for the purpose of field testing of the meter.

EXTERNAL BOLTS

Casing bolts shall be made of AISI Type 316 stainless steel.

CONNECTIONS

Maincases shall be flanged. The 2" meters shall be oval flanged and 3" size shall be round flanged per Table 4, AWWA C702.

REGISTERS

Separate magnetic-drive registers shall record the flow of the turbine and disc meters and their total will be the registration of the compound meter. The registers shall be permanently roll-sealed, straight reading indicating in cubic feet, gallons, or cubic meters. Registers shall include a center-sweep test hand, a low flow indicator, and a glass lens. The registers shall be serviceable without interruption of the meter's operation. Registers shall be guaranteed for at least ten (10) years.

COLD WATER METERS/1-1/2" - 10" CLASS II TURBINE TYPE

SPECIFICATIONS

GENERAL

All meters furnished shall be manufactured by a registered ISO 9001 quality standard facility. Acceptable meters shall have a minimum of fifteen (15) years of successful field use. All specifications meet or exceed the latest revision of AWWA C701.

LEAD FREE LEGISLATION

Federal changes are on the horizon governing the acceptable amount of lead in the drinking water system. Knowing that water meters have a life expectancy of approximately 20 years, the Utility wishes to ensure that meters purchased today will meet the Safe Drinking Water Act (SDWA) per NSF 372 that will become effective in January 2014 for the following reasons:

- The Utility wishes to assure the safety of its drinking water.
- The Utility wishes to safeguard its investment in metering infrastructure.
 - As of January 4, 2014 meter inventory that does not meet the SDWA (NSF 372) lead free requirements will have to be returned to the manufacturer or scrapped at a cost that the Utility is not willing to incur.
 - After January 4, 2014, any meters not in compliance with these requirements that are physically removed from service for testing or repair, cannot be re-installed and will have to be scrapped at a cost that the Utility is not willing to incur.

As a result, the Utility requires that all water meters submitted in this proposal be compliant with NSF/ANSI 61 Annex G and Annex F. Specifically:

- Meters shall be made of "lead free" alloy as defined by NSF/ANSI 61, Annex G and Annex F.
- Manufacturers shall provide a copy of a letter from the NSF on NSF letterhead documenting compliance with NSF/ANSI 61, Annex G which allows a maximum weighted average lead content level of 0.25% of the wetted surface area.
- Manufacturer shall provide a copy of a letter from the NSF on NSF letterhead documenting compliance with NSF/ANSI 61, Annex F which requires leaching of less than 5 µg/L in tests performed per the NSF/ANSI 61 test methodology for water with a pH of 5 and pH of 10.
- Manufacturer will provide documentation that its US-based foundry uses only lead free materials in the manufacture of its water meters. This documentation shall be signed by an authorized officer of the company.

TYPE

Meters shall be of the inline horizontal-axis type per AWWA Class II.

CAPACITY

The capacity of the meters in terms of normal operating range, maximum continuous flow, maximum loss of head, and maximum intermittent flow shall be as shown below:

Size	Normal Operating Range (gpm)	Maximum Continuous Flow (gpm)	Maximum Loss of Head at Max Cont Flow (psi)	Maximum Intermittent Flow (gpm)
1 1/2"	4 - 160	160	4	200
2"	4 - 200	200	4.5	250
3"	5 - 450	450	5	560
4"	10 - 1200	1200	5.5	1500
6"	20 - 2500	2500	5	3100
8"	35 - 4000	4000	5	5000
10"	50 - 6500	6500	3.5	8000

SIZE

The size of the meters shall be determined by the nominal size (in inches) of the opening in the inlet and outlet flanges. Overall lengths of the meters shall be as follows:

Meter Size	Laying Length	Meter/Strainer Combined Length
1 1/2"	10" (13" w/test spool)	—
2"	10"	17"
3"	12"	18"
4"	14"	21 1/2"
6"	18"	27"
8"	20"	30"
10"	26"	41"

CASE AND COVER

The maincase and cover shall be cast from NSF/ANSI 61, Annex G and Annex F certified lead free alloy containing a minimum of 85% copper. The size, model, NSF 61 certification and arrows indicating direction of flow shall be cast in raised characters on the maincase or cover. The cover shall contain a calibration vane for the purpose of calibrating the turbine measuring element while the meter is in-line and under pressure. The calibration vane shall be mounted under the register or shall be covered by a protective cap that is attached in a tamper-resistant device.

EXTERNAL BOLTS

Casing bolts shall be made of AISI Type 316 stainless steel.

CONNECTIONS

Maincases shall be flanged. 2" sizes shall be oval flanged and 3" sizes shall be round flanged per Table 3, AWWA C701.

REGISTERS

Registers shall be permanently rolled-sealed, straight reading, indicating in cubic feet, gallons, or cubic meters. Registers shall include a center-sweep test hand, a low flow indicator and a glass lens. Registers shall be serviceable without interruption of the meter's operation. Registers shall be guaranteed for at least ten (10) years.

REGISTER BOX

Register boxes and covers shall be of bronze composition. The name of the manufacturer and the meter serial number shall be clearly identifiable and located on the register box cover.

REGISTER BOX SEALING

The register box shall be affixed to the top cover by means of a plastic tamper proof seal pin that must be destroyed in order to remove the register.

METER SERIAL NUMBER

The meter serial number shall be imprinted on the meter maincase or cover as well as the register box cover.

MEASURING CHAMBER

The turbine measuring chamber shall be a self-contained unit attached to the cover for easy removal. The turbine spindles shall be stainless steel; turbine shafts shall be tungsten carbide.

UNITIZED MEASURING ELEMENT

A UME is a complete assembly, factory calibrated to AWWA standards that includes the cover, registers, and both a turbine measuring element assembly. It shall be easily field removable from the meter body without the requirement of unbolting flanges.

INTERMEDIATE GEAR TRAIN

The intermediate gear train shall be directly coupled to the turbine rotor and magnetically coupled to the register through the meter cover. All moving parts of the gear train shall be made of a self-lubricating polymer or stainless steel for operation in water.

REGISTRATION ACCURACY

Registration accuracy over the normal operating range shall be 98.5% to 101.5%.

REMOTE CAPABILITY OPTIONS

All meters shall be equipped with encoder remote registers per AWWA C707 and meet all AWWA C701 performance standards.

Acceptable meters shall be Neptune HP Turbine or approved equal.

SOLID STATE ABSOLUTE ENCODER SPECIFICATIONS

SPECIFICATIONS

It is the preference of the utility to obtain an advanced encoder-based remote metering system capable of providing electronically encoded meter information as described in the enclosed specification. Specifications for the required cold water meters can be found in the enclosed documentation. Bids should be submitted with detailed information of the features and benefits to the utility to adequately evaluate the

proposed system. Proposals without adequate information may not be considered.

DESCRIPTION – GENERAL

Integrated Unit – Pit Set

- The MIU shall be sealed in a roll-sealed copper can and glass lens to allow for submersion in a flooded pit environment.
- For pit or vault applications, the MIU shall be designed with an internal antenna.
- The device shall provide a location for a tamper-deterrent seal. Tampering with the device functions or connections shall not be possible without causing visible damage to the device exterior or to the seal.
- The device shall be capable of operating at temperatures of -22°F to +149°F (-30°C to +65°C) and operating humidity factor of 0 to 100% condensing.
- The radio circuit board and battery will be protected by a hard potting material.
- The device shall be designed for an optional remote antenna capable of being installed through the industry standard 1¾” hole in the pit lid for maximum transmission range.
- The optional through-the-lid antenna will be capable of mounting to various thicknesses of pit lids from ½” to 2½” and various distances from meters.
- The optional through-the-pit-lid antenna shall be rigid in design to withstand traffic and shall have a dual-seal connection to the MIU housing.
- The MIU device must be protected against static discharge without loss of data per IEC 801-2, issue 2.

Operation Specifications

- The MIU shall operate within FCC Part 15.247 regulations for devices operating in the 902 MHz to 928 MHz unlicensed band. The output power of the devices will be governed by their conformance to these relevant FCC standards.
- To minimize the potential for RF interference from other devices, the MIU shall transmit using the frequency hopping, spread spectrum technique comprised of alternating pseudo-random frequencies within the 902 MHz to 928 MHz unlicensed band.
- For ease of implementation, the System shall not require any special licensing, including licenses from the FCC. The System must, therefore, operate in the 902 MHz to 928 MHz unlicensed band.
- The System must be expandable at any time without getting authorization from the FCC.
- No wake-up tone shall be necessary.
- No MIU programming shall be necessary for installation.
- The MIU shall provide 8-digit reading resolution from encoded registers using either Neptune E-Coder or Sensus UI-1203 protocol in mobile as well as fixed

network data collection applications, simultaneously, without the need for programming.

- The MIU shall read the encoded register at 15-minute intervals to provide accurate leak and reverse flow detection using 8-digit resolution reads.
- The MIU shall transmit readings from the encoder that are not older than 15 minutes.
- The MIU shall transmit the meter reading continuously at a predetermined transmission interval.
- The MIU shall transmit fixed network messages every 7½ minutes – standard. No programming shall be necessary to activate transmission of fixed network messages.
- The fixed network message shall include multiple meter readings for redundancy to improve read success rates.
- The MIU shall transmit mobile messages every 14 seconds – standard. No programming shall be necessary to activate or revert to transmission of mobile messages.
- Power shall be supplied to the MIU by a lithium battery with a capacitor. The vendor shall warrant that the MIUs shall be free of manufacture and design defects for a period of twenty (20) years – the first ten (10) years from the date of shipment from factory without prorating and the second ten (10) years with prorating, as long as the MIU is working under the environmental and meter reading conditions specified.
- The number of radio-based meter reads performed must not affect the battery life.
- The battery life shall not be affected by outside erroneous wake-up tones (e.g., other water, gas, or electric utilities reading and therefore sending out a wake-up tone).
- The battery shall be a fully potted component of the MIU with no external wires.
- For reliability and meter reading integrity, the vendor shall be the sole manufacturer of the different components of the System (water meters, RF MIUs, meter reading equipment, and meter reading software) and provide a turnkey system offering to the utility.
- In the event of a cut wire, the MIU shall not send the last good read as this can lead to mis-billing. The MIU shall transmit a trouble code in lieu of the meter reading.
- Tamper – If wiring has been disconnected, a “non-reading” shall be provided indicating wire tamper; a reading that gives the last available reading is an incorrect reading.
- Each device shall have unique preprogrammed identification numbers of ten (10) characters. ID numbers will be permanent and shall not be altered. Each device shall be labeled with the ID number in numeric and barcode form. The label shall

also display FCC approval information, manufacturer's designation, and date of manufacture.

- The MIU shall transmit the encoder meter reading and a unique MIU ID number. The MIU shall interface to encoder registers using Neptune E-Coder or Sensus UI-1203 communication protocol via a 3-conductor wire without need for special configuration to the MIU.
- The MIU shall be mounted per the manufacturer's installation instructions.
- The handheld reading equipment shall provide a test mode to verify proper operation of the MIU by displaying the MIU ID number and meter reading.
- The MIU shall be capable of being received by either a handheld receiver, mobile receiver, or fixed network receiver without special configuration, programming of operation modes, or remanufacture.

These specifications cover a self-contained solid state absolute encoder register metering system designed to obtain remote simultaneous water meter registration that is guaranteed to exactly match the registration on the register odometer. The metering information shall be obtained through a remotely located receptacle or Meter Interface Unit (MIU) using a compatible data capture system. The above system shall be configured as follows:

- Solid-state absolute encoder meter register — Direct mounting, electromagnetically encoded measuring element into an electronic solid-state odometer. Encoder shall provide value-added flow data including leak, tamper and back flow detection when connected to a compatible RF AMR MIU. Batteries and digital counters using volatile memory are not allowed. Encoder register shall display flow rate information at the register.
- Remotely mounted receptacle or MIU providing a communication link for the transmission of information from the register.
- Data acquisition equipment with which the above components can be interrogated. Such equipment shall be configured in two types:
 - A device that captures information and displays it visually to confirm correct system installation and wiring.
 - A device that is pre-programmed with route information and is capable of storing collected data in solid-state memory. This device shall also electronically transfer the data for use by the utility billing computer.

ENCODER REGISTER UNIT

Registration

- The register shall provide at least a nine-digit visual registration at the meter.
- The unit shall provide an eight-digit meter reading for transmission through the radio MIU.
- The dial shall have a high resolution nine-digit LCD display for meter testing.
- The register shall employ a visual LCD leak detection indicator as well as provide remote leak detection through an ASCII format to the RF AMR/AMI MIU.
- The register shall provide reverse flow detection, communicated as ASCII format data to the RF AMR/AMI MIU.

- Reverse flow detection shall be calculated based on 15-minute interval consumption.
- The register shall provide an indication of days of zero consumption, communicated as ASCII format data to the RF AMR/AMI MIU.
- The manufacturer will guarantee that the reading obtained electronically matches the LCD odometer reading on the register and that the manufacturer will pay the difference at the current rate whenever a discrepancy appears.
- The register should accumulate and register consumption without connecting to a receptacle or MIU.
- The register shall display flow rate information.

Mechanical Construction

The registers should be manufactured in two different versions; one for inside set application and one for pit set.

Inside Set Version

- The unit must be constructed of high-strength polycarbonate and possess a hermetic sonic weld seal. Registers for inside set applications should be oil-free designs.
- The register shall be attached to the meter case by a bayonet attachment. Fastening screws or nuts shall not be required. A tamper proof seal pin shall be used to secure the register to the maincase.
- The register shall be removable from the meter without disassembling the meter body and shall permit field installation and/or removal without taking the meter out of service.
- Provision shall be made in the register for the use of seal wires to further secure the register.
- Terminal screws must be accessible on the register for transmission wire connection to the remote receptacle or a future AMR system. A permanently potted wire connection shall be available for pit set meters applications.

Pit Set Version

- The unit must be constructed in a roll-sealed copper shell and glass lens assembly.
- The register shall be attached to the meter case by a bayonet attachment. Fastening screws or nuts shall not be required. A tamper proof seal pin shall be used to secure the register to the maincase.
- The register shall be removable from the meter without disassembling the meter body and shall permit field installation and/or removal without taking the meter out of service.
- Provision shall be made in the register for the use of seal wires to further secure the register.
- Terminal connections must be permanently potted so that the terminal cover cannot be removed.

Electrical Construction

- The solid-state absolute encoder register shall incorporate an Application Specific Integrated Circuit (ASIC) and firmware designed to verify accurate measurement, information transmission, and data integrity.
- Connection shall be made to the register by three screw-type terminals sonically inserted into the register top. Access to the terminals shall be available to all models of register with the exception of a permanently potted version. A port cover shall be provided to cover the terminals after they have been wired.

Meter Reading Information

- The solid-state absolute encoder register shall provide to the reading equipment an eight-digit meter reading. An identification number of up to 10 digits shall be provided with each reading when read using a probed reading device.
- The solid-state absolute encoder register shall provide additional value-added information remotely when connected to a radio MIU (i.e. detailed leak detection data, days of leak state, days of no consumption, and back flow indication). This information shall be communicated through the encoder protocol and RF MIU to the route management software to allow the seamless integration of data into a CIS package.

REMOTE RECEPTACLE

Mechanical Construction

- Where indicated, a remote receptacle must be provided for attachment to a pit meter lid with another unit also designed for attachment by wall mounting.
- The materials employed shall be corrosion resistant, resistant to ultraviolet degradation, unaffected by rain or condensation, and compatible with rugged service and long life.
- The pit receptacle shall be mounted in a single 1 $\frac{3}{4}$ " hole in the pit lid while not extending more than 4 $\frac{1}{2}$ " into the pit.
- The pit-mounted receptacle shall be provided with a minimum length of six feet of wire connected and sealed at the receptacle without terminal exposure.

The remote receptacle shall not contain a battery unless it is a radio MIU.