Georgia Environmental Protection Division

Guidelines for Ultrasonic Water Meter Maintenance Program

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Section 1: General

Sec. 1.1 **Scope**

This proposed guideline is to assist drinking water supply utilities with a guide and recommendations on criteria governing the testing and maintenance program for ultrasonic water meters installations.

Sec. 1.2 **Purpose**

The proposed guidelines have been developed to address the following:

- provide protocol for the ultrasonic water meter testing and maintenance program;
- ensure ultrasonic water meters are tested to provide accurate water use within acceptable accuracy limits;
- ensure ultrasonic water meters are calibrated to provide accurate water use within acceptable accuracy limits;
- assist in ensuring that ultrasonic water meters meet the intent of the guidance relating to ultrasonic water meters in accordance with the AWWA M6 Manual entitled Water-Meters Selection, Installation, Testing, and Maintenance, Fifth Edition, 2012, #30006, and American Water Works Association (AWWA) Standard ANSI/AWWA C750-10 (Revision of AWWA C750-03).

Sec. 1.2.1 **Governing Legislation**

The Georgia Water Stewardship Act of 2010 (GWSA) governs the framework for the water efficiency and meter installation, calibration, repair, testing and replacement program. The GWSA describes provisions for the need for water use reduction as the primary driver of general water accountability. The GWSA provides requirements relating to implementation of a comprehensive water audit, water balance and to account for usage and determination of losses in a distribution system.

Sec. 1.3 **Application**

Ultrasonic meters are now an option for: large flows, raw water, treated water, settled water, backwash, supernatant and chemical lines applications.

Sec. 1.4 **Water Metering Locations**

- Source or water withdrawal or raw water intake;
- In-plant facility;
- Production or treated water output or exit of the treatment facility;
- Distribution or pumping stations;
- End users.

Section 2: References

Thornton, J., (2002), Water Loss Control Manual. McGraw Hill, New York. 74-76: 588-590

American Water Works Association (AWWA), M36 Manual, Water Audits and Loss Control Programs Third Edition, 2009

AWWA, M6 Manual, Water Meters -Selection, Installation, Testing and Maintenance Fifth Edition, 2012

Clancy, J., (2010), Ultrasonic Meter Flow Calibrations Considerations and Benefits. Colorado Engineering Experiment Station, Inc.

ACCUSONIC a Division of ADS LLC: Principles of Operation: Multiple-Path Transit-Time Flow Meter: " Establishing a Metering Plan to Account for Water Use and Loss 2003

AWWA Standards, May 1, 2010, Transit-Time Flowmeters in Full Closed Conduits: ANSI/AWWA C750-10 (Revision of ANSI/AWWA C750-03)

Section 3: Definitions

Sec. 3.1 **Water Metering**: Water metering means a process of measuring water use through the use of a meter.

Sec. 3.2 **Water Meter**: A device for measuring or estimating the volume, or flow of water at the water source, well or throughout a water system to determine flow throughout that portion of the water system.

Sec.3.3 **Types of Water Meters:**

- Displacement water meters;
- Velocity water meters;
- Electromagnetic meters;
- Ultrasonic meters.

Sec. 3.4 **Ultrasonic Meters**: Ultrasonic water meters use an ultrasonic transducer to send ultrasonic sound waves through the fluid to determine the velocity and translate the velocity into measurement of the water volume and/or rate of flow.

Sec. 3.5 **Types of Ultrasonic Meters**:

- Ultrasonic Doppler meters;
- Ultrasonic Transit Time meters.

Ultrasonic Doppler Meter: Doppler meter is a device that works on principle of reflection and is used to measure liquid which includes either particles or entrained air. Doppler meters are usually not used in clean water application.

Ultrasonic Transit Time Meters: Transit time meter is a device that works according to Faraday's law of measuring velocity in the pipe from the changes in the time taken for sending and receiving signals from one sensor to another.

Section 4: Guidance for Requirements

Sec. 4.1 **Materials**

A water meter shall comply with the requirements of the Safe Drinking Water Act including other state and federal regulations for public water system.

The pipe materials could affect the transmission of the sensor-signals (Thornton et al, 2002, pp. 74-77).

The most commonly used pipe materials are: iron, steel and Poly Vinyl Chloride (PVC).

Sec. 4.2 **Selection**

The selection of a water meter should consider the local water and environmental conditions, cost effectiveness installation, maintenance and testing.

The utility operator should consult with water professional prior to selection and purchase of a water meter.

The flowmeter should be selected with due regard for the intended application, size and quality of water AWWA Standards ANSI/AWWA C750-10.

Sec. 4.3 **Installation**

Installation procedures should always be in accordance with the manufacturer's instructions and/or in accordance with AWWA Standards ANSI/AWWA C750-10.

The ultrasonic water meters must be fitted to meet the requirement of approximately 10 pipe diameters of straight run upstream and 5-pipe diameter downstream for proper performance (Thornton et al, 2002, p. 589).

Indicators and other special digital features should be incorporated into the unit in order to provide circuit operation or alarm and indicate readouts and other signal transmissions such as ranges, totalizing and the type of signal transmissions (Thornton et al, 2002, p. 588).

The ultrasonic meter should not be located near a point where there is sudden pressure drop.

Sec. 4.4 **Initial Calibration**

The ultrasonic water meter shall be tested and certified provided it is performed by accredited water professional in accordance with the AWWA M6 Manual entitled Water Meters Selection, Installation, Testing, and Maintenance.

Testing methodology is to be in accordance with AWWA M6 Manual entitled Water Meters Selection, Installation, Testing, and Maintenance in accordance with AWWA Standard C750 Transit-Time Flowmeter Full Closed Conduits.

It is recommended to undergo a zero –flow calibration if possible. This allows an in-place calibration of the unit.

Sec. 4.5 **Ultrasonic Accuracy Determination**

The AWWA M6 manual requires that all new ultrasonic meters should be tested for accuracy of registration at flow rates and test-flow quantities before they are placed in service:

Accuracy: ±1 to ±2.5 percent of rate
Repeatability: ± 0.25 percent
Rangeability: 20:1
Size range: 0.125 – 120 in. (3.1mm – 3 m)
(Source Thornton et al, 2002, p.588).

Sec. 4.6 **Ongoing Verification of Calibration**

The ultrasonic flowmeter testing should be done on a periodic basis to ensure accountable results.

The indicators for testing more frequently include:

- Registered usage volume;
- Meter age;
- Water quality;
- Periodic review of meter calibration;
- Accuracy certification.

It has been established that the only way to determine whether a specific meter is operating efficiently is to test it. (Thornton et al, 2002, p.542).

The AWWA recommendations for meters in service should be tested, on average, as follows:

Meter size 5/8 in. to 1 in = Every 10 years;
Meter sizes 1 in. to 4 in = Every 5 years;
Meter sizes larger 4 in. = Every year;
(Source: Multiple-Path Transit-Time Flowmeters Principle of Operation, 2003, pp. 31-32).

Sec. 4.7 **Recording and Reporting**

The ultrasonic meter test report is to state the date of the test, serial number, size, make of the meter and the error of measurement in percentage as indicated above.

The utility should provide the exact location of the water meter, date the meter was installed, make, size, type and serial number of each meter.

Photograph and/or a diagram of meter showing clear pipe before and after the water meter.

The ultrasonic meter reading at the time of installation.

The public water system should read the meters regularly and document and/or report the information in the water metering reporting and tracking form.