RFP # AMI -17-06-01

REQUEST FOR PROPOSAL/COMPETITIVE SEALED BID

ADVANCED METERING INFRASTRUCTURE SYSTEM

(AMI)

6,400 METERS APROX.

DISTRICT AREA:

SOUTH PADRE ISLAND, PORT ISABEL, LAGUNA VISTA AND LAGUNA HEIGHTS.

COSTS REQUIRED BY CYLES

RFP SCHEDULE:

ADVERTISING ON JUNE 25, JULY 2 AND 9, 2017.

MANDATORY PRE-BID MEETING ON JULY 3, 2017 AT 10:00 AM

DEADLINE TO PARTICIPATE: JULY 17, 2017 AT 10:00 AM

BID OPENNING ON JULY 17, 2017 AT 10:30 AM

Finance Department

AMI SYSTEM REQUEST FOR PROPOSAL/COMPETITIVE SEALED BID

1 INTRODUCTION AND BACKGROUND

The Laguna Madre Water District (District's), is soliciting proposals for a Hybrid Advanced Metering System in an effort to improve the process of collecting water meter reading data; detect tamper and theft, as well as other alerts; also provide the capability to safely conduct disconnection and reconnect water services remotely, and provide customer-side leak detection at all meter locations; and improve the billing process and customer service by providing alerts and other management tools. It is the intent of this project to maintain the option to read metering devices using mobile collector and/or fixed collectors without the need to change technology in the field devices. Support of an integrated consumer-facing web portal shall provide water customers with access to usage information, alerts and budget management tools.

Should the LMWD opt for fixed network at any time, the system must support optional conversion of some or all meter services to a fixed collector network. This network must also be capable of supporting acoustic sensors used for the identification of leaks throughout the distribution piping network and autonomously provide correlated leak locations as well as notify LMWD staff of significant changes. LMWD will be selecting a technology that is future proof as technology changes.

Vendors that have the ability to communicate with and upgrade the field devices through the use of an open standards protocol network without changing hardware will be considered advantageous.

The District's mission is to provide the most economical and reliable service possible for our customers. District's expects the proposed AMI system will serve as a vital tool for achieving this vision while moving forward with other business process improvements. The AMI system and meter replacement project is expected to provide an information technology which will:

- Increase meter accuracy by replacing approximately 6,500 of the LMWD's existing water meters.
- Provide LMWD customers with timely information.
- Significantly enhance service to LMWD customers through:
    - Improved billing accuracy
    - Faster response to customer needs and inquiries
    - More efficient customer service
    - Remote Disconnect
    - Two Way Communication
    - Leak Detection
    - Immediate Profiles
- Improved reading data reliability.
- Improve the [Utility]'s operational efficiency and reduce costs through interval data from water meter reads for right-sizing programs, notification of leaks, tampering, and theft.
- Optionally have the capability to detect and alert LMWD staff to distribution leak events before they become costly emergencies. The system shall have the ability to provide a visual representation of leak status and automatically perform correlation to a precise distribution leak location.

The successful respondent will be selected using criteria set forth later in this RFI and based on the proposer's ability to meet the District's vision for the future.

1.1 Utility Background

The LMWD has an inventory of nearly 6,500 water meters. Of these, approximately 6,500 will be replaced with new water meters equipped with encoder registers and AMI radio modules.

Currently, the LMWD collects meter readings through the use of the following existing technologies and manufacturer(s):

- Manually reading meters and entering reads into [Manufacturer]'s handheld computing device(s).
- Touch probe collecting meter readings into [Manufacturer]'s handheld computing device(s).
- Walk-by radio collection of meter readings into [Manufacturer]'s handheld computing device(s).
- Mobile radio collection of meter readings into [Manufacturer]'s laptop computer mounted in a vehicle.
- Listing of other [Manufacturer]'s technology.

The LMWD is interested in a fixed location distribution leak detection system with the ability to operate under open architecture radio communication network or via a cellular network technology. LMWD has a leakage rate of approximately 3%. Additionally, typically 456 bursts occur per year and 600 leaks are repaired each year.

- Refer to the electronic file which accompanies this document for the locations of all fire hydrants and valve boxes in the distribution main network. The file also contains information on the pipe material and diameter. This is to be used to determine the locations and quantities of leak detection sensors for the leak detection system
- Currently, the LMWD relies on a combination of a leak detection survey program and customer calls to identify distribution main leaks and/or bursts.

1.2 Service Territory

In order to convey the service territory size, footprint and topographical characteristics, detailed files are being provided to plot the location of meters within the current service area to aid proposers with estimating the number of data collectors required to cover the area. **Other network devices, such as remote disconnect meters and leak detection sensors will also be within the service area. We currently offer service to Laguna Vista/Laguna Height, Port Isabel and South Padre Island. The billing is issued by Cycle I, II and III, respectively.**

Please refer to the electronic files which accompany this RFI for a listing of all meter locations, manufacturer, age, size and type of register of all meters currently deployed on each water service within the service area of the District. This list is provided for the proposer to assess the retrofit and replacement options for existing meters. All files must be used solely for the express purpose of determining system characteristics and shall not be shared or distributed to others without the express permission of the LMWD.

- The attached electronic file (or printed) map depicts the square miles service territory of the District.
- See the attached electronic file for a complete list of meters, types and sizes with the latitude and longitude coordinates for the service location, including street, city, and zip code that should be used to plot the service territory of the LMWD.
- If fixed network is to be proposed, see the attached electronic file for a list of potential locations that the LMWD owns or has access to which may provide suitable mounting locations for the data collectors. The sites that have local power available are listed accordingly. The physical street address or alternately the longitude and latitude coordinates are listed. Additional sites may be considered at the vendors' request.

1.3 Project Implementation

Immediately upon receipt of a Notice to Proceed, the Vendor shall develop and submit a critical path schedule. This schedule shall reflect the work authorized by the LMWD under the schemes described herein. This schedule must be approved by the LMWD prior to the commencement of work. A mutually agreed upon critical path schedule will become an integral part of the contract and will be used to assess contract performance and

measure progress. It may also be used to declare the Vendor in default of this contract. In the event a mutually agreeable schedule cannot be produced, this contract shall become null and void.

1.4 Instruction to Vendors

THE GENERAL TERMS AND CONDITIONS WHICH FOLLOW APPLY TO ALL PURCHASES OR SERVICES AND BECOME A DEFINITE PART OF EACH FORMAL INVITATION TO PROPOSE, PURCHASE ORDER, OR CONTRACT ISSUED BY DISTRICT, UNLESS OTHERWISE SPECIFIED. BY SUBMITTING A PROPOSAL, THE VENDOR AGREES TO BE BOUND BY THESE TERMS AND CONDITIONS. VENDORS OR THEIR AUTHORIZED REPRESENTATIVES ARE EXPECTED TO FULLY INFORM THEMSELVES OF THE CONDITIONS, REQUIREMENTS, AND SPECIFICATIONS BEFORE SUBMITTING PROPOSALS. FAILURE TO DO SO WILL BE AT THE VENDOR'S OWN RISK AND WILL NOT SECURE RELIEF ON THE PLEA OF ERROR.

2 AMI MODULE TECHNICAL SPECIFICATIONS

2.1 AMI Water Module Requirements

2.1.1 The AMI water module shall be capable of receiving meter data from existing water meters equipped with absolute encoder registers, such as Master Meter, Elster/AMCO, Mueller Systems, Hersey Meters, Badger, Neptune and Sensus which utilize absolute encoder output protocol meeting AWWA standards. Pulse-type register and accumulator technologies shall not be accepted.

2.1.2 Each module shall have the ability to operate in a hybrid fashion, whereby it may be deployed in either a mobile or fixed network environment and require no programming to switch from one to the other. The endpoint shall also switch modes automatically upon detection of either a network collector or, if none is present, revert operation to mobile mode.

2.1.3 AMI modules for connection meters and registers, remote disconnect meters, repeaters and other related network devices shall be capable of being configured to communicate with collectors in a modifiable star-type network topographical architecture. Repeaters may be used within the network to support the forwarding of meter data to collectors.

2.1.4 System radio components must communicate using an open standard communications protocol and have a minimum output of 13 dBm radiated power for mobile and 20 dBm radiated power for fixed network mode, operating within the unlicensed 902 to 928 MHz frequency range. The endpoint shall be comply with FCC Part 15 rules and utilize direct sequence spread spectrum for data transmissions.

2.1.5 All system radio components shall incorporate open architecture communications technology such as established by the LoRa® Alliance, that support the use and interoperability of third party devices which can bring added value to the system. Please describe these capabilities in detail.

2.1.6 The AMI module shall be designed and built for installation in outdoor environment with mounting options for mounting through the lid of water meter boxes and above ground discretely on a wall, to limit required inventory for various installations.

2.1.7 AMI modules shall be housed in a single package designed for rugged, harsh environments and capable of wide ranging temperatures and high humidity (zero (0) to one hundred (100) percent) for extended periods of time without damage. Describe moisture barriers which protect all electronic components within the proposed AMI Module.

2.1.8 The AMI module must function accurately and reliably while not being damaged over an operating temperature range of negative forty (-40) degrees Centigrade to seventy (70) degrees Centigrade.

2.1.9 The AMI modules shall be designed to operate in the above conditions while maintaining a battery life of twenty (20) years...

2.1.10 Battery status shall be transmitted to the user interface with alerts of low battery levels for preemptive maintenance at least six months in advance of failure.

2.1.11 Each AMI module shall be adaptable to function together with collectors and repeater devices as a true two-way network that allows the remote configuration and firmware update of each.

2.1.12 Module must support requests of hourly meter readings for up to 105 days.

2.1.13 The AMI module shall be capable of storing meter data, including hourly meter readings, alarms, as well as date and time stamps, for a minimum of one hundred five (105) days in non-volatile memory. Devices that can store more than 120 days will be considered advantageous.

2.1.14 AMI modules shall be capable of operating on the same network as other functional devices such as meter service shut-off valves and acoustic leak detection devices for distribution mains that can be monitored and configured remotely from the user interface.

2.1.15 The AMI module must report batch readings on a scheduled basis, typically daily (i.e. one daily report including twenty-four (24) hourly readings) and shall be remotely configurable by the utility through the host software application.

2.1.16 The AMI module shall have the capability to receive and process commands from the host for firmware updates to eliminate the need of manually performing the update functions by replacing AMI modules.

2.1.17 The AMI Module shall employ actionable alerts. Please indicate compliance with each below:

- Tamper or Meter Disconnected
- Bad Read or – "?" or "–" marks in register message
- Small Customer-Side Leak Detected
- Large Customer-Side Leak Detected
- No Flow detected – Specific period of time set in the host software
- Reverse Flow / Backflow
- High Flow Rate Detected – Specifics set by host software
- Battery Health
- Register tamper detection alert
- Register removal alert

2.1.18 When operating in fixed mode, the AMI module's clock date & time settings shall be updated to match a reference time from the global positioning system ("GPS") via GPS-equipped network collector(s) and have the ability to maintain synchronization to within 15 milliseconds.

2.1.19 AMI modules shall have the ability to be read utilizing a mobile collection device. The module must be able to be read automatically by the mobile collection device if the fixed network infrastructure has an interruption in service. The modules are required to be read in the same manner as a drive by network at posted residential speed limits.

2.1.20 Modules must be able to operate an automated shut off valve by using a mobile collection device in the event the fixed network service is interrupted.

3 INSTALLATION DEVICES

3.1.1 Handheld computing devices shall be used to gather installation data and automatically upload data to the host server via cellular or other Wide Area Network (WAN) capability. No field programming of AMI module shall be required.

3.1.2 The handheld computing device must have an internal GPS receiver capable of collecting coordinates with accuracy to within three (3) meters of the target location.

3.1.3 The handheld device shall have an integrated camera and barcode scanning capabilities.

4 AMR System Technical Specifications

The host billing system will supply all route information such as account number, current reading, high/low range and other data elements. This eliminates the need to maintain redundant data files and avoids opportunity for introduction of errors conflicting with the host system. The Meter Reading Route Management Software shall load and unload data into collection devices and allow reporting of collected data. Collected data will then be transferred back to the host billing system.

The software package provided shall meet each of the following provisions:

4.1 System Overview

4.1.1 Provide a standard interface for utility billing systems as well as the ability to adapt to existing billing system interfaces as stipulated in section 1.0

4.1.2 Output this route data for reading to the user's choice of any or all of the following types of collection devices:

- Handheld Computer for visual read and entry via alphanumeric keypad
- Handheld Computer with wand/probe for touch pad reading
- Handheld Computer/Radio Receiver for radio reading
- Laptop Computer with radio receiver for mobile radio reading

4.1.3 Support the use of manual entry, touch pad read and offsite (walk by) radio read technology to be implemented as needed within the same route, giving the utility the maximum flexibility in use. Mobile (drive by) radio read equipment shall be supported in separate routes.

4.1.4 Support radio frequency data collection from one-way open architecture radio modules that are compatible with current style remote meters from the following meter manufacturers: AMCO, Badger, Hersey, Neptune and Sensus.

4.2 Computer Platform

4.2.1 Be designed to operate within any of the following operating systems: Windows XP or Vista.

4.2.2 Be a Microsoft™ Windows application, which is designed meeting the Open Systems Foundation goals. The data utilized in the application shall be compatible with a host of other management and office applications such as spreadsheet and database tools.

4.2.3 Be capable of running on a computer that meets or exceeds the following minimum requirements: 1.6 GHz Processor or faster, 512 MB of RAM, 2GB of free available hard disk space, 17" SVGA monitor, CD-ROM drive, mouse, and standard COM1 and COM2 serial ports and USB 2.0 for handheld communications.

4.3 Communications – PC to Laptop Computer

4.3.1 Permit the transfer of data and generation of reports.

4.3.2 All communications during upload and download of laptop computer shall be extensively error checked to ensure data integrity.

4.3.3 The system shall load/unload reading data from mobile laptop computer by flash card or serial connection.

4.4 Functions & Features – Handheld reading

4.4.1 Provide the ability to read and search specific MIUs.

4.4.2 Display battery life information for the MIU.

4.4.3 Display signal strength information for the MIU.

4.4.4 Display leak, back flow, no flow, and wire tamper information for the MIU.

4.5 7.0 -Functions & Features – Mobile RF reading

4.5.1 Function with minimal required interaction by the operator to ensure safety while driving. Allow easy viewing of read or unread accounts.

4.5.2 Show route status including number of meters read, unread and percentage complete. Allow reading of multiple routes at one time.

4.5.3 Stamp meter readings with time and date of read. Time/date information shall be passed to the host billing system in the format requested by the host billing system.

4.5.4 Allow for standard reporting through built in reports.

4.5.5 Verify data integrity in every message.

4.5.6 Have the capability to connect to the utility network to upload/down load meter reading routes.

4.5.7 Support Windows XP or Vista software with a notebook computer supplied by the utility.

4.5.8 Be capable of reading up to 50,000 accounts a day when reading multiple routes at one time.

4.5.9 The system must indicate visually to the operator if the laptop computer loses communications with the radio receiver during operation.

4.5.10 Have a light weight (less than one pound) receiver in a case built for durability and ruggedness.

4.5.11 Have mapping capabilities. Mapping screens must distinguish completed portions of a route from those yet to be read, for example with the use of color or icon removal.

4.5.12 Be updated dynamically, identifying the remaining portion of the route to be read. Sorting of the remaining modules by street and route sequence number is required.

4.5.13 Operate as a receiver only (one-way unlicensed mode, 902-928MHz. In bubble up mode, the collection device must operate in one-way radio transmission mode and continually receive meter readings without transmitting a wake-up call. The collection device will receive encoded meter readings, leak detection, backflow, no flow, tamper information and duration for events on a radio frequency that does not require an FCC license.

4.5.14 Have mobile collection components that are lightweight and portable. They must mount temporarily in the meter reading vehicle. No dedicated vehicle(s) must be required.

4.5.15 Power connections must be furnished from an auxiliary power supply (cigarette lighter) to the mobile collector and the antenna must be magnetically mounted on the roof of the vehicle for ease in transport from vehicle to vehicle.

5 AMI NETWORK TECHNICAL SPECIFICATIONS

5.1 Gateway Data Collectors and Support Infrastructure

Gateways are to support the operation of the selected system by being complimentary to a hybrid deployment of both mobile and fixed network endpoints throughout the LMWD/service area and comply with the following requirements:

5.1.1 The Gateway data collectors shall be universal AC/DC powered units with battery to support autonomous operation with a minimum of four (4) hours of backup power and must have options for solar power. Collectors must be able to be easily reconfigured in the field should there be a need to switch a collector from AC to DC power or vice versa.

5.1.2 Gateway data collectors must be able to communicate with all AMI modules, network repeaters and ancillary devices within an assigned area with one (1) watt of power and use spread spectrum technology within the unlicensed 902 to 928 MHz ISM band of frequencies.

5.1.3 All system radio components shall incorporate open architecture communications technology such as established by the LoRa® Alliance, that support the use and interoperability of third party devices which can bring added value to the system. Please describe these capabilities in detail.

5.1.4 The collector shall communicate via Wide Area Network (WAN) connections, such as cellular or Ethernet to allow communication with the host servers and software. Collectors will have the capability of switching communications mode even after being deployed in the field.

5.1.5 Gateway data collectors shall receive and forward meter data from all AMI modules and other network devices within the assigned coverage area at defined intervals, then communicate any recent data to the host server at least once per hour. Collector communication intervals shall be configurable by the LMWDthrough the host software.

5.1.6 The Gateway data collectors shall communicate on demand to AMI Modules, Repeaters and other related endpoint devices via versatile network architectures.

5.1.7 The Gateway data collector host software shall allow self-diagnosis of problems associated with the communication network and the ability to automatically seek an alternate communication path if initial daily or real-time upload is unsuccessful.

5.1.8 The Gateway data collectors shall use 128-bit state-of-art data security techniques to prevent unauthorized access to the data.

5.1.9 The gateway data collectors shall have the ability to time synchronize all devices to GPS clock a minimum of once per day to within 15 milliseconds and allow daily upload of meter data and system health checks. The gateway collector shall report the error to the host software for user notification.

5.1.10 The gateway data collector shall allow remote firmware and software upgrades to all network devices.

5.1.11 The gateway data collector shall utilize an outdoor NEMA4 enclosure, be rated for minus forty degrees Celsius (-40C) to eighty-five degrees Celsius (85C), with remote antenna capability and ability to be pole or wall mounted.

5.1.12 If the AMI vendor is recommending a mixed network of AMR/AMI the vendor must explain in detail the process of combining the data in a single user interface. In addition, the vendor must also explain the limits of AMI network coverage.

5.2 Head End Host Software and User Interface (fixed network operation)

5.2.1 The host server shall act as the central collection point for all data within the system. The server collects data from the gateway collectors and stores the gathered data in a secure database. Once data is stored and analyzed by the host server and software, the data shall be available for display via an easy to use web based graphical user interface.

5.2.2 The vendor shall provide a managed hosting service, where the Vendor shall own and manage the server hardware and software, including monitoring, to ensure the server operates according to industry best practices and performance standards. Hosting shall be in a secure, environmentally controlled facility with redundant failover communication and power systems that provides support services twenty-four (24) hours per day, seven (7) days per week and certifies better than 99.9% uptime. The Vendor hosted solution shall utilizes a secure web-based application as the User Interface.

5.2.3 As an alternate to hosting services, the vendor shall also offer, as an option, a perpetual license for the host software. The host software solution shall utilize a secure web-based application user interface which will be operated on the utility's own servers on-premises.

5.2.4 Data shall be presented via a graphical user interface that will allow for system health and data analysis, as well as providing meter reads for utility bill generation.

5.2.5 The host software server shall manage and archive data for at least twenty five months such that it can be accessed by any utility computers or portable computing devices, both locally and remotely via the web. All relevant meter data maintained on the hosted servers shall belong to the Utility.

5.2.6 The host system software must be web browser-based using Thin Client Architecture and shall have defined applications with standard interfaces to allow for existing and planned software applications. At a minimum, there shall be a hosting interface, map application for asset, leak and alarm management, as well as a customer facing web portal for rate payers to view or manage their usage and alerts.

5.2.7 The host software must have flexible meter reading data formats which are compatible with the utility's billing application. Interoperability must be capable of tight integration whereby minimal effort is required to maintain database updates for either the billing or host software.

5.2.8 The host software shall capable of generating reports, viewing demand graphs, determine usage patterns and enforce watering restrictions. Data will be easily exported to files supported by other applications such as Microsoft Excel or Adobe Acrobat.

5.2.9 Using information from alerts uploaded within each record, the host software shall have the ability to generate specific e-mail alerts or SMS messages for each status code which may configured through the user interface. Utility staff shall be able to view alerts and other pertinent GIS type information through an ESRI based map application via the web.

5.2.10 Alerts generated by an AMI Module shall be accompanied by the time of the event, which shall be stored and optionally forwarded by the server in the notification message. Further, user shall have the option to have the alert status report each interval in which it is true and have the option to report when the condition has cleared and reset the alert status to normal.

5.2.11 The user interface shall permit the sending of alert messages regarding high use, tampering, and other system operating parameters to appropriate utility personnel via cell phone SMS (text) or e-mail.

5.2.12 The user interface shall allow the utility to correlate consumption with meteorological data obtained from NOAA or other reliable source and made available within the user interface.

5.2.13 Data shall be stored for a minimum of twenty-five (25) months as directly accessible history and have options for archival beyond this period. Vendor shall state compliance and options for archival of data.

5.2.14 Three-tier architecture shall be utilized whether in the data center or on-premise. Web servers accessed by the customer shall be separated by a firewall from the web servers where the host software resides. Roles for users shall restrict access to certain functionality based upon user account configuration. Security of data messages shall be provided for data actually sent through the network to a meter by using an encryption key. All passwords in the database for system access are encrypted and system accesses utilize TLS (Transport Layer Security) with 1024 bit keys to secure and encrypt all web access to the host user interface.

5.2.15 Proposed system must include the capability of supporting acoustic leak detection devices placed throughout the distribution network. Software shall have the capability of providing data and presenting correlated locations of indicated leaks on an ESRI based mapping platform.

5.2.16 Proposed system must include a revenue protection module that includes District Metering Areas and other ways to prevent loss of revenue.

5.2.17 Proposed system must include a territory map with all the endpoints and their alert status.

5.2.18 Proposed system needs to allow users to configure the information they want to see in the account listing page. The user preferences must be saved on their profile and the system automatically remembers the configuration every time the user logs in.

5.3 User Interface Consumer Portal

5.3.1 The vendor shall offer a secure, web-based customer facing application for utility customers to access their own consumption, billing data, use management tools and alerts.

5.3.2 The utility customers shall have access to reports for yearly, monthly and hourly data, and be able to set parameters which trigger email when usage exceeds set parameters, either in dollars and/or volumetric units.

5.3.3 Consumption data shall be correlated with meteorological local temperature and precipitation.

5.3.4 Reports shall be available in graphical and tabular views for reading, consumption, and billing approximations coinciding with date ranges selected by users.

5.3.5 Utility shall have a software access portal to perform maintenance, set rate schedules and post user videos or bulletin board messages to consumers with the service area.

5.4 Server Head End Hardware

5.4.1 Vendor shall provide the options for local or off-site software and server solutions. The application and data servers shall be an Intel and Windows based Microsoft SQL server. If managed by the vendor, server and application software shall reside in a secure, Tier-3 hardened third-party data center monitored by the system provider. The data center shall have multiple power and communications channels as well as fully redundant fail-over locations to support disaster recovery.

5.4.2 The host software and data shall be accessible with a secure utility or customer login and password to view the system data from any web enabled device.

5.4.3 All network communication shall use latest IPv4 or later protocols and support AES encryption with 256-bit keys on the VPN connection to the servers. The system shall also support 128-bit encryption on the cellular network connection along with any proprietary protocols.

6 TRAINING AND IMPLEMENTATION

6.1.1 The vendor shall be responsible for supplying and delivering the AMI system components complete, including training and ensuring the proposed AMI system is operational prior to full deployment. This includes, support for the development of an interface to the utility billing system and functional testing of the system.

6.1.2 The vendor shall have a proven program of professional project management to ensure successful system installation. Provide resumes for key managers to be involved in this project.

6.1.3 Project managers must be experienced in managing the design, installation and optimization of proposed system. Project management experience shall include system integration, training and system support.

6.1.4 Provide sample implementation and training plans based upon a systems similar to the one being proposed.

7 NETWORK ACCESSORIES

7.1 Acoustic Leak Detection (ALD) Modules

The selection by the LMWDof an AMI network is a large capital investment. In order to increase the value to the utility, the network must also support a Permanent Leak Detection Monitoring System for the distribution main pipe network. The system will be used for detecting and locate ng leaks in cast iron, ductile iron, steel, asbestos cement and concrete pipes with diameters of 2 inch through12 inch. Preference will be given to vendors who offer a single-source manufacturing for all hardware and software.

For the supply, commissioning and maintenance of the Permanent Leak Detection System, the leak sensors, shall monitor acoustic noise in the water pipes, analyze the noise characteristics and detect and identify the presence of leaks. The acoustic sensors shall have an automatic correlation function whereby correlation data files are automatically sent to the server for correlation analysis of a suspected leak. **Systems that involve manual correlation or require additional, external or third-party hardware or software to gain correlative functionality will be considered non-compliant.**

7.1.1 The server shall be able to receive the message transmitted from the leak sensors. Any suspected leaks based on the correlation data files shall be identified on the user interface on a daily basis. The data shall be stored on the server for viewing and analysis.

7.1.2 The ALD modules shall incorporate the same AMI module radio component as other endpoints in the radio network.

7.1.3 The leak detection system shall use existing fire hydrants to house the leak detection sensors and gather leak detection data on the distribution pipe network. Preference shall be given to a leak sensor that is integrated within the fire hydrant so as not to be affected by vandalism or other damage

7.1.4 The proposed system shall come with a web-based user interface that is integrated with other endpoints on the radio network, including water meters.

7.1.5 The leak detection sensors shall have the capability to automatically perform a spectral analysis comparing baseline noise and comparing them to previous samples will be performed daily to detect changes.

7.1.6 To minimize false positives, the system shall have the capability to perform correlation analysis as a secondary level of leak detection. This will also determine the location of a suspected leak.

7.1.7 The accuracy of a located leak shall be up to 6 feet from the confirmed leak location.

7.1.8 The leak detection sensors shall have a battery life of at least 5 years.

7.1.9 The server software shall have leak detection analysis and decision support features:

- Graphic display of sensors and leak alarms (including actual position) on map
- Ability to choose historic dates and display results of correlation and leak alarms on map for comparison
- Historic analysis of key parameters for several months to monitor network performance
- Generated leak reports shall have email and print function
- Correlation history to display all values of leak in the list area that are displayed on the map.

8 SYSTEM INSTALLATION

8.1 Meter and System Installation

8.1.1 Describe involvement and time requirements for utility personnel during the installation and deployment of the meter reading system.

8.1.2 Provide a sample project plan and schedule in Gantt chart format which highlights major deliverables and deadlines of the installation and deployment of the AMI System.

8.1.3 Vendor to provide three (3) last references from previous customers where the proposed system installed and deployment proved successful. Please include utility name, current progress of the project, total project and date of completion.

8.1.4 Installer to provide three (3) references from previous customers where the installation of water meters and systems proved successful. Please include utility name, current progress of the project, total project and date of completion.

8.1.5 Describe basic installation process and include data tracking and quality assurance procedures utilized to assure data collection, customer service quality, and data accuracy during the implementation phase of the project.

8.1.6 Provide an organization chart which shows the project management team and field team members that will be carrying out the installations. Include the company, individual names and titles of each person.

8.1.7 Include an industry specific resume for each person responsible for the management of the overall project and installation process.

8.1.8 It is imperative that utility customers be informed of upcoming replacement of their water meter and installation of the AMI module. Explain processes to be employed which will minimize issues and when issues arise, how contractor will address them.

8.1.9 Scrap meters replaced by the contractor shall be returned to the Utility.

9 SYSTEM WARRANTY

Provide all standard published warranties and any services, including additional costs, your firm will offer to ensure system functionality and availability of system components for fifteen (15) years. At a minimum, a one hundred (100) percent warranty on all equipment, software and labor on the AMI system will be in effect during the first twelve (12) months following commissioning and acceptance.

Provide a price for software support and upgrades available following the initial warranty period.

Provide all standard published warranties and any services, including additional costs, your firm will offer to ensure system functionality and availability of system components for 15 years. At a minimum, a 100% warranty on all equipment, software and labor on the AMI system will be in effect during the first 12 months following commissioning and acceptance as outlined in this agreement.

Provide a price for software support and upgrades available following the initial warranty period.

10 WATER METER REGISTER SPECIFICATIONS

10.1 Water Meter Compatibility

The Utility is committed to selecting a technology which provides the most efficient, cost effective and flexible solution. The selected system must be capable of receiving meter data from existing water meters equipped with absolute encoder registers, such as Master Meter, Elster/AMCO, Mueller Systems, Hersey Meters, Badger, Neptune and Sensus which utilize absolute encoder output protocol meeting AWWA standards. Pulse-type register and accumulator technologies shall not be accepted.

10.2 Electromechanical 6-Dial Absolute Encoder Register

10.2.1 The register shall be a true absolute encoder register which provides direct electronic transfer of meter register information to the AMI Module. The register of choice shall be Mueller Systems Translator register or equal. Data shall include:

- Register ID (minimum of eight digits)
- Meter Read (minimum of six dials)
- Reading Errors (number wheel location error, etc.)

10.2.2 The encoder register shall send data in ASCII format (American Standard code for Information Interchange) to the AMI Module.

10.2.3 The encoder register shall transmit the complete odometer wheel reading, a minimum of six (6) digits, all ten (10) dial positions of the number wheels, plus at least an eight (8) digit register identification number that has been factory set and never duplicated.

10.2.4 Encoders shall use a non-contact position reading technology so as to prevent drag and wear of critical electronic parts.

10.2.5 When an AMI Module interrogates the encoder register, a microprocessor within the register shall determine the true position of all number wheels, encode the reading then send it to the AMR device.

10.2.6 A method of preventing register reading ambiguity shall be utilized so as to eliminate reading errors due to number wheels being in unreadable positions which would cause the register to forward reading error code.

10.2.7 The encoder register shall be permanently factory sealed with epoxy potting of all terminal connections. Encoder registers requiring field sealing or field splices of the wire connection will not be allowed.

10.2.8 The register must conform to the most current revision of AWWA C-707.

10.2.9 No wire connections or wire splicing of any kind shall be required during installation.

10.2.10 In-line waterproof (Nicor or Itron) connections shall be permissible when required to facilitate installation.

10.2.11 Registers shall be secured to the meter main case by a tamper resistant bayonet-style locking mechanism and an unobtrusive security pin, protecting against unauthorized removal of the register.

10.2.12 No special tools shall be required to remove the register.

10.3 Electromechanical 8-Digit Absolute Encoder Register for 5/8 Inch through 2 Inch Positive Displacement Meters

(To be used after introduction of the ME-8 register which will begin in January (smallest to largest) and include all sizes of PD meters by October 2017)

10.3.1 The register shall be a true absolute encoder register which provides direct electronic transfer of Meter register information to the AMI Module. The register of choice shall be the Mueller Systems ME-8 register or equal. Data shall include:

- Register ID (minimum of ten digits)
- Meter Read (minimum of eight dials)
- Reading Errors (number wheel location error, etc.)

10.3.2 The encoder register shall send data in ASCII format (American Standard code for Information Interchange) to the AMI Module.

10.3.3 The encoder register shall transmit the complete odometer wheel reading, a minimum of eight (8) digits, all ten (10) dial positions of the number wheels, plus at least a ten (10) digit register identification number that has been factory set and never duplicated.

10.3.4 Encoders shall use a non-contact position reading technology so as to prevent drag and wear of critical electronic parts.

10.3.5 When an AMI Module interrogates the encoder register, a microprocessor within the register shall determine the true position of all eight number wheels, encode the reading then send it to the AMR device.

10.3.6 A method of preventing register reading ambiguity shall be utilized so as to eliminate reading errors due to number wheels being in unreadable positions which would cause the register to forward reading error code.

10.3.7 The register must conform to the most current revision of AWWA C-707.

10.3.8 The encoder register shall be permanently factory sealed with epoxy potting of all terminal connections. Encoder registers requiring field sealing or field splices of the wire connection will not be allowed.

10.3.9 No wire connections or wire splicing of any kind shall be required during installation.

10.3.10 In line waterproof (Nicor or Itron) connections shall be permissible as required to facilitate installation and field investigations.

10.3.11 Registers shall be secured to the meter main case by a tamper resistant bayonet-style locking mechanism and an unobtrusive security pin, protecting against unauthorized removal of the register.

10.3.12 No special tools shall be required to remove the register.

10.4 Solid State Registers for 5/8 Inch through 2 Inch Positive Displacement Meters Only

This specification covers Solid State Register intended for use with all positive displacement meters, sizes 5/8 inch through 2 inch.

10.4.1 The register shall be housed in a waterproof composite enclosure that utilizes thermoplastic and a heat treated, tempered glass lens suitable for installation in any environment.

10.4.2 The register shall incorporate a thermoplastic register cover to provide protection for the lens and display.

10.4.3 The register shall incorporate a 358 degree rotation for optimal installation and reading orientation.

10.4.4 The technology deployed for electronic data interchange shall be solid state and not contain any moving mechanical components

10.4.5 The register shall provide for up to 9-digit electronic resolution to the AMR/AMI system

10.4.6 The register shall provide a means of capturing magnetic tampering and register removal from a meter displaying a numeric indication of these tampers on the LCD display as a deterrent to theft.

10.4.7 The register shall provide a visual indication of all billing digits on the LCD by providing a line above and below these digits.

10.4.8 The register shall provide a visual icon/indication when a minimum of 6 months of battery life remains.

10.4.9 The register shall provide a visual icon/indication of specifiable backflow on the LCD.

10.4.10 The register shall provide a visual icon/indication of low flow and the direction of such flow on the LCD.

10.4.11 The encoder register shall send data in ASCII format (American Standard code for Information Interchange) to the interrogation device.

10.4.12 Up to 10 digits of the meter reading total shall be provided on the LCD display as requested by the customer.

10.4.13 The encoder register shall be permanently factory sealed with epoxy potting of all terminal connections. Encoder registers requiring field sealing or field splices of the wire connection will not be allowed.

10.4.14 No wire connections or wire splicing of any kind shall be required during installation.

10.4.15 In line waterproof (Nicor or Itron) connections shall be permissible as required to facilitate installation and field investigations.

10.4.16 Registers shall be secured to the meter main case by a tamper resistant bayonet-style locking mechanism and an integral locking ring and wedge, protecting against unauthorized removal of the register.

10.4.17 No special tools shall be required to remove the register.

10.4.18 The register must conform to the most current revision AWWA C-707.

11 WATER METER SPECIFICATIONS

11.1 5/8 X 1/2 Inch and 5/8 Inch X 3/4 Inch Composite Positive Displacement Meters

This Specification covers composite body cold-water positive displacement meters in 5/8" sizes and the materials employed in their fabrication. These meters shall offer a completely lead free alternative that encourages conservation, recycling, water purity and green lifestyles. The utility recognizes the importance of incorporating lead free products where possible and makes every effort to protect the health of their customers.

11.1.1 All meters shall meet or exceed the latest version of the American Water Works Association Standard C710 for Cold Water Meters - Displacement Type, Plastic Main Case.

11.1.2 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.1.3 All Meters shall comply with the latest state low lead and no lead initiatives due to their unique design, which incorporates suitable engineered polymers for wetted surfaces in the meter with no possibility of lead contamination.

11.1.4 Main cases shall be composed of an engineered polymer which is black in color to reduce the incidence of theft.

11.1.5 Main case shall incorporate stainless steel male threads to prevent crossed or stripped threads during installation when utilizing existing bronze couplings and to facilitate ease of installation.

11.1.6 Stainless steel threads shall provide adequate length to permit complete tightening of the existing bronze couplings of the setter to prevent interference with the body.

11.1.7 The meter case must utilize an external male thread to accommodate the internally threaded bottom plate to provide structural stability and prevent leaks.

11.1.8 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees F.

11.1.9 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.1.10 The meter serial number shall be stamped on the main case of the meter.

11.1.11 Bottom plates shall be made of a suitable engineered polymer that utilizes an internal thread to provide strength and dimensional stability.

11.1.12 The bottom plate shall utilize an O-ring seal

11.1.13 Measuring chambers shall be made of a suitable engineered polymer as described in AWWA C-710.

11.1.14 Chamber shall incorporate a nutating disc. Oscillating piston style measuring elements are not acceptable.

11.1.15 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.1.16 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.1.17 The measuring chamber shall be locked into place with a single unit strainer/chamber retainer.

11.1.18 The chamber shall be designed for long life, to reduce wear and must not exceed 58 nutations per gallon.

11.1.19 Meters shall not exceed seven PSI pressure loss at AWWA safe maximum operating capacity.

11.1.20 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.1.21 Meters shall be pressure tested to ensure against leakage.

11.1.22 Meters shall comply with the AWWA C710 new meter accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.1.23 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
5/8"	15	1.75

11.1.24 All meters shall be provided with strainer screens installed in the meter.

11.1.25 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.2 5/8 Inch X 1/2 Inch and 5/8 Inch X 3/4 Inch Low Lead Bronze Positive Displacement Meters

This Specification covers low lead body cold-water positive displacement meters in 3/4" sizes and the materials employed in their fabrication. These meters shall offer a low lead alternative that encourages conservation, recycling, water purity and green lifestyles.

11.2.1 6.6.1 These meters shall offer a lead free solution that encourages conservation, recycling, water purity and green lifestyles.

11.2.2 All meters shall meet or exceed the latest version of the American Water Works Association Standard C700 for Cold Water Meters - Displacement Type, Bronze Main Case.

11.2.3 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.2.4 All meters shall comply with the latest state low lead initiatives due to their design which incorporates suitable engineered polymers for wetted surfaces inside the meter.

11.2.5 Main cases shall be composed of a low lead bronze.

11.2.6 Main case shall incorporate the choice of bottom plates that include cast iron which is painted black, bronze, or polymer bottoms.

11.2.7 The cast iron bottom shall provide a frost bottom designed to break prior to the main case.

11.2.8 Bronze and polymer bottoms provide protection against “hot soil”.

11.2.9 The spud threads shall provide adequate length to permit complete tightening of existing bronze couplings of the setter to prevent interference with the body.

11.2.10 The meter case must utilize stainless steel fasteners for securing the bottom plate to the main case.

11.2.11 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees F.

11.2.12 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.2.13 The meter serial number shall be stamped on the main case of the meter.

11.2.14 The bottom plate shall utilize a gasket seal

11.2.15 Measuring chambers shall be made of a suitable material as described in AWWA C-700.

11.2.16 Chamber shall incorporate a nutating disc. Oscillating piston style measuring elements are not acceptable.

11.2.17 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.2.18 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.2.19 The measuring chamber shall be locked into place with a single unit strainer/chamber retainer.

11.2.20 The chamber shall be designed for long life, to reduce wear and must not exceed the following nutations per gallon; 58.

11.2.21 Meters shall not exceed seven PSI pressure loss at AWWA safe maximum operating capacity.

11.2.22 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.2.23 Meters shall be pressure tested to ensure against leakage.

11.2.24 Meters shall comply with the AWWA C700 new meter accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.2.25 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
5/8"	15	1.75

11.2.26 All meters shall be provided with strainer screens installed in the meter.

11.2.27 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.3 5/8 X 1/2 Inch and 5/8 X 3/4 Inch Low Lead Bronze Positive Displacement Meters with Remote Disconnect & Reconnect Valves

This Specification covers low lead body, cold-water, positive displacement meters that employ an integral disconnect valve that is compatible with an open architecture AMI system. These meters shall be 5/8 inch AWWA standard size by 7-1/2 inch laying length. These meters shall be cast of a low lead bronze alternative that encourages conservation, recycling, water purity and green lifestyles. The integral pilot valve and transceiver shall allow the utility to remotely turn on/turn off water supply to a residence as required through a compatible AMI network, remotely through a user interface or via a mobile application with a handheld appliance and radio. The meter of choice shall be the Mueller Systems 420 Bronze RDM meter or equal.

11.3.1 All meters shall meet or exceed the latest version of the American Water Works Association Standard C700 for Cold Water Meters - Displacement Type, Bronze Main Case.

11.3.2 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.3.3 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees Fahrenheit.

11.3.4 The main case must incorporate the measuring element and a remote disconnect valve inside the standard 7-1/2 inch laying length specified by the AWWA C-700 standard.

11.3.5 The entire meter, including the measuring element, valve, and connections shall fit within the standard laying length as described in AWWA C700 of 7.5 inches. Meters that utilize a separate valve outside of the meter body or meters where the total combined lay length of the PD meter and the valve together along with the connections do not match the standard 7.5 inch PD meter lay length will not be acceptable.

11.3.6 All meters shall incorporate an integral valve which is capable of stopping (disconnecting) and starting (reconnecting) the flow of water through the meter. The valve must be capable of being actuated via the network in an AMI system or by a remote mobile application.

11.3.7 Pilot valves are more efficient in design than ball valves and consume less energy during activation and as such are preferable to other types of valves.

11.3.8 Pilot valves have been utilized extensively in irrigation systems and have a proven track record in domestic water systems for reliability. As a result this design is the preferred solution.

11.3.9 The valve must utilize a “pilot valve” design which diverts the flow of water around a diaphragm and utilizes water pressure to actuate the valve and maintain the open or closed position. Rotational or ball valve technology will not be permitted.

11.3.10 The valve shall be operated and actuated using the same AMI module described used within the fixed network. Two separate radio modules shall not be required.

11.3.11 A replacement valve kit shall be offered for the ongoing maintenance of the valve. The kit must contain all the components required for a complete pilot valve rebuild.

11.3.12 The valve actuation shall utilize the battery which operates the fixed network AMI module.

11.3.13 The AMI module shall be designed and warranted to operate for twenty (20) years assuming the operation of the valve for a complete cycle (one disconnect and one reconnect) every month for twenty years or two hundred forty (240) cycles over the life of the module.

11.3.14 The manufacturer shall warranty the main case for a period of at least 20 years from the date of shipment.

11.3.15 The meter serial number shall be stamped on the main case of the meter.

11.3.16 Bottom plates shall be made of engineered plastic only.

11.3.17 The bottom plate shall utilize a gasket seal.

11.3.18 The bottom plate shall utilize stainless steel bolts and washers as a means of securing the bottom plate to the main case.

11.3.19 Measuring chambers shall be made of a suitable engineered polymer as described in AWWA C-700.

11.3.20 Chamber shall be of the nutating disc style.

11.3.21 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.3.22 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.3.23 The measuring chamber shall be locked into place with a single unit strainer/chamber retainer.

11.3.24 The chamber shall be designed for long life, to reduce wear and must not exceed the following nutations per gallon; 58.

11.3.25 A dual strainer shall be utilized in the valve diaphragm.

11.3.26 Meters shall not exceed the C-700 pressure loss specification at AWWA safe maximum operating capacity.

11.3.27 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.3.28 Meters shall be pressure tested to ensure against leakage.

11.3.29 Meters shall comply with the latest AWWA C-700 accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.3.30 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
5/8"	15	1.75

11.3.31 All meters shall be provided with strainer screens installed in the meter.

11.3.32 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.4 3/4 Inch Short Length, 3/4 Inch Standard Length and 3/4 X 1 Inch Composite Positive Displacement Meters

This Specification covers composite body cold-water positive displacement meters in 3/4" sizes and the materials employed in their fabrication. These meters shall offer a completely lead free alternative that encourages conservation, recycling, water purity and green lifestyles. The utility recognizes the importance of incorporating lead free products where possible and makes every effort to protect the health of their customers.

11.4.1 All meters shall meet or exceed the latest version of the American Water Works Association Standard C710 for Cold Water Meters - Displacement Type, Plastic Main Case.

11.4.2 All meters shall comply with the latest NSF-61 requirements and those included in the EPA requirement change on January 4, 2014.

11.4.3 All meters shall comply with the latest low lead and no lead initiatives due to their unique design, which incorporates suitable engineered polymers and stainless steel for wetted surfaces in the meter with no possibility of lead contamination.

11.4.4 Main cases shall be composed of suitable engineered polymer which is black in color to reduce the incidence of theft.

11.4.5 Main case shall incorporate stainless steel male threads to prevent crossed or stripped threads during installation when utilizing existing bronze couplings and to facilitate ease of installation

11.4.6 Stainless steel threads shall provide adequate length to permit complete tightening of the existing bronze couplings of the setter to prevent interference with the body.

11.4.7 The meter case must utilize an external male thread to accommodate the internally threaded two piece bottom plate design to provide structural stability and prevent leaks.

11.4.8 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees F.

11.4.9 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.4.10 The meter serial number shall be stamped or etched on the main case of the meter.

11.4.11 Bottom plates shall be designed as a two part unit made of a suitable engineered polymer that utilizes an internal thread to provide strength and dimensional stability.

11.4.12 The bottom plate shall utilize an O-ring seal

11.4.13 Measuring chambers shall be made of a suitable engineered polymer as described in AWWA C-710.

11.4.14 Chamber shall be of the nutating disc style.

11.4.15 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.4.16 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.4.17 The measuring chamber shall be locked into place with a single unit strainer/chamber retainer.

11.4.18 The chamber shall be designed for long life, to reduce wear and must not exceed the following nutations per gallon; 33.3.

11.4.19 Meters shall not exceed seven PSI pressure loss at AWWA safe maximum operating capacity.

11.4.20 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.4.21 Meters shall be pressure tested to ensure against leakage.

11.4.22 Meters shall comply with the AWWA C710 accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.4.23 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
3/4"	15	2.0

11.4.24 All meters shall be provided with strainer screens installed in the meter.

11.4.25 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.5 3/4 Inch Short Length, 3/4 Inch Standard Length and 3/4 Inch X 1 Inch Low Lead Positive Displacement Meters

This Specification covers low lead body cold-water positive displacement meters in 3/4" sizes and the materials employed in their fabrication. These meters shall offer a low lead alternative that encourages conservation, recycling, water purity, and green lifestyles. The meter of choice shall be the Mueller Systems 435 Bronze meter or equal.

11.5.1 All Meters shall meet or exceed the latest version of the American Water Works Association Standard C700 for Cold Water Meters - Displacement Type, Bronze Main Case.

11.5.2 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.5.3 All Meters shall comply with the latest state low lead initiatives due to their unique design, which incorporates low lead bronze for all wetted surfaces in the meter.

11.5.4 Main cases shall be composed of low lead bronze that meets the latest NSF requirements.

11.5.5 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees Fahrenheit.

11.5.6 The main case must incorporate the measuring element inside the standard 7-1/2” or 9” laying lengths specified by the AWWA C-700 standard and customer choice.

11.5.7 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.5.8 The meter serial number shall be stamped on the main case of the meter.

11.5.9 Bottom plates shall be made of cast iron or bronze as required by the utility.

11.5.10 The bottom plate shall utilize a gasket seal.

11.5.11 Cast iron and bronze bottom plates shall utilize a plastic liner to separate the plates from the wetted portion of the meter.

11.5.12 The bottom plate shall utilize stainless steel bolts as a means of securing the bottom plate to the main case.

11.5.13 Measuring chambers shall be made of a suitable engineered polymer as described in AWWA C-700.

11.5.14 Chamber shall be of the nutating disc style.

11.5.15 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.5.16 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.5.17 The measuring chamber shall be locked into place with a single unit strainer/chamber retainer.

11.5.18 The chamber shall be designed for long life, to reduce wear and must not exceed the following nutations per gallon; 33.3.

11.5.19 Meters shall not exceed seven PSI pressure loss at AWWA safe maximum operating capacity.

11.5.20 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.5.21 Meters shall be pressure tested to ensure against leakage.

11.5.22 Meters shall comply with the latest AWWA C700 accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.5.23 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
3/4"	15	2.0

11.5.24 All meters shall be provided with strainer screens installed in the meter.

11.5.25 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.6 1 Inch Low Lead Positive Displacement Meters

This Specification covers low lead body cold-water positive displacement meters in 1 Inch size and the materials employed in their fabrication. These meters shall offer a low lead alternative that encourages conservation, recycling, water purity, and green lifestyles.

11.6.1 All Meters shall meet or exceed the latest version of the American Water Works Association Standard C700 for Cold Water Meters - Displacement Type - Bronze Body.

11.6.2 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.6.3 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees F.

11.6.4 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.6.5 The meter serial shall be stamped on the main case of the meter.

11.6.6 Bottom plates shall be made of cast iron or bronze.

11.6.7 Measuring chambers shall be made of a suitable engineered plastic as described in AWWA C-700.

11.6.8 Chamber shall be of the nutating disc style.

11.6.9 The chamber magnet shall be driven by a stainless steel drive shaft.

11.6.10 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.6.11 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.6.12 The measuring chamber shall be locked into place with a chamber retainer.

11.6.13 The chamber shall be a large capacity chamber to reduce wear and must not exceed the following nutations per gallon; 12.

11.6.14 Meters shall not exceed seven-PSI pressure loss at AWWA safe maximum operating capacity.

11.6.15 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.6.16 Meters shall be pressure tested to ensure against leakage.

11.6.17 Meters shall comply with the AWWA C700 accuracy requirements as specified in of the standard for a period of one year from the date of installation.

11.6.18 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
1"	15	3.0

11.6.19 All meters shall be provided with strainer screens installed in the meter.

11.6.20 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.7 1-1/2 Inch and 2 Inch Nylon Coated, Ductile Iron Body, Positive Displacement Meters

This Specification covers Nylon coated, ductile iron body cold-water positive displacement meters in 1-1/2 inch through 2 inch sizes and the materials employed in their fabrication. The LMWDrecognizes the importance of incorporating lead free products where possible and makes every effort to protect the health of their customers.

11.7.1 All Meters shall meet or exceed the latest accuracy and pressure requirements of the American Water Works Association Standard C700 for Cold Water Meters - Displacement Type for accuracy, testing, and disc nutations.

11.7.2 Main cases shall be composed of lead free nylon coated ductile iron

11.7.3 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees F.

11.7.4 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.7.5 The meter serial shall be affixed to the flange of the main case of the meter.

11.7.6 Top plates shall be made of lead free nylon coated ductile iron with a composite insert.

11.7.7 Measuring chambers shall be made of a suitable engineered plastic as described in AWWA C-700.

11.7.8 Chamber shall be of the Nutating Disc style.

11.7.9 The chamber magnet shall be driven by a stainless steel drive shaft.

11.7.10 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.7.11 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.7.12 The measuring chamber shall be locked into place with a chamber retainer.

11.7.13 The chamber shall be a large capacity chamber to reduce wear and must not exceed the following Nutations per gallon.

Size	1-1/2”	2"
Nutations / Gal	6.47	3.92

11.7.14 Meters shall not exceed seven-PSI pressure loss at AWWA safe maximum operating capacity.

11.7.15 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.7.16 Meters shall be pressure tested to ensure against leakage.

11.7.17 Meters shall comply with the AWWA C700 new meter accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.7.18 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
1-1/2"	15	5,500,000
2"	15	8,500,000

11.7.19 All meters shall be provided with strainer screens installed in the meter.

11.7.20 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.8 1-1/2 Inch through 2 Inch Low Lead Bronze Positive Displacement Meters

This Specification covers bronze body cold-water positive displacement meters in 1-1/2" though 2" sizes and the materials employed in their fabrication. These meters shall offer a low lead alternative that encourages conservation, recycling, water purity and green lifestyles.

11.8.1 All Meters shall meet or exceed the latest version of the American Water Works Association Standard C700 for Cold Water Meters - Displacement Type - Bronze Body.

11.8.2 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.8.3 All materials used in the construction of the main cases shall have sufficient dimensional stability to retain operating clearances at working temperature up to 105 degrees F.

11.8.4 The manufacturer shall warranty the main case for a period of 25 years from the date of shipment.

11.8.5 The meter serial shall be stamped on the main case of the meter.

11.8.6 Top plates shall be made of bronze.

11.8.7 Measuring chambers shall be made of a suitable engineered plastic as described in AWWA C-700.

11.8.8 Chamber shall be of the nutating disc style.

11.8.9 The chamber magnet shall be driven by a stainless steel drive shaft.

11.8.10 The chamber magnet shall incorporate a protective plastic shroud around the magnet.

11.8.11 The measuring chamber shall incorporate a locating device that aligns to the main case of the meter to ensure proper chamber orientation and alignment.

11.8.12 The measuring chamber shall be locked into place with a chamber retainer.

11.8.13 The chamber shall be a large capacity chamber to reduce wear and must not exceed the following nutations per gallon.

Size	1-1/2 "	2"
Nutations Per Gallon	6.47	3.92

11.8.14 Meters shall not exceed seven-PSI pressure loss at AWWA safe maximum operating capacity.

11.8.15 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.8.16 Meters shall be pressure tested to ensure against leakage.

11.8.17 Meters shall comply with the AWWA C700 accuracy requirements as specified in the standard for a period of five years from the date of installation.

11.8.18 Additionally, the manufacturer shall warranty the meter to meet or exceed AWWA repaired meter accuracy standards per the following:

Size of Meter	Years of Warranty or	Millions of Gallons Registered
1-1/2"	15	5,500,000
2"	15	8,500,000

11.8.19 All meters shall be provided with strainer screens installed in the meter.

11.8.20 Strainers shall be rigid, fit snugly, be easy to remove, and have an effective straining area at least twice that of the inlet opening.

11.9 3/4 Inch through 6 Inch Low Lead Bronze MVR Vertical Turbine Meter

This specification covers cold water meters in sizes 3/4” through 6”. The intended use of this meter is to simplify applications by using one type of meter where three different types of meters would normally be used. The meter specified here must be highly accurate, light weight and have minimal maintenance.

11.9.1 All meters must conform to applicable AWWA C-701 Class I Standards and this specification.

11.9.2 Meters shall be of the Vertical Rotor Turbine type. All water must pass through a measuring element. Multi-Jet and Single Jet meters are not AWWA C-701 class 1 compliant and are therefore not acceptable.

11.9.3 The size of the meter shall be determined by the nominal size opening of the inlet and outlet.

11.9.4 Meters 3/4” through 2” shall be offered in compact as well as standard laying lengths as determined by AWWA C-700 as listed below.

Size	Compact	Standard
3/4”	7”	9”
1”	9”	10 3/4”
1 1/2”	9”	13”
2”	10”	17”

11.9.5 Meters 3” through 6” shall be no longer than those listed below.

Size	Length
3”	12”
4”	14”
6”	18”

11.9.6 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.9.7 The main case shall contain both the measuring element and the integral strainer. 3/4” through 2” shall be bottom case entry and 3” through 6” shall be of the top case entry design.

11.9.8 The size, model, direction of flow shall be cast in raised characters on the case. The serial number shall be imprinted on both the body and the register lid.

11.9.9 All 1 1/2” through 2” meters with standard laying length shall be equipped with test ports. 3” through 6” meters shall be offered with a test port option at the customer’s request.

11.9.10 All external bolts, nuts and washers shall be of stainless steel.

11.9.11 Flanged ends 1 1/2” and 2” meters shall be of the oval type, 3” through 6” shall be round flanges.

11.9.12 Meters of 3/4” and 1” in size shall be threaded Male Straight Pipe Thread. Meters 1 1/2” and 2” shall be Internal Pipe Thread.

11.9.13 Meters shall be guaranteed to operate successfully at a working pressure of 150 PSI without leakage or damage to any part.

11.9.14 The registration shall be accurately recorded through the normal operating flow limits at not less than 98% nor more than 102% of actual throughput. Accuracy at the specified minimum flow rate shall be at least 95% at the flow specified by size in the table below.

Size	Normal Operating Flow @ 98% - 102%	Minimum Flow @ 95%
3/4”	1.0 - 30 GPM	.50 GPM
1”	1.5 - 50 GPM	.75 GPM
1 1/2”	2.0 - 100 GPM	1.50 GPM
2”	3.0 - 160 GPM	2.00 GPM
3”	4.0 - 350 GPM	2.50 GPM
4”	5.0 - 650 GPM	3.50 GPM
6”	15 - 1300 GPM	5.00 GPM

11.9.15 Registers shall be magnetic driven, straight reading, and provide easy to read visual registration at the meter.

11.9.16 Registers shall be permanently hermetically roll scaled utilizing an “L” shaped gasket between the copper housing and the register lens.

11.9.17 Registers shall contain a low flow indicator and a center sweep hand.

11.9.18 The unit of measurement shall be in U.S. Gallons, Cubic Feet, or Cubic Meters.

11.9.19 The measuring chamber shall be a turbine assembly mounted in a vertical orientation. All water must pass through the measuring element.

11.9.20 The turbine will utilize a “Retro-Thrust” feature to reduce wear over the life of the meter. Low flows will cause the rotor to wear against a sapphire bearing mounted in the top case of meter. High flows will cause the turbine to pull down in the flow way to wear against a sapphire bearing located in the bottom of the hub assembly.

11.9.21 The inlet hub assembly shall include integral straightening vanes to eliminate the need for straight pipe diameters in front of or behind the meter.

11.9.22 All meters must be provided with integral strainers.

11.9.23 Meters 3/4” through 1 1/2” shall have polymer type strainers while meters 2” and larger shall have stainless steel strainers.

11.9.24 All strainers must have an effective straining area of at least two (2) times the nominal pipe size of the meter.

11.9.25 The weight of the meter shall not exceed the following amounts:

Size	Compact (lbs.)	Standard (lbs.)
3/4"	4	5
1”	7	10
1 1/2"	10	13
2”	16	20
3”	N/A	38
4”	N/A	68
6”	N/A	140

11.10 3/4 Inch through 6 Inch Low Lead Bronze Vertical Turbine Meter for Residential Fire Systems

This specification covers cold water meters in sizes 3/4” through 2”. The intended use of the Residential Fire Meter (RFM) is to provide accurate measurement of water consumption for both domestic and fire suppression water requirements through a single supply line using a meter which bears UL approval. Per existing AWWA standards, C700 (Positive Displacement) and C708 (Multi-jet) meters are not acceptable for use in combination potable water/fire suppression supply lines and should not be used. The meter in this specification must be highly accurate, light weight and have minimal maintenance. It must provide fire suppression flows even though the strainer may become partially blocked and the measuring element may become incapacitated.

11.10.1 All meters should conform to the AWWA Standard for residential fire meters.

11.10.2 At a minimum, all meters must be UL approved.

11.10.3 Meters shall be of the Vertical Rotor Turbine type.

11.10.4 All water must pass through the measuring element.

11.10.5 Positive Displacement, Multi-Jet and Single Jet meters are not Vertical Rotor Turbine Meters and are therefore unacceptable.

11.10.6 The size of the meter shall be determined by the nominal size opening of the inlet and outlet.

11.10.7 Meters 3/4" through 2" shall be offered in compact laying lengths and listed below.

Size	Compact
3/4"	7"
1"	9"
1 1/2"	9"
2"	10"

11.10.8 All meters shall comply with the latest NSF-61 372 requirements and those included in the EPA requirement change of January 4, 2014.

11.10.9 The main case shall contain both the measuring element and the integral strainer.

11.10.10 3/4" through 2" shall provide bottom case entry.

11.10.11 The size, model, direction of flow shall be cast in raised characters on the case.

11.10.12 The UL logo and listing shall be cast into the casting prominently.

11.10.13 The serial number shall be imprinted on both the body and the lid.

11.10.14 All external bolts, nuts and washers shall be stainless steel.

11.10.15 Meters 3/4" and 1" in size shall be Male Iron Pipe.

11.10.16 Meters 1 1/2" and 2" shall be Internal Pipe Thread.

11.10.17 Meters shall be guaranteed to operate successfully at a working pressure of 175 PSI without leakage or damage to any part.

11.10.18 Meters must be capable of withstanding (5) times the working pressure or 875 PSI during capability testing.

11.10.19 The registration shall be accurately recorded through the normal operating flow limits at not less than 98% nor more than 102% of actual throughput. Accuracy at the specified minimum flow rate shall be at least 95% at the flow specified by size in the table below.

Size	Normal Operating Flow 98% - 102%	Minimum Flow Limits 95%	Maximum Intermittent Flow
3/4"	1.0 - 30 GPM	.50 GPM	35GPM
1"	1.5 - 50 GPM	.75 GPM	55GPM
1 1/2"	2.0 - 100 GPM	1.50 GPM	110 GPM
2"	3.0 - 160 GPM	2.00 GPM	175 GPM

11.10.20 Registers shall be magnetic driven, straight reading, and provide easy to read visual registration at the meter.

11.10.21 Registers shall be permanently hermetically roll sealed utilizing an “L” shaped gasket between the copper housing and the register lens. Registers shall contain a low flow indicator and a center sweep hand.

11.10.22 The unit of measurement shall be in U.S. Gallons, Cubic Feet or Cubic Meters.

11.10.23 Meter size and date of manufacture shall be stamped on the register face plate. All registers including encoder registers shall have the register or meter serial number clearly and permanently stamped on top of the register.

11.10.24 Register lids and housings must be manufactured of a molded red plastic for easy visual identification as fire service meters.

11.10.25 Housings shall be designed to facilitate removal of the register without special tools and permit field replacement.

11.10.26 The measuring chamber shall be a turbine assembly mounted in a vertical orientation. All water must pass through the measuring element.

11.10.27 The turbine will utilize a “Retro-Thrust” feature to reduce wear over the life of the meter. Low flows will cause the rotor to wear against a sapphire bearing mounted in the top case of meter. High flows will cause the turbine to pull down in the flow way to wear against a sapphire bearing located in the bottom of the hub assembly.

11.10.28 The inlet hub assembly shall include integral straightening vanes to eliminate the need for straight pipe diameters in front of or behind the meter.

11.10.29 All meters must be provided with stainless steel, integral strainers that provide a minimum of four (4) times the inlet pipe diameter of strainer surface area to provide adequate flow rates in case of fire and blockage of the strainer.

11.10.30 All strainers must have an effective straining area of at least four (4) times the nominal pipe size of the meter.

11.10.31 The weight of the meter shall not exceed the following amounts:

Size	Compact (lbs.)
3/4"	4
1"	7
1 1/2”	10
2”	16

11.10.32 The meter shall be designed so that no straight pipe diameters of pipe are needed upstream or downstream to properly install the meter and maintain its performance.

11.10.33 Meters shall be able to be installed in yokes, meter setters, or between elbows and maintain accuracy and performance.

11.10.34 Meters may be installed vertically or horizontally.

11.11 Fire-Service Meter with Bypass – 3 Inch through 10 Inch

This Specification covers Cold-Water Meters - Fire-Service Type with ductile iron main cases, in 3" though 10" sizes. The fire service meter shall consist of a combination of a mainline meter, automatic valve mechanism and a bypass meter. The meter shall be so designed for applications where a high degree of accuracy is required over a wide range of water flow rates. The meters must conform to American Water Works Standard C-703, as most recently revised, have UL listing, be Factory Mutual and NSF-61 compliant.

11.11.1 Meters shall be comprised of a horizontal turbine main-line meter measuring element, measuring high flow rates and a bypass meter of the appropriate size for measuring low flow rates.

11.11.2 A spring activated valve shall automatically control flows between the mainline and bypass sections of the meter.

11.11.3 The size of the meter shall be determined by the nominal size of the opening of the inlet and outlet flanges of the meter.

11.11.4 Meters shall be guaranteed to operate successfully at a working pressure of 175 PSI without leakage or damage to any part.

11.11.5 All external bolts shall be of non-ferrous stainless steel composition.

11.11.6 The maximum overall length of the meter shall be face-to-face dimensions as listed below:

Size of Meter	Length	Size of Bypass
3"	33"	3/4"
4"	35"	1"
6"	45"	2"
8"	53"	2"
10"	68"	2"

11.11.7 The uni-body main case and strainer shall be constructed of ductile iron and be epoxy coated. The main case shall be a uni-body design that contains both the main line meter measuring element and the strainer to eliminate excess hardware, fasteners, reduce the possibility of leaks and reduce weight and size.

11.11.8 A spring loaded valve that automatically controls flows between the main line and bypass shall be attached to the rear of the main case.

11.11.9 The main-line measuring element shall be easily accessible by removal of a single top case. The main-line valve shall be easily accessible by removal of a single cover.

11.11.10 A test port must be included in the cover of the main line valve.

11.11.11 All main cases 3" through 10" shall have flanged ends with the inlet and outlet flange having a common axis.

11.11.12 The size, type and direction of flow through the meter shall be cast in raised characters on the main line.

11.11.13 A removable test plug shall permit field testing and re-calibration of both the mainline and bypass meters through the valve cover.

11.11.14 The registration shall accurately be recorded through the normal test flow limits at not less than 98.5% or more than 101.5% of actual throughput.

11.11.15 At crossover, that point when measurement transfers from the bypass meter to the mainline meter, accuracy must be no less than 85%.

11.11.16 Accuracy at minimum test flow shall be at least 95% at rate of flow specified in the table.

Size	Normal Test Flow Limits GPM @ ±1.5%	High Intermittent Flow Rates GPM @ ±1.5%	Minimum Flow Rates GPM @ 95%
3”	6 - 600	750	1/2
4”	8 - 1000	1250	3/4
6”	15 - 2000	2500	2
8”	30 - 3500	4400	2
10”	40 - 5500	6900	2

11.11.17 Meters shall have performance capabilities of continuous operation up to the rated maximum flows as outlined above without affecting long-term meter accuracy caused by undue wear.

11.11.18 Meter shall also be rated for a 25% flow capacity in excess of the maximum flow listed above. This would be for intermittent high flow capacity only.

11.11.19 The main line valve shall be the spring loaded type, which offers a predetermined and substantial resistance to opening in order to divert the low flow rates of flow through the appropriately sized bypass meter.

11.11.20 The spring loaded valve shall open when pressure loss through the bypass section approaches 2 PSI.

11.11.21 The mainline valve mechanism shall be constructed in a unitized manner to permit easy replacement of the entire assembly.

11.11.22 The valve shall be simple and effective in operation with ease of maintenance not requiring any special tools to remove the assembly.

11.11.23 The main-line measuring element shall be unitized and easily removed from the main case cover.

11.11.24 Meters shall have a design that allows water to flow straight through the measuring element where it turns a rotor at a rate in direct proportion to the quantity of water flowing though the meter.

11.11.25 The straight-through design shall allow high volumes to flow with a minimum of head loss.

11.11.26 During low flow, a tungsten carbide bearing shall float against a stainless steel shaft; during high flows, a tungsten carbide bearing shall gently move back against a second stainless steel shaft. During medium flows, the rotor shall float between both tungsten carbide bearings floating in the water on sapphire bushings.

11.11.27 Bypass meters shall consist of an appropriately sized Residential Fire Meter on 3” and 4” fire meters. The 6”, 8”, and 10” sizes shall utilize a 2” high pressure positive displacement meter or a 2” residential fire meter at the customer’s request.

11.11.28 Locking ball valves shall be offered as on all bypasses.

11.11.29 A swing check shall be incorporated in all bypasses to prevent backflow.

11.12 Fire-Service Meter without Bypass – 3 Inch through 10 Inch

This Specification covers Cold-Water Meters - Fire-Service Type with ductile iron main cases, sizes 3" though 10". The fire-service meter shall consist of a combination of a mainline meter and UL approved strainer. The meter shall be so designed for applications where a high degree of accuracy is required over a wide range of water flow rates. The meters must conform to American Water Works Standard C-703, as most recently revised, be UL listed, Factory Mutual and NSF-61 compliant. The meter of choice shall be a Mueller Systems FM3 Fire Service meter or equal.

11.12.1 Meters shall be comprised of a horizontal turbine meter measuring element, measuring flow rates and a UL listed strainer housed in a uni-body design without a bypass.

11.12.2 The size of the meter shall be determined by the nominal size of the opening of the inlet and outlet flanges of the meter.

11.12.3 Meters shall be guaranteed to operate successfully at a working pressure of 175 PSI without leakage or damage to any part.

11.12.4 All external bolts shall be of non-ferrous stainless steel composition.

11.12.5 The maximum overall length of the meter shall be face-to-face dimensions as listed below:

Size of Meter	Length
3"	18"
4"	20"
6"	24"
8"	28"
10"	39-1/4"

11.12.6 The uni-body main case and strainer shall be constructed of ductile iron and be epoxy coated. The main case shall be a uni-body design that contains both the main line meter measuring element and the strainer to eliminate excess hardware, fasteners and reduce weight, size and the possibility of leaks.

11.12.7 The main-line measuring element shall be easily accessible by removal of a single top case. All main cases 3" through 10" shall have flanged ends with the inlet and outlet flange having a common axis.

11.12.8 The size, type and direction of flow through the meter shall be cast in raised characters on the main line.

11.12.9 The registration shall accurately be recorded through the normal test flow limits at not less than 98.5% or more than 101.5% of actual throughput.

Size	Normal Test Flow Limits GPM @ ±1.5%	High Intermittent Flow Rates GPM @ ±1.5%
3”	6 - 600	750
4”	8 - 1000	1250
6”	15 - 2000	2500
8”	30 - 3500	4400
10”	40 - 5500	6900

11.12.10 Meters shall have performance capabilities of continuous operation up to the rated maximum flows as outlined above without affecting long-term meter accuracy caused by undue wear.

11.12.11 Meter shall also be rated for a 25% high intermittent flow capacity in excess of the normal flow listed above. This would be for intermittent high flow capacity only.

11.12.12 The main-line measuring element shall be unitized and easily removed from the main case cover.

11.12.13 Meters shall have a design that allows water to flow straight through the measuring element where it turns a rotor at a rate in direct proportion to the quantity of water flowing though the meter.

11.12.14 The straight-through design shall allow high volumes to flow with a minimum of head loss.

11.12.15 During low flow, a tungsten carbide bearing shall float against a stainless steel shaft; during high flows, a tungsten carbide bearing shall gently move back against a second stainless steel shaft. During medium flows, the rotor shall float between both tungsten carbide bearings floating in the water on sapphire bushings.

11.13 Hydrant Meter – 3 Inch

This specification covers the cold-water hydrant meter in the 3” size. These specifications are in compliance with AWWA C701 standard with certain additions as noted below. All specifications meet or exceed the latest revision of AWWA C701 for accuracy and pressure requirements. The intended use for these meters is in the measurement of potable water for applications where flow is consistently moderate to high. Meters must be designed for applications where accuracy is an essential part of maintaining revenue.

11.13.1 Meter shall have a design that allows water to flow straight through the measuring element where it turns a rotor at a rate in direct proportion to the quantity of water flowing though the meter. The straight-through design shall allow high volumes to flow with a minimum of head loss.

11.13.2 During low flow, a tungsten carbide bearing shall float against a stainless steel shaft; during high flows, a tungsten carbide bearing shall gently move back against a second stainless steel shaft. During medium flows, the rotor shall float between both tungsten carbide bearings floating in the water on sapphire bushings.

Meter Size	Low Flow (GPM) (95% Minimum)	Normal Range (GPM) ± 1.5%	Intermittent High Flow (GPM) ± 1.5%
3”	5	8 – 500	625

11.13.3 Meters shall have performance capabilities of continuous operation up to the rated maximum flows as outlined above without affecting long-term meter accuracy caused by undue wear. Meter shall also be rated for a 25% flow capacity in excess of the maximum flow listed above. This would be for intermittent high flow capacity only.

11.13.4 Main case shall be epoxy coated aluminum for light weight. Size and direction of the flow shall be cast, in raise characters, on both sides of main case.

11.13.5 The measuring element shall be of unitized construction. The complete measuring element shall consist of three basic parts: rotor assembly; calibration vane and unitized straightening vanes.

11.13.6 To simplify maintenance, the meter shall be designed to allow quick, easy, in-line exchange of the measuring element without removing the main case from the installation.

11.13.7 The measuring element shall utilize tungsten carbide bearings and sapphire bushings to minimize were and increase accuracy life.

11.13.8 Boxes and lids shall be made from a durable thermoplastic construction or bronze and as an option.

11.13.9 Meters shall be guaranteed to operate successfully at a working pressure of 175 PSI without leakage or damage to any part.

11.13.10 The measuring element shall be designed to allow accuracy calibration without changing gears. The calibration change shall be a minimum of 6%. The adjusting vane shall be located under the register assembly that provides a locking mechanism that secures it from unauthorized tampering.

11.13.11 The meter serial number shall be imprinted on the meter top case and on the register box lid. The first two numbers of the serial number shall denote the year of manufacture. No numbers shall be duplicated.

11.13.12 Meter laying length with connections shall be 16”.

11.13.13 Meter shall not weight more than 15 lbs.

11.13.14 Connections shall be as follows: 2-1/2” National Standard for fire hose coupling thread, female and male couplings.

11.13.15 All external bolts and washers shall be stainless steel.

11.14 Magnetic Resonance (MAG) Meters

This Specification covers electromagnetic flow meters compatible with battery powered displays/registers or mains power in sizes 3" though 48". The meter of choice shall be a Mueller Systems HbMAG Electromagnetic meter or equal.

11.14.1 All Meters shall meet or exceed the latest EPA and NSF-61 requirements for lead and contaminants.

11.14.2 Meters in 3” through 12” sizes shall be available in an FM Approved variant when required for fire service.

11.14.3 Measuring technology shall be electromagnetic in nature utilizing Faraday’s Law of Induction to determine all flow data. The meter shall be either battery powered or mains powered with battery backup and a microprocessor based signal converter as specified by the customer.

11.14.4 Operating principle: Utilizing Faraday’s Law of Electromagnetic Induction, the flow of conductive liquid through the sensor induces an electrical voltage that is proportional to the velocity of the flow.

11.14.5 Outer main case shall be composed of epoxy coated carbon steel with welded flanges.

11.14.6 The sensor shall utilize a SST tube inside an epoxy coated outer carbon steel case with welded steel flanges

11.14.7 The sensor flow tube shall be constructed of an EPDM liner surrounded by two integral coils.

11.14.8 All internal components shall be encased in a waterproof compound.

11.14.9 The meter serial number, part number, size and description shall be affixed to the display/register housing of the meter with a permanent label.

11.14.10 Measurement and grounding electrodes shall be Hastelloy C-276

11.14.11 Construction: The sensor flow tube and liner material shall be constructed of EPDM surrounded by two integral coils.

11.14.12 Installation: A minimum of 5 pipe diameters up stream and 3 pipe diameters downstream of straight pipe the same nominal size of the meter are recommended. (Consult Mueller Systems for any variations)

11.14.13 Media Temperature: 32 to +158° F.

11.14.14 Availability in sizes: 3 inch to 48 inch diameters as standard.

11.14.15 Enclosure rating shall be NEMA 6P.

11.14.16 No mechanical measuring element component may extend into the measuring tube which increases pressure loss.

11.14.17 No strainers shall be used or required for proper operation of the meter. Strainers increase pressure lose and are not desirable.

11.14.18 In the event a strainer is used, acceptable installation is a minimum of 5 inlet pipe diameters downstream of the meter.

11.14.19 Meters shall be 100% factory tested for accuracy and have the factory test results provided with each meter.

11.14.20 Meters shall be pressure tested to ensure against leakage.

11.14.21 Displays/Registers shall have Mueller Systems encoder protocol output as the standard output. In lieu of the encoder output, a dual pulse output is available for communication with SCADA, BMS, and BAS systems.

11.14.22 Displays/Registers shall be battery powered with an LCD display or mains powered with battery backup as required.

11.14.23 Two battery options shall be offered; a 10 year external battery pack shall be preferred. A 6 year integral battery shall also be offered as an alternate.

11.14.24 Both battery options must be easily field replaced with common service tools and not require special tools or hardware.

11.14.25 Contain two eight-digit counters for forward or reverse flow.

11.14.26 The display/register shall provide for visual registration of forward net total, rate of flow, backflow total, have a resettable counter and diagnostic icons at the meter.

11.14.27 The numerals on the number wheels of the display/register shall be a minimum of 1/4" in height and should be legible at a 45-degree angle.

11.14.28 The display/register shall be secured to the meter main case (or remotely located up to 33' away per the customer's request) by SST screws which can be sealed with a suitable seal wire by the customer for tamper protection.

11.14.29 For all installations, the solid state display/register shall be permanently factory sealed with an epoxy coating of all wire terminal connections. Displays/Registers requiring field sealing of the wire connection will not be allowed.

11.14.30 All wiring for radio MIU's in line connectors shall be installed and potted to the Display/Register by the manufacturer. A choice of a 25' Nicor connector or a 25' Itron connector shall be offered on all meters.

11.14.31 In line waterproof connections are permitted for meter connection to Radio MIU's to facilitate installation and field analysis of operation. 25' Nicor and Itron in line connections are approved to be used.

11.14.32 At a minimum, the meter should be compatible with the Mi.Net system or equivalent.

11.14.33 Display/Register Location: Integral on sensor/meter body, or remote as required with watertight connections

11.14.34 Remote Display/Register Length: 33'

11.14.35 Display: LCD showing flow rate, totalized values, service menu, resettable totalizer and alarm.

11.14.36 Power supply: Replaceable internal or external battery or mains powered with battery backup as specified by customer.

11.14.37 Operating temperature: -4 to +140 degrees F.

11.14.38 Outputs: two (2) passive pulse outputs are available as an alternative to the encoder output

11.14.39 The meter serial number, part number, size and description shall be affixed to the display/register housing of the meter with a permanent label.

11.14.40 Accuracy: 0.4% +/- 2mm/sec of actual flow.

11.14.41 Normal Flows: +/- 0.4%

11.14.42 Low Flow: 95% minimum

11.14.43 Bi-directional flow capabilities shall be standard

11.14.44 Two eight-digit counters - one for forward and one for reverse flow.

11.14.45 Each flow sensor shall be wet calibrated by an accredited flow lab with traceable instruments referring directly to the physical unit of measure according to the International System of Units. The calibration certificate ensures recognition of the test results worldwide including the U.S. with NIST traceability.

11.14.46 The calibration information shall be stored internally in the Display/Register signal converter for the lifetime of the product.

11.14.47 A printed certificate of calibration shall accompany each flow sensor.

11.14.48 Additional field calibration shall not be required as part of the general installation process. The meter shall be plug and play without the need for any field set up or programming.

11.14.49 All programming shall be done at the factory without the need for any field programming.

11.14.50 The signal converter shall either be integrally mounted or remotely mounted as specified by the customer.

11.14.51 The signal converter system shall be equipped with a fault and status log.

11.14.52 A system fault shall be indicated by an icon on the display

11.14.53 Follow manufacturer's recommendation for the minimum upstream (5X) and downstream (3X) installation requirements of straight pipe in the same nominal size as the flow sensor.

11.14.54 In the event no straight pipe lengths are available before or after the meter, installation is still a viable option with a verified accuracy of +/- 2% to allow for installations in cramped and tight environments.

11.14.55 Wiring between flow sensors and remote mounted signal converters shall use cable type and procedures as per the manufacturer's recommendation.

11.14.56 Connection of integral grounding straps is required in all applications.

11.14.57 The use of grounding rings is required per the installation instructions when cathodic protected, lined, or plastic pipe is used. The use of grounding rings is recommended for all applications,

11.15 EDC4 Spring Loaded Detector Check Specification – 3 Inch through 10 Inch

This specification covers spring loaded detector check valves in sizes 3" through 10". The detector check of choice shall be Mueller Systems model EDC4.

11.15.1 All detector checks shall be approved by Factory Mutual Research and listed by Underwriters Laboratories.

11.15.2 All detector checks shall be NSF-61 compliant.

11.15.3 The intended use of this detector check is to prevent water from reentering the potable water system, while detecting leaks in the fire sprinkler system or unauthorized usage of sprinkler system water.

11.15.4 Spring loaded detector check designs are superior to weighted designs since they can be mounted horizontally or vertically. They are smaller in size, weigh less and therefore cost less to install. They offer more versatility than comparable weighted designs.

11.15.5 The detector check valve shall positively shut off the flow of water through the main line until a pressure differential of approximately 2.0 psi is met through the bypass meter.

11.15.6 The main line automatic lever valve shall open freely at 2.0 psi and allow an unobstructed flow through the main line.

11.15.7 The Automatic Lever Valve in the main line shall be a spring loaded design. Spring mechanisms provide for low head loss during fire conditions.

11.15.8 The inlet and outlet of the detector check shall be paralleled and have a common axis.

11.15.9 An air bleeder device shall be provided at the top of the upper main case body.

11.15.10 Detector check must be designed to handle water ranging from 33° to 100° Fahrenheit.

11.15.11 The size of the detector check shall be determined by the nominal size opening of the inlet and outlet. Sizes available: 3", 4", 6", 8" and 10"

11.15.12 Detector checks 3" through 10" shall be offered in the laying lengths listed below:

Size	Laying Length
3”	15.00”
4”	15.00”
6”	21.00”
8”	25.00”
10”	28.75”

11.15.13 The main case of the check valve shall be made of Cast Iron, Fusion Bonded Epoxy Coated inside and out, following AWWA C550.

11.15.14 For the optional bypass meter, please see specifications for a vertical turbine or specifications for a positive displacement meter.

11.15.15 The size, model, manufacturer’s serial number, company name and direction of flow shall be cast, stamped or provided on an etched metal plate mechanically attached on the outer case of the valve.

11.15.16 All operating parts of the spring and clapper mechanism are attached to the cover for easy removal and maintenance. Full spring tension is not achieved until cover is bolted to the body.

11.15.17 Body to be provided with four drilled and tapped holes with plugs whereby a standard ¾” bypass can be installed after installation of the detector check valve.

11.15.18 All sizes (3” through 10”) shall come with flange ends; follow ANSI class 250 flat-faced flanges.

11.15.19 Valve shall be guaranteed to operate successfully at working pressure of 175 PSI without leakage or damage to any part. The valve shall also be guaranteed to test successfully at hydrostatic pressure of 350 PSI.

11.15.20 33degrees to 110 degrees F

11.15.21 Detector check must be designed so that it can be installed horizontally or vertically.

11.15.22 The weight of the detector check shall not exceed the following weights:

Size	Weight in lbs.
3”	70.00
4”	79.25
6”	166.50
8”	318.00
10”	501.00

Optional Bypass Trim Kits and Bypass Meters

11.15.23 The detector check shall be compatible with an optional, standardized trim kit and the customer’s choice of bypass meter as separate line items.

11.15.24 The separate prefabricated bypass shall be comprised of preformed ¾" copper tubing, a lockable ball valve on the inlet side of the bypass and a spring actuated check valve on the outlet side of the bypass to prevent backflow through the bypass meter.

11.15.25 The bypass shall be elevated above the centerline of the tap bosses and no greater than 10-7/8" from the centerline of the main valve to the centerline of the bypass when installed.

11.15.26 Bypass pipe size for all sizes shall be ¾" diameter.

11.15.27 A separate magnetic vertical turbine meter or positive displacement meter shall be available as specified by customer for use in the bypass.

11.15.28 Bypasses designs shall be of a prefabricated design and shipped separately from the detector check.

11.15.29 The bypass meters approved for this detector check bypass are the ¾" Mueller Systems MVR 30 magnetic vertical turbine meter or the Mueller Systems 420 positive displacement meter. No other meters are approved.

ESTIMATED INSTALLED METER COUNT

Cycle 1	**LAGUNA VISTA AND LAGUNA HEIGHTS**						
Mtr Size	**5/8"**	**1"**	**2"**	**4"**	**6"**	**8"**	
BK 11	254	35	17	0	3	0	
BK12	250	33	6	0	0	0	
BK 13	121	4	13	0	0	0	
BK 14	145	0	0	0	0	0	
BK 15	185	6	23	3	1	0	
BK 23	0	2	1	0	0	0	
BK 25	905	253	12	0	0	0	
Bk 27	62	2	0	0	0	0	
BK 29	22	11	1	0	0	0	
Total	1944	346	73	3	4	0	2370

Cycle 2	**PORT ISABEL**	**1"**	**2"**	**4"**	**6"**	**8"**	
BK 1	95	22	14	0	0	0	
Bk 2	136	16	8	1	0	0	
BK 3	174	22	10	0	0	0	
BK 4	270	29	24	1	0	1	
Bk 5	73	5	9	0	0	0	
BK 6	99	4	0	1	0	0	
Bk 7	102	0	0	0	0	0	
BK 8	86	6	1	0	0	0	
BK 9	45	7	2	4	1	0	
BK 10	66	1	1	0	0	0	
BK 21	88	7	0	0	0	0	
BK 22	101	10	3	2	0	0	
Bk 24	11	4	8	3	1	0	
BK 26	54	6	0	1	0	0	
Total	1400	139	80	13	2	1	1635

Cycle 3	**SPI 5/8"**	**1"**	**2"**	**4"**	**6"**	**8"**	
BK 16	191	65	65	33	32	0	
BK 17	461	124	49	10	11	0	
BK 18	432	290	69	15	10	0	
BK 19	401	142	43	7	6	0	
BK 20	0	0	2	1	1	0	
BK 28	6	10	0	0	0	0	
Total	1491	631	228	66	60	0	2476

TOTAL	6,481	ESTIMATED

QUESTIONARE (REQUIRED)

1. Provide detailed history of your company and the experience you have in the meter program that you are offering
2. Provide references of companies and/or other water districts using this software
3. Is this system compatible with Incode, and if it is what are the main issues involved in the conversion process?
4. Does your system allows customer to see their water consumption from smart phones or tablets?
5. What type of training is included?
6. For reordering meters? Provide estimated freight costs and delivery estimates.
7. How many people will be assigned to this project?
8. What are the options for profiles, do you handle graphs, is the information immediately available?
9. How long it would normally takes to install your proposed software, including the training and implementation schedule.
10. Provide cost effective upgrading system from drive by to fixed system options. Do you offer alternatives to migrate from AMR to AMI?
11. Can System go back to Drive by from Fixed System in a case of an emergency?
12. The District coverage area has three cycles. Offer cost by Cycle.

TABULATION PROPOSED COST

AREA	CYCLE	5/8"	1"	2"	4"	6"	8"	NO. OF METERS	COST BY CYCLE
LV/LH	I	1943	346	73	3	4		2369	$
PI	II	1398	139	80	13	2	1	1633	$
SPI	III	1488	631	228	66	60		2473	$
						TOTAL	ESTIMATED METERS	6475	$

* LMWD may choose to break down the project in phases. Or to choose only one cycle per Budget Year.

* Cost provided must be fully functional and if additional costs are needed must be included in the tabulation cost by cycle column.