

# Master meter accuracy: essential to efficient operations

**I**nnumerable articles, essays and instructions have been written and an equal number of training sessions have likely been presented on the subject of the proper application, selection and installation of water meters. As is well known, the purpose of a water meter is to measure the amount of water delivered. The focus of this article is on master meters – those that deliver water to an entire distribution system.

The accuracy of master meters is critical to the efficient management and operation of public water systems. Let me repeat! The accuracy of master meters is critical to the management and operation of public water systems. Let me

explain. Consider the master meter as a “parent” to the residential or domestic service water meters. The purpose of the individual users’ meters is to measure the amount of water delivered to the customers so an appropriate bill for water used can be

charged. The charge (billing) of the residential meters determines the amount of revenue a system receives. When the customer meters are inaccurate, the potential for revenue loss can be staggering if a significant number of meters under-register. Similarly, as master meters deliver water to a water system, either from another supplier, well production or

processing plants, the accuracy of the master meter(s) is essential to help the water system accurately determine water use and water loss. I also think of a master meter as the central “cash register” that

Whenever installing a new, large master meter, or replacing an old one, it is recommended that a meter with a built-in test port be installed. If this cannot be done, then it is recommended that a

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records the amount of product available for resale by the utility. The accuracy of any master meter is critical to determining the overall water use/loss efficiency of the system it serves.

## Make them testable

It is very important when installing a turbine or compound meter to have it placed in an

testing tee, a minimum of three pipe diameters downstream of the meter be installed.

The meter manufacturer should be contacted to confirm the correct distance from the meter to place any fittings if it is necessary to locate tees, elbows or any other devices in close proximity upstream or downstream of the meter.



*Gary Armentrout  
Technical Assistant*



*This booster station is set up to allow the master meter to be tested “in place.” A test port allows for KRWA’s test meter to be placed downstream of the system’s master meter with no need to remove the large meter from its normal position.*

installation so the meter can be tested. Large meters are heavy and the removal for testing of the meter or servicing can be very time-consuming and costly.

KRWA recommends testing large meters for accuracy at least once every year. Because a very high volume of water passes through this type of meter and

because in most water systems such meters are used for reporting total water usage to a state agency, it is important that the master meter operates within industry standards. A meter that is not within the standards can be

accurate measurement under low and high pressure; must be accurate with a variety of flow rates and have long life. The American Water Works Association has established industry standards for

manufacturers in designing and building of water meters to ensure that meters are as accurate as possible. While the industry manufacturers focus on accuracy, in my opinion it's when the meter arrives at the utility that



*This installation shows a screen attached directly to a 2-inch meter. Down stream from the meter a 2-inch valve is attached so that the meter can be tested in place.*



*This is what can happen if proper maintenance is not performed regularly on a system's meters. When tested this meter was over registering which led to the water system showing a water loss.*

costing a water system much time and money. The time comes in when the system spends hours looking for leaks in a distribution system when in fact there are no leaks. Although that staff time costs, the real cost is due to the lost revenue because a meter is either over or under registering. KRWA provides assistance to test water meters. This service is presently provided at no charge to the utility. Over the years, KRWA has tested hundreds of water meters of all sizes. Our testing equipment is certified annually. In some cases, KRWA can recalibrate your large meter back to industry standards on the spot. If you are interested in discussing meter testing, I encourage you to contact KRWA at (785)336-3760.

Water meters are designed and manufactured to rigorous standards. Meters must provide



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## Setting up a meter testing program

Some water utility operators and managers are sometimes reluctant to take on the added work of ensuring meter accuracy. On the other hand, some water systems spell out those responsibilities in job descriptions. Below is an example of how one rural water district in Kansas added the responsibility to the staff job descriptions:

- "The Manager, Operator and Bookkeeper will cooperate to ensure that customers' meter readings are being accurately reported and recorded."
- "The District, through its staff, will maintain an on-going meter testing/evaluation program, including on master meters, to ensure accurate production records and accurate water loss ratios."

## Correct master meter installation

The installation of master meters should not be left to imagination. The manner in which a master meter is installed can dramatically impact the accuracy of the meter. All the concern and care in the world that the manufacturer used in the design of the meter will be of no consequence if the meter is installed incorrectly by the utility. The manufacturer also provides correct installation guidelines. Adhering to those is the responsibility of the consultant or the water utility. Improper installation can and will cause master meters to either under-register or over-register. Some of the basic issues to consider should include these:

1. Size the meter for the application; the meter size should be based on the flow rate, not pipe size.
2. Do not install elbows, reducers or tees directly onto or in close proximity of the meter unless the manufacturer approves such installations. Having fittings butting up to the meter will likely contribute to inaccurate meter registration. Some meter manufacturers require a minimum of from five to eight times the pipe diameter of straight pipe upstream of the meter and from two to four times the pipe diameter of straight pipe downstream before suggesting that fittings can be installed. For the best accuracy and long life, a swirl-free, uniform flow velocity in the pipe immediately upstream of the meter is required.

compromises to those goals begin.

A comprehensive meter testing program should begin with the master meters. Such a program not only benefits the system creating a more efficient operation but also allows the system to maintain the lowest possible water rates. Watch for future articles where I will present some results of meter testing and change-out programs on water systems in Kansas. In the meantime, I encourage you to attend sessions at the upcoming KRWA conference in Wichita.

Watch for these two outstanding sessions pertaining to water loss. Thursday, March 29 at 9:30 a.m., "The Financial Impact of Water Loss and Leak Detection," presented by Andy Crocker of Metrotech. Also in the same timeframe watch for, "The Key is in the Recordkeeping," presented by Joan Kenny, Kansas Division of Water Resources.

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