EBMUD Commercial Guidebook:
Metering of Individual Units

EBMUD

METERING OF INDIVIDUAL UNITS

From a water management perspective, it makes sense to meter a facility's total water use and as many end uses of water as practical. This discussion focuses on the metering of individual dwelling units at commercial, mixed use, and multi-family properties. Submetering of individual end-uses such as tenant spaces allows businesses to evaluate their usage, address leaks, and make data-informed decisions about behavioral, equipment, or operational changes that could result in lower utility costs and water and energy usage. Business owners also often need to address changing regulations and business priorities and are increasingly focused on engaging in sustainable business practices that lower their environmental impact and support meeting sustainability certification requirements.

Submetering individual multi-family residences, commercial units, or water-intensive fixtures is beneficial to property managers and tenants for a variety of reasons:

- Commercial water damage is one of the most common and costly claims for businesses, yet it is a regular exception in insurance policies. Beyond the cost of the water itself, water damage can affect floors, walls, ceilings, equipment, and even foundations. Facility flooding can also damage electrical equipment or lead to environmental or safety hazards related to gray or black water damage and mold, which can result in operational downtime, repair costs, and lost revenue.
- Submeter and meter data can be integrated into a building management system, enabling the operator to track usage and quickly identify where there are water-related problems that need to be repaired. In some cases, leaks may occur under the building foundation or in non-obvious or observable locations.
- Submeters can be useful tools by allowing staff to isolate sections of mainline for further investigation by a leak detection company.
- Submetering also allows the property manager to benchmark water use across multiple properties and report savings to executive management to get buy-in for efficiency projects such as retrofitting shared water-using fixtures and targeting water-consuming buildings to incorporate best management practices. In many cases, energy use is directly tied to water usage, such as with hot water devices, and water waste may also cause energy waste. See Chapter 1, The True Cost of Water, for more information.
- Submetering individual units/spaces at business parks can result in better regulation of wastewater discharges that may not otherwise be detected. A lack of submetering may lead to unmonitored and unregulated wastewater discharges and lost discharge fees. Submetering individual occupants could eliminate or reduce these issues, especially if there is communication between the water provider and the wastewater authority.

Submetering Basics

A primary meter (also known as a "master meter") measures the total amount of water consumed by an entire property and is generally the meter a utility will use to bill water customers. While primary meters show total water use, they cannot indicate how much water is consumed by each building, unit, or water-using fixture that may be on one property, unless there is one primary meter for each unit or water-using fixture.

A "submeter" is a secondary meter, often a non-billing, third-party device purchased by an owner or site manager, that is installed downstream of a primary meter.

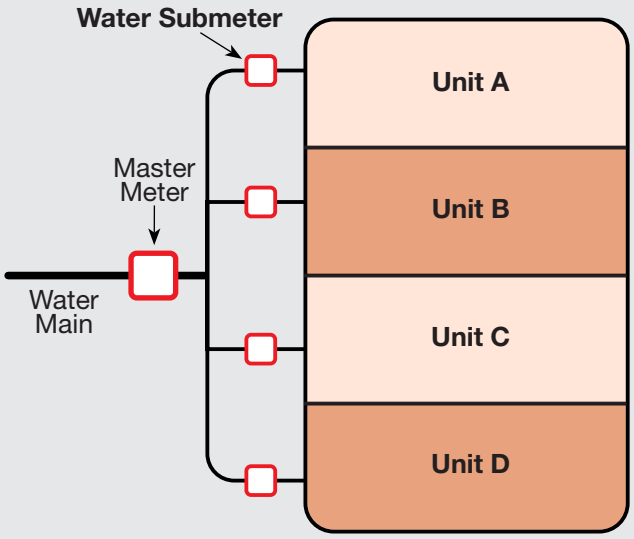
A submeter can provide more targeted water consumption information such as for:

- An individual unit within a multi-family residential structure
- An individual unit in a mixed-use residential or commercial structure
- A water-intensive fixture such as a pool, boiler, or cooling system

After installing a submeter, users may see a 10% - 20% reduction in water use due to easier identification and elimination of leaks that may otherwise go unchecked for extended periods of time.[1] EBMUD recommends using "smart" submeters that can log water use history, send alerts, or provide a remote dashboard. This water

1 Santa Clara Valley Water District (2007, April 13) ValleyWater.org
https://www.valleywater.org/sites/default/files/Water-Submeter-Results-for-manufactured-housing_SCVWD_2007.pdf

Figure 5-1: Water Submeter



The building illustrated has a primary meter ("master meter") that measures the total volume of water consumed by all units. Then, submeters measure the water consumed by each unit.

consumption information can be provided to end users in multiple ways. While utility-managed metering data is generally provided by the utility via bills or an online dashboard, users installing submeters will need to manage the submeter data in a way that best suits their specific needs..

Submetering Multifamily Tenants

There is a wide scope of residential developments that may want to submeter tenant water use. The list includes duplexes, condominiums, townhouses, mobile-home parks, and multi-unit apartments. Submetering, with billing based upon actual water use, is much more equitable for customers where water usage can vary significantly among tenants. Billing water use volumetrically can promote accountability in tenant water use, as well as accountability for managing shared water use such as landscapes, pools, and common spaces. Billing practices are regulated and certified by local authorities and state law; be sure to check with the local water utility prior to moving to volumetric billing.

A national study on submetering and allocation programs conducted in 2004 found 15% water savings[2] and 21% indoor energy savings associated with submetering by third-party billing entities (non-water providers) at existing multi-family buildings. At sites where the occupants also had some landscaping, such as condominiums, townhouses, and mobile-home parks, the water savings is estimated at 20%.[3]

For new developments submetering may be required by law. In California, SB-7 has required multi-family developments seeking water service to submeter tenants since January 1, 2018.[4] For those required to submeter tenants, we recommend installing systems that provide the end users convenient access to hourly or real-time water use information in their space, as well as the option to receive leak alerts.

Vendor-installed and managed submeter systems are increasingly common for multi-family and high-rise residential buildings. These systems are often offered as packages that include installing meters, maintaining meters, and billing customers. Some systems offer leak alert notifications and water consumption read outs installed in residential units. Submetering is often more cost effective, in terms of water savings, when unit occupants are also responsible for outdoor irrigation. If a central boiler is used, individual hot water meters may be required to measure hot water.

For existing buildings that are not submetered, the decision to submeter is typically determined by feasibility and the expense of installing submeters within the development's existing plumbing layout as well as applicable regulations. While retrofitting existing buildings can be expensive, the long-term costs associated with finding and repairing leaks and mismanaged water use can make a compelling case for investing in the upgrade. It is possible that some buildings may be relatively inexpensive to submeter, and some buildings may have been intentionally designed with submeter retrofits in mind.

In submetered developments there may be some water use that is considered 'common' use that typically benefits all users – such as landscapes, pools, laundry, or cooling systems. These water uses may or may not have their own direct submeter and are frequently accounted for by taking the total primary meter water use, and subtracting all metered tenant uses.

We recommend directly submetering the common use water sources, so that it is easier to understand how efficiently the common water use is being managed.

2 https://calwep.org/wp-content/uploads/2021/03/Submetering-of-Multi-Family-Residential-Properties-PBMP-2005.pdf
3 https://www.ebmud.com/download_file/force/1310/809?submeter_report.pdf
4 https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB7

Submeter Selection

It is very important to select the appropriate type and size of submeter for the uses occurring at the desired submetering location. Undersized water meters can cause excessive pressure loss, reduced flow, and noise. Oversized meters are not economical and do not accurately measure minimal flow rates.

Work with the meter manufacturer to select an appropriately sized submeter.

Developments experiencing difficulties dividing the water bill among tenants, frequent leaks, or other challenges controlling water (and wastewater) costs **are great candidates for submetering.**

It is critical to understand both the buildings and individual units' size, function, fixture types, usage occupancy, and peak use to select an appropriately sized meter. These statistics determine the minimum and maximum flow rates and will assist in the selection of a properly sized water meter for each unit. A brief overview of different meter types is listed in Table 5-1 on the following pages.

For additional resources on meter selection, sizing, maintenance, and installation, see the References and Resource section below.

Recommendations

- Meter individual units in new apartments, condominiums, townhouses, mobile-home parks, and mixed-use buildings of less than four stories
- Submeter all tenant units/spaces individually, particularly those where any of the following applies:
- When designing the plumbing system for a multi-family building, supply each unit with a single pipe source for the water to facilitate individual unit submetering.
  - Water consumption could exceed 500 gal/d (0.021 L/s) for that unit/tenant
  - Tenant space is occupied by a commercial laundry, cleaning operation, restaurant, food service, medical office, dental office, laboratory, beauty salon, or barbershop
  - Total building area exceeds 50,000 square feet (4,645 square meters)

TABLE 5-1. OVERVIEW OF DIFFERENT METER TYPES

METER TYPE	PROS	CONS	BEST USES
POSITIVE DISPLACE-MENT	• Usually lower cost • Have been in production many years • Less sensitive to upstream and downstream flow conditions	• Can be sensitive to orientation • Accuracy can diminish over time • Sensitive to water quality	• For small commercial or institutional applications
TURBINE	• High speed accuracy • Less pressure loss than PD meters • Easier function to explain to customers • Have been in production many years • Less sensitive to water quality	• Low speed inaccuracy • Sensitive to upstream and downstream flow conditions • Requires regular calibration	• Most appropriate for continuous, high-flow applications • Not usually recommended for commercial, institutional, or residential buildings because water flows are in constant fluctuation, with very low minimum flow rates such as from leaks
COMPOUND	• Accurate at both high and low range • Have been in production many years	• Low speed inaccuracy • Sensitive to upstream and downstream flow conditions • Sensitive to orientation Usually higher cost • Potential problems with crossover range between PD and Turbine elements • Often has two dials instead of one • Heavy and bulky size • Requires regular calibration	• Good choice for large commercial or institutional facilities

TABLE 5-1. OVERVIEW OF DIFFERENT METER TYPES (continued)

METER TYPE	PROS	CONS	BEST USES
STATIC	• Less frequent calibration requirements, if any • Higher range of accurate flowrates • Less head loss and less noise • Sometimes provide Pressure and Temperature • Compact design	• Limited by battery life if not replaceable battery • Past history of water intrusion in pit settings • May be more expensive than mechanical meters • "Black box," difficult to explain function to some customers	
SINGLE/ MULTI-JET	• Easier function to explain to customers • Low flow accuracy • Compact design • Can be lower cost than PD and static • Multi-jet can work better with impurities in water • Some can be installed vertically	• Single jet can be sensitive to upstream and downstream flow conditions • Accuracy can diminish over time • Potential for overspin and startup error reducing accuracy with frequent starts and stops	

Resources

1. Aquacraft. (2004). National Multiple Family Submetering and Allocation Program Study, *https://aquacraft.com/downloads/study-of-impacts-of-sub-metering-on-multi-family-water-use/*
2. City of Austin, Texas. (1999, December 16(adopted)). “Installation of Water Meters,” Section 2.3.3. Water and Wastewater Criteria Manual.
3. City of Austin, Texas. (2007, May 3). Water Conservation Task Force Water Conservation Strategies Policy Document, Recommendation IN-2, p. 10.
4. East Bay Municipal Utility District. (2006, September). Metering Program for New Non-Single Family Dwelling Units: Findings, Conclusions, and Recommendations.
5. Miami-Dade County Consumer Services Department. (1996). Miami-Dade County Water Remetering Ordinance, 96-137.
6. Texas Commission on Environmental Quality. (2005, April 13(adopted)). “Utility Submetering and Allocation,” Utility Regulations, Chapter 291, Subchapter H.
7. Environmental Protection Agency. (2012, October). WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities. EPA.gov *https://www.epa.gov/sites/default/files/2017-02/documents/watersense-at-work_final_508c3.pdf*
8. Ibid. (2017, January 19). Resource Manual for Building WaterSense® Labeled New Homes. *https://19january2017snapshot.epa.gov/www3/watersense/docs/home_builder_resource_manual_v1.1_508.pdf*
9. Ibid. (2022, September). Improving Water Management Using Advanced Metering Infrastructure Data: A Guide for Facility Managers. EPA.gov, *https://www.epa.gov/watersense/advanced-metering-infrastructure*
10. Texas Water Development Board. (2018, May). Best Management Practices for Commercial and Institutional Water Users. twdb.texas.gov, *https://www.twdb.texas.gov/conservation/BMPs/CI/doc/Commercial%20&%20Institutional%20BMP%20Guidebook.pdf*
11. Greenest City Scholar Program, Chloe Sher. (2016, August 12). Water Submetering Promote Water Efficiency-A Survey of Existing Literature and Local Case Studies. UBC.com, *https://sustain.ubc.ca/about/resources/water-sub-metering-promote-water-efficiency*
12. Santa Clara Valley Water District. (2007, August 13). Water Submetering in Mobile Home Parks. ValleyWater.org, *https://www.valleywater.org/sites/default/files/Water-Submeter-Results-for-manufactured-housing_SCVWD_2007.pdf*

EBMUD Resources

13. New Meter Installation
    https://www.ebmud.com/customers/new-meter-installation/
14. Multi-Family Study
    https://www.ebmud.com/water/conservation-and-rebates/water-conservation-publications/multi-family-submetering-billing-allocation-study/
15. Indoor and Outdoor Requirements for new and expanded service
    Water Efficiency Review - Indoor Water Use Requirements
    Water Efficiency Review - Outdoor Water Use Requirements
16. Regulations Governing Water Service
    https://www.ebmud.com/customers/new-meter-installation/regulations/regulations-governing-water-service/

Meter and Submeter Certification for Billing Purposes

17. National Certification
    https://www.ncwm.com/ntep-certificates
18. National Sanitation Foundation
    http://info.nsf.org/Certified/PwsComponents/Listings.asp?TradeName=meters&

California Resources

19. SB-7 2007 – 2016
    https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB7
20. Division Of Measurement Standards: California Type Evaluation Program
    https://www.cdfa.ca.gov/dms/programs/ctep/ctep.html
21. California Type Evaluation Program (CTEP) Certificates of Approval (COA) Database Search
    https://www.cdfa.ca.gov/dms/ctep.html

Bay Area Resources

22. Alameda County Weights and Measures
    https://www.acgov.org/cda/awm/
23. Contra Costa Weights and Measures
    https://www.contracosta.ca.gov/2205/Weights-Measures
24. City of Oakland
    https://www.oaklandca.gov/topics/state-regulations-for-water-metering-per-senate-bill-sb-7-for-multi-unit-structures

Meter Selection, Installation, Maintenance Resources

25. American Water Works Association, M6 Water Meters - Selection, Installation, Testing, And Maintenance, Fifth Edition
    https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productid/39311822
26. American Water Works Association, M22 Sizing Water Service Lines and Meters, Third Edition
    https://engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/47430593
27. 2021 International Green Construction Code® (IgCC®)
    https://shop.iccsafe.org/international-codes/2021-international-green-construction-coder-igccr.html
28. LEED Guide to Water Metering (2020)
    https://www.usgbc.org/resources/leed-guide-water-metering
29. U.S. Department of Energy, Water Metering Best Practices (2022)
    https://www.osti.gov/biblio/1866391/
30. Resource Manual for Building WaterSense® Labeled New Homes (2014)
    https://www.epa.gov/sites/default/files/2017-01/documents/ws-homes-builder-resource-manual.pdf

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East Bay Municipal Utility District

375 11th Street, Oakland CA 94607

Phone: 1-866-403-2683

E-mail: waterconservation@ebmud.com