Overview

An important rule in water management is that you can't manage what you don't measure. Tracking a facility's total water use, as well as specific end uses, is a key component of the facility's water-efficiency efforts. Source meters measure the amount of water being supplied to the facility, while submeters measure usage for specific activities, such as cooling tower, process, or landscape water use. Accurately measuring water use can help facility managers identify areas for targeted reductions and to track progress from water-efficiency upgrades. Submeters can also help identify leaks and indicate when equipment is malfunctioning.

Meters and submeters can be integrated into a centralized building management system, making it easy to track usage and implement a water management plan (see Section 1.2: Water Management Planning). These systems are capable of electronically storing data from meters and submeters, reporting hourly, daily, monthly, and annual water use. They can also trigger alerts when leaks or other operational anomalies are detected.

Installing the correct meter and ensuring it functions properly are critical to accurate water measurement. There are many types and sizes of meters intended for different uses, so it is important to choose the correct one. Improper sizing or type can cause problems for the building. For example, an undersized water meter can cause excessive pressure loss, reduced flow, and noise. Oversized meters are not economical and do not accurately measure minimal flow rates. All utility-grade water meters manufactured and installed for domestic water service by a water utility in the United States must comply with American Water Works Association (AWWA) standards. Submeters that are installed for water management purposes and not used for revenue purposes are not subject to such standards.

Best Practices

There are several best practices for metering water use, including correctly choosing what to meter and submeter; selecting, installing, and maintaining meters; and reading and recording metered data to track water use and integrate it into the water management plan.

Determining What to Meter and Submeter

It's best to meter all water conveyed to the facility, regardless of source. For example, even if a building's water is solely supplied by an alternative source (e.g., municipally supplied reclaimed water), a source meter can still be installed to track and manage water use. If multiple sources of water are provided to a facility, each source should be metered and tracked separately.

Building owners and operators should consider installing separate submeters to measure specific end uses that are permanently plumbed, as indicated in Table 2-1. For more information and additional recommendations on metering and submetering, review the U.S. Green Building Council’s LEED® rating system\(^3\) and the 2012 International Green Construction Code.\(^4\)

Table 2-1. Submetering Recommendations

<table>
<thead>
<tr>
<th>Submeter Application</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenant Spaces</td>
<td>Meter all tenant spaces individually.</td>
</tr>
<tr>
<td>Cooling Towers</td>
<td>Meter cooling tower make-up water and blowdown water supply lines. A single make-up meter and a single blowdown meter can record flows for multiple cooling towers if they are controlled with the same system. Separately controlled cooling towers should have separate make-up and blowdown water meters.</td>
</tr>
<tr>
<td>Heating, Ventilating, and Air Conditioning (HVAC) Systems</td>
<td>Individually or collectively meter HVAC systems with aggregate annual water use of 100,000 gallons or more or if the facility has 50,000 square feet or more of conditioned space. Metered systems should include evaporative coolers, humidifiers, mist cooling devices, and recirculating water systems with a fill water connection, such as chilled water, hot water, and dual temperature systems.</td>
</tr>
<tr>
<td>Steam Boilers</td>
<td>Meter the make-up water supply line to steam boilers with a rating of 500,000 British thermal units per hour (Btu/h) or greater. A single make-up meter can record flows for multiple boilers.</td>
</tr>
<tr>
<td>Single-Pass Cooling Systems</td>
<td>Meter any systems or equipment that use single-pass cooling water and do not use a chilled water system or closed-loop recirculation.</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Meter irrigation systems that are automatically controlled.</td>
</tr>
<tr>
<td>Roof Spray Systems</td>
<td>Meter roof spray systems for irrigating vegetated roofs or thermal conditioning.</td>
</tr>
<tr>
<td>Ornamental Water Features</td>
<td>Meter make-up water supply lines for ornamental water features with a permanently installed water supply.</td>
</tr>
<tr>
<td>Pools and Spas</td>
<td>Meter make-up water supply lines for indoor and outdoor pools and spas.</td>
</tr>
<tr>
<td>Industrial Processes</td>
<td>Individually meter industrial processes consuming more than 1,000 gallons per day on average.</td>
</tr>
</tbody>
</table>

\(^3\) Ibid.
2.2 Metering and Submetering

Table 2-1. Submetering Recommendations (cont.)

<table>
<thead>
<tr>
<th>Submeter Application</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Water Sources</td>
<td>Meter water use from alternative water sources, such as gray water, rainwater, air handler or boiler condensate, or other sources discussed in Section 8: Onsite Alternative Water Sources.</td>
</tr>
<tr>
<td>Other Processes</td>
<td>Meter any other process with a projected annual water use of 100,000 gallons or more.</td>
</tr>
</tbody>
</table>

**Meter Selection**

The first step in choosing a meter is to determine its use and select the appropriate type of meter from the list below:5

- Positive displacement meters are best suited for small commercial or institutional applications because they have high accuracy rates at low flows and can precisely measure peak flows.

- Compound meters are a good choice for large commercial or institutional facilities because they accurately measure low flows and high flows with their multiple-measuring chamber design.

- Turbine and propeller meters are most appropriate for continuous, high-flow applications and are inaccurate at low flows. These types of meters are not usually recommended for commercial, institutional, or residential buildings because water flows are in constant fluctuation, with very low minimum flow rates.

Next, select the appropriate size of the meter. It is critical to understand the building's size, function, fixture types, usage occupancy, and peak population in order to select the appropriately sized meter. These statistics determine the minimum and maximum flow rates and will assist in the selection of a properly sized water meter.6 AWWA Manual M22, Sizing Water Service Lines and Meters, provides additional guidelines for selecting and sizing utility-owned and installed water meters.7

**Meter Installation and Maintenance**

After selecting a meter, consider the following installation and maintenance best practices to ensure optimal meter operation:

- When installing a meter, follow the manufacturer’s instructions. Improper installation can lead to metering inaccuracies.

- Install meters in an accessible location to allow for reading and repair. In addition, ensure that the meter location is protected from potential damage.

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5 Smith, op. cit.
6 Ibid.
To ensure uniform flow entering the meter, do not install the meter near pipe bends. In general, place the meter in a location where there is a space of straight pipe equivalent to at least 10 times the pipe diameter downstream of the meter and five times the pipe diameter upstream of the meter.8

Create a map indicating the location of all water supply meters and submeters to be included in the facility water management plan.

Include a strainer on all meters and submeters. Debris and sediment can enter a meter and have an adverse effect on accurate measurement. An inline strainer on the meter’s inlet will collect debris and sediment and prevent them from entering the meter body.9

Since meters deteriorate with age, test them for accuracy and calibrate them on a regular basis. AWWA recommends that utility-owned meters be tested, on average, as follows:10

- Meter sizes 5/8 inch to 1 inch: Every 10 years
- Meter sizes 1 inch to 4 inches: Every five years
- Meter sizes 4 inches and larger: Every year

Consider inspecting and calibrating submeters more frequently, depending upon the type and size of the meter and its application.

Water Use Tracking and Integration Into the Water Management Plan

Building owners and operators should consider installing a water meter data management system with remote communication capabilities that provides instant feedback on all metered water use in a central location. This type of system makes it easier for building managers to identify leaks or other abnormalities and better understand and manage water use at the facility.

If the facility is not integrating metering data into a centralized data system, consider the following best practices:11

- Assign responsibility to track water use at least monthly.
- Ensure that staff understands how to read the meters and record data properly. Pay special attention to the units that the meter uses—gallons, cubic feet, and hundred cubic feet are common units for water meters. Also, ensure that staff record the numerical values properly. Meters often include one or more trailing zeros that must be added after the numerical dial reading.

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9 Smith, op. cit.

A meter reads 201,670 cubic feet.
2.2 Metering and Submetering

- Plot total water use and submetered data monthly and examine data for unexplained fluctuations.
- Evaluate trends and investigate and resolve any unexpected deviations in water use.

**Additional Resources**


