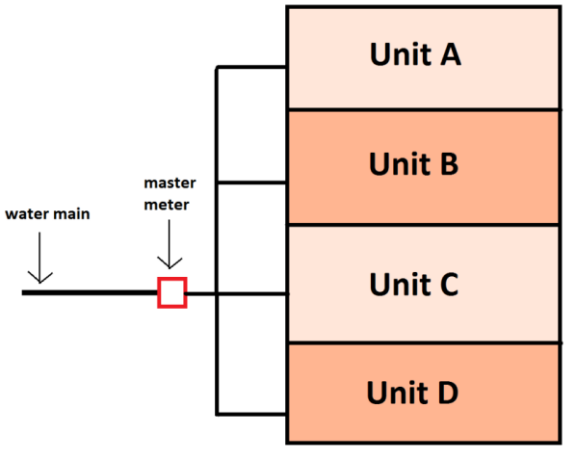
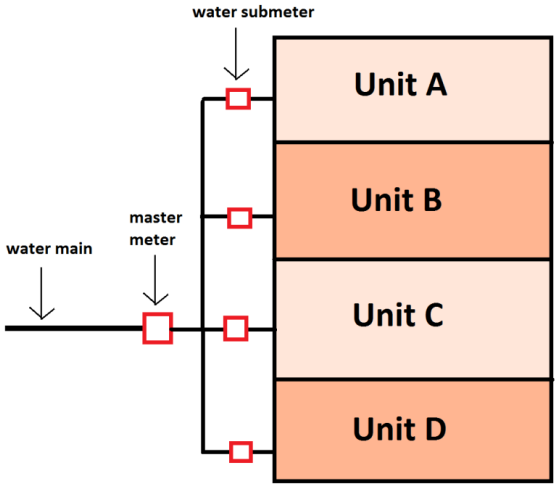
Water Sub-metering

The information presented here is borrowed from the City of Vancouver's report "*Water Sub-Metering to Promote Water Efficiency – A Survey of Existing Literature & Local Case Studies*" with their permission.

A sub-meter is "a water measuring device used at a subsection or end use of a water supply system for any of the following purposes: billing, water management, collecting and analyzing water usage data, detection of leaks, equipment failure, water waste and irregular or abnormal use of a specific application" (IAPMO 2015) (see figure below). For instance, sub-meters can be installed for all units in a strata titled property, allowing property managers to identify the water usage of individual tenants who can then be charged based on their actual water usage. Theoretically, by charging tenants for their actual water use, water sub-metering encourages tenants to use less water and to use water more efficiently. Moreover, sub-meters can also be installed to measure the water usage of water intensive fixtures such as boilers and irrigation systems within the property. Consequently, sub-metering allows property owners and/or managers to collect the water consumption data of each unit and/or fixture on their property, and hence identify water conservation possibilities.



Supply System without Sub-meters



Supply System with Sub-meters

Without sub-meters, tenants are typically charged a flat rate, meaning that they pay the same amount regardless of how much water they use. However, with sub-metering, information on the actual water consumption of individual tenants can be acquired. Thus tenants can be billed fairly for their actual water usage.

Sub-metering provides the water usage data of individual units, allowing landlords/tenants to identify and compare the water usage of these units throughout the year. By comparing regular water bills, landlords/tenants can identify abnormal fluctuations in water usage that can signal the existence of water leakage and/or identify water conservation possibilities. Sub-metering data also allows property managers to identify high volume consumers, providing them with an opportunity to provide targeted education. They can also verify and measure water savings periodically.

FREQUENTLY ASKED QUESTIONS

Who could benefit from sub-metering?

Type of Space	General Recommendations
Individually leased space	Meter all leased spaces
Total irrigated area with controllers	Meter all automatically controlled systems
Cooling towers	Separately controlled cooling towers should have separate make-up and blowdown water meters
Heating, Ventilating, and Air Conditioning (HVAC) Systems	Water use >378,541 L/year or conditioned space >4645 m2
Steam and hot-water boilers	>500,000 Bty/hr (146 kW)
Any water-intensive process	Consumption >378,541 L/year or >3,785 L/day
Ornamental water features, pools and spas	Meter make-up water supply lines
Alternative water sources	Meter water use from sources such as gray water, rainwater or boiler condensate

Are all sub-meters the same?

In order to provide accurate water use information, selecting, sizing, reading and maintaining sub-meters are four essential components (FMC 2003). There are various types of sub-meters designed for different applications. Some types of sub-meters are designed to measure low water flow while others are meant to measure high water flow. Depending on the use, size of the water line and water flow, an appropriate meter must be selected to obtain accurate water use measurements and minimize meter and pipe damage. Most sub-meters used in buildings for monitoring and cost allocating purposes are positive displacement or single jet sub-meters, whereas some other types are used for larger connections (see below for examples).

Type of Sub-Meter	Ideal Conditions	Recommendations
Positive Displacement Meters	Low flows; accurately measures peak flow	Ideal for Residential and Commercial Buildings
Turbine Meters	Continuous, high flow	Not recommended for Commercial, Institutional and Residential Buildings
Compound Meters	Low and High flows	Ideal for Large Commercial and Institutional Facilities
Single Jet Meters	Able to measure hot water	Physically smaller; Suitable for confined spaces

Does sub-meter size matter?

A properly sized meter is necessary to prevent damage to the meter and reduce water that is unaccounted for through inaccurate measurements. Sub-meters have different sizes and can be fitted onto different sizes of water lines. It is critical to consider several factors when selecting the appropriate size of the meters (EPA 2012; FCM 2003):

- Building Size
- Function of building
- Occupancy of building
- Equipment/fixtures on site

These factors can determine the minimal and maximum flow rates and thus a properly sized meter. The larger the flow meter size, the higher its velocity capacity, and the greater the flow rate it can measure. However, undersized water meters can cause excessive pressure loss, reduced flow, noise, and pipe damage. Oversized meters are not economical and cannot accurately measure minimal flow rates (EPA 2012).

What are the installation requirements for sub-meters?

Different types of meters have different installation requirements for accurate measurement. The best practice to ensure optimal meter operation is to follow the manufacturer's instructions on installation. In general, regardless of type of sub-meter, all meters should meet the following requirements (AWWA 2012; FEMA 2003):

- Be located in an accessible and protected location to allow for repair and reading
- Be protected from freezing and other potential damage
- Possess an inlet-shut off valve for meter maintenance
- Provide an appropriate bypass assembly with valves to avoid water supply stoppage during meter servicing for critical water lines
- Have installed a strainer upstream of turbine, propeller and compound meters to prevent large debris from damaging the meter
- Provide for adequate straight length piping on upstream and downstream sides of the meter, as required by the manufacturer

What about retrofitting a sub-meter to an existing building?

When retrofitting sub-meters to existing buildings, there are several factors that may affect the velocity of the water flow and thus the accuracy of the meter:

- Orientation of the meter (e.g. inclination of the meter)
- Entry nozzle length
- Aging pipe with scale built-up
- Obstructed meter strainers
- Length of a straight pipe on the either side of the meter

Do sub-meters require maintenance?

In addition to proper installation, sub-meters also require regular maintenance to ensure accuracy. American Water Work Association (AWWA) recommends meters to be tested and calibrated for accuracy with the following frequency (AWWA 2012):

- 5/8 inch to 1 inch – Maintenance every 10 years
- 1 inch to 4 inches – Maintenance every 5 years
- 4 inches or greater – Maintenance every year

How do you read a sub-meter?

There are different ways that water meters can be read. In addition to the traditional way of reading the meters directly by viewing the odometer display on site, several data transmitting technologies can provide accurate water usage measurement remotely. Automated meter reading (AMR) technologies, including absolute encoders, pulse and 4-20 mA, provide an efficient way of data collection, allowing property managers and owners to track water usages easily and implement a water management plan effectively.

How might sub-metering benefit me?

- **Increased water conserving behavior.** As a result of increased water conservation by residents, utilities can avoid developing new water supply infrastructure and reduce their operational costs.
- **More control over total housing costs.** Prior to water sub-metering, tenants are charged a fixed water rate (which is included in the monthly rent payments) regardless of how much they consume. With sub-metering, lower-water-consuming tenants are likely to pay less than they now pay for their actual water consumption.

- **Reduce the cost paid for unused water.** By identifying water use daily, weekly and monthly, tenants and property owners/managers can recognize water conserving possibilities and leaks.
- **Potential increase in property value.** Sub-metering can potentially increase property value for owners/managers as tenants may prefer to be made aware of their water consumption and have control over their water bill.

Keep in Mind:

- Potential regulatory issue: a sub-meter is a plumbing modification. Local laws likely require permits, inspections and fees.
- Potential liability issue: owners or tenants may be held liable for meter malfunction, or leaks.