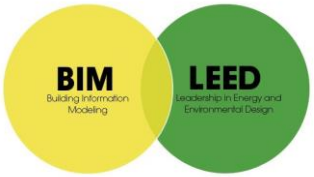
PART 7 – Water efficiency



Introduction

According to the United Nations Environment Program, if the current water consumption rates continue, two out of every three people will live in water-stressed conditions by the year 2025.

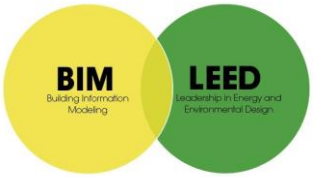
With the increase of residential, commercial, and industrial development, the use of potable water increases.

Green building need to address this issue by improving their water efficiency. Where efficiency means doing the same thing by using less of the same resource. As a result, water will still be used, but it will be used in a smarter way.

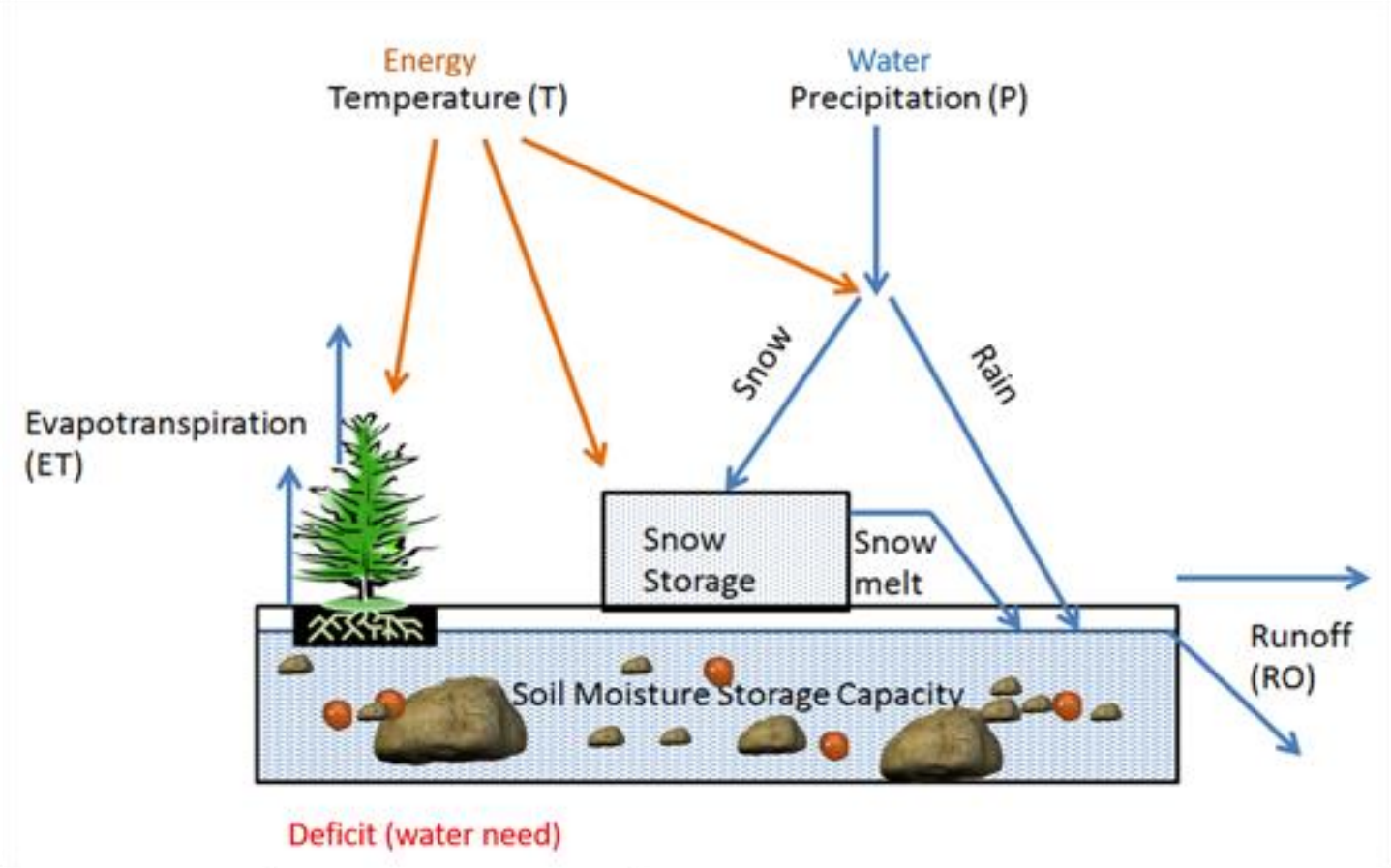
The **water balance** approach, which aims to balance water supply with water consumption, is not achievable for every location. An example of the water balance approach would be to use only captured rainwater and/or underground water for the water needs of the building, so no water would be used from municipal lines.

The WE credit category will be discussed under two major sections:

- Indoor water use
- Outdoor water use



Introduction



LEED indoor and outdoor water use calculations

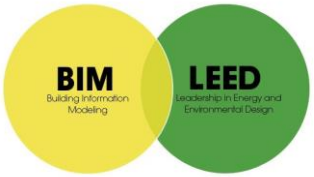
Indoor water use

It is necessary to first calculate a **baseline** water usage and then find innovative ways to establish water use reductions from the baseline during the design phase. In LEED, projects will be awarded points under the WE credits according to the percent reduction made from their baseline water usage.

To calculate the baseline water usage of a project, first the baseline rates for flow and flush fixtures should be determined. In the LEED calculations, the baseline flow and flush rates are specified by the **Energy Policy Act of 1992 (EPAct 1992).**

The occupant usage should then be calculated to find out how much those fixtures will be used. In LEED, the **Full-time equivalent (FTE)** value will be used to determine the occupant usage of fixtures. And to obtain the FTE of the building, the occupants will first be identified by the following occupant types:

- Full-time staff
- Part-time staff
- Transient occupants
- Residents



LEED indoor and outdoor water use calculations

Indoor water use

How to Calculate FTEs?

$$\text{FTE per Year} = \frac{\text{Total Hours Worked during a Year}}{\text{Total Working Hours per Year}}$$

$$\text{FTE per Month} = \frac{\text{Total Hours Worked during a Month}}{\text{Total Working Hours per Month}}$$

$$\text{FTE per Week} = \frac{\text{Total Hours Worked during a Week}}{\text{Total Working Hours per Week}}$$

LEED indoor and outdoor water use calculations

Indoor water use

Example

- A part time employee works 25 hours per week instead of 40 (full time).

$$FTE\ Fraction = \frac{25}{40} = 0.625$$

For more complex arrangements use:

$$FTE\ Fraction = \frac{PT\ hours\ in\ a\ year}{FT\ hours\ in\ a\ year}$$

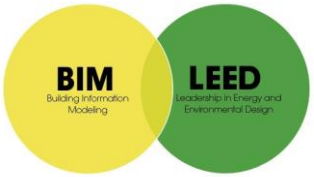
Once the FTE values is calculated and the baseline flow and flush rates for fixtures are taken from the EPAct 1992, the baseline indoor water consumption can be calculated. Next, project teams will need to discover innovative strategies for reducing water consumption as much as possible.

LEED indoor and outdoor water use calculations

Outdoor water use

The projects that contain landscaping will need to calculate the baseline **landscape water requirement (LWR)**. LWR is the amount of water that the landscape will require during the site's peak watering month.

To calculate the LWR, projects will use the **US Environmental Protection Agency (EPA)'s WaterSense Water Budget Tool**. This online tool will calculate the total LWR of the project, which will be the baseline value. Next, project teams will need to discover innovative ways for reducing this value.



Indoor water use

Use of water for urinals, toilets, showers, kitchen, and other applications all contribute to indoor water use.

Indoor water use

Indoor potable water consumption can be reduced by using water-efficient fixtures and/or using non-potable water sources where appropriate.

The use of **WaterSense**-labeled products can be a good strategy that will contribute to reducing indoor water usage because it identifies high-performance, water efficient fixtures.

Following there are types of different fixtures that can be installed to decrease potable water consumption.

Indoor water use

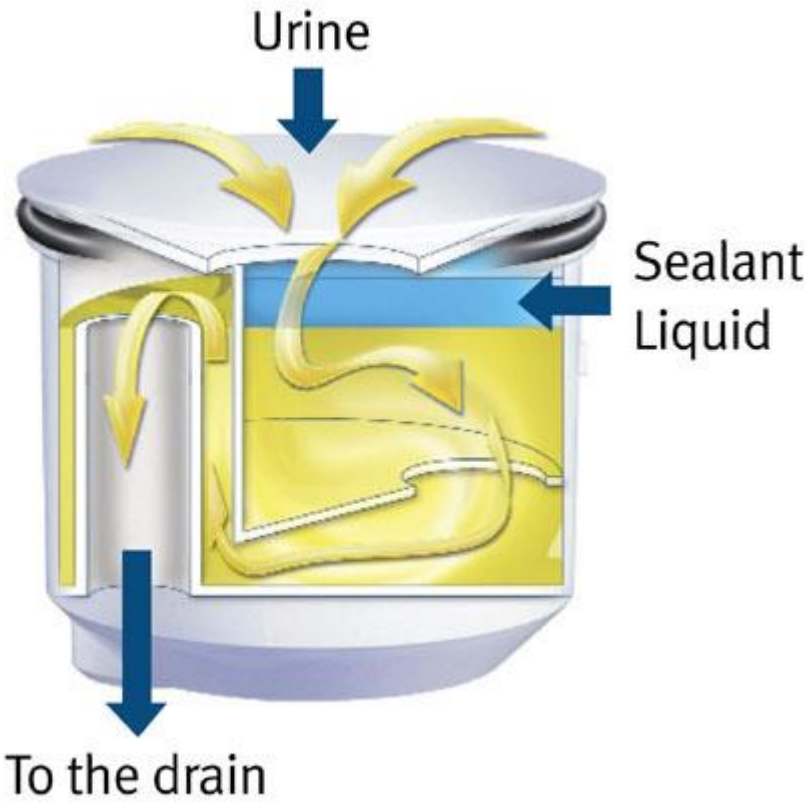
Dual-flush toilets

Indoor water use

High-efficiency toilets

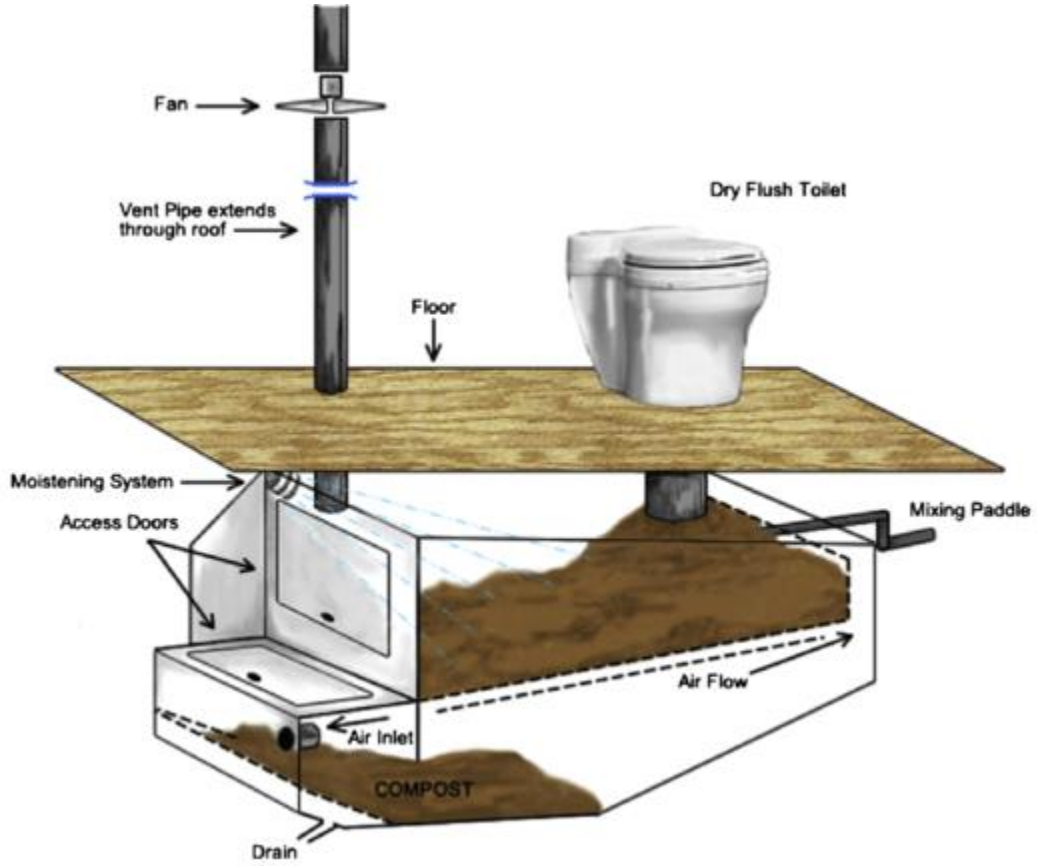
Indoor water use

Waterless urinals



Indoor water use

Composting toilet systems



Indoor water use

Low-flow showerheads and faucets

Indoor water use

Faucets with low-flow aerators and/or motion sensors

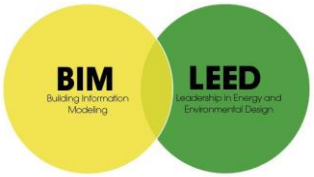
Indoor water use

The use of harvested **rainwater** and/or **graywater** as the flush water of toilets can decrease potable water consumption.

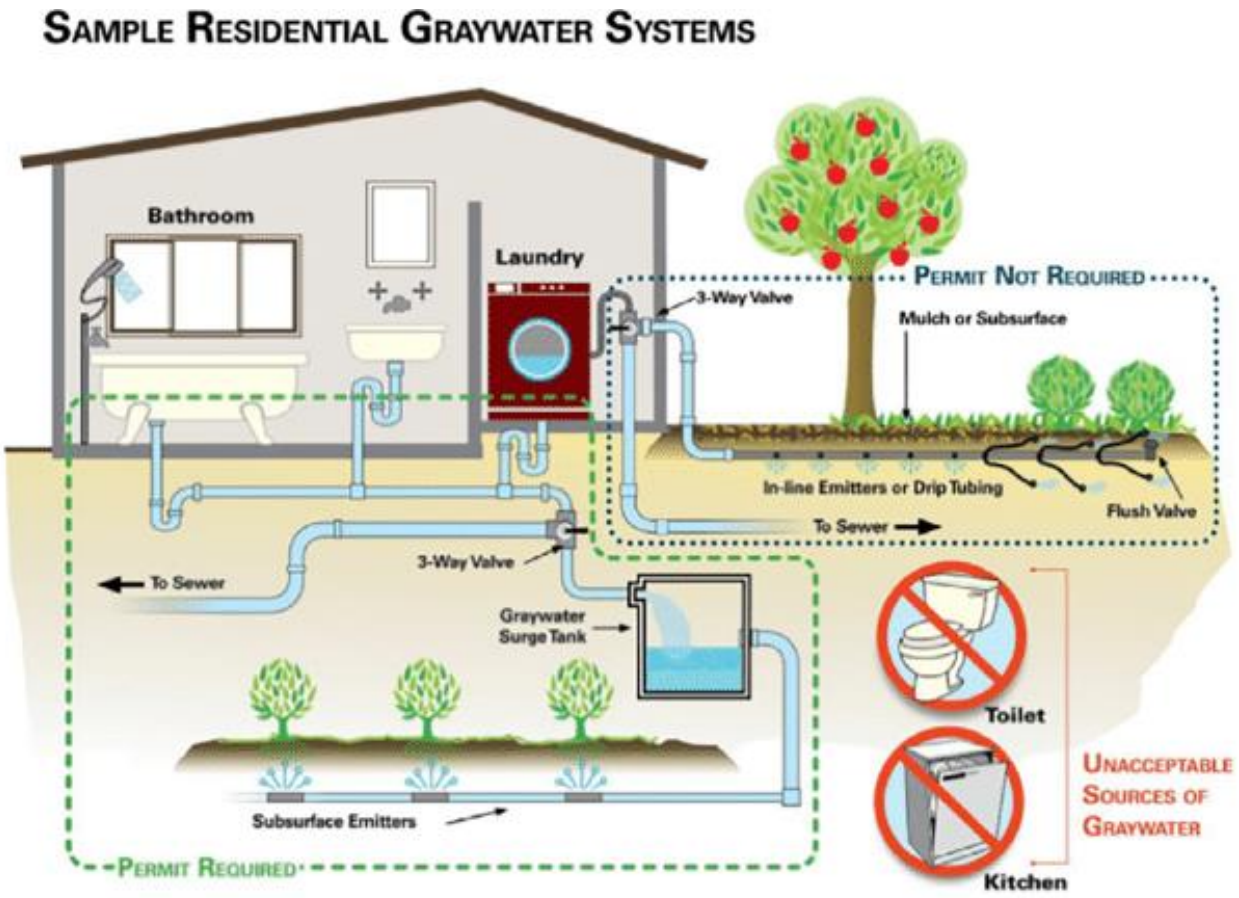
Graywater is the untreated household water that does not meet toilet waste. Used water from bathtubs, showers, bathrooms washbasins, and clothes washers and laundry tubs can be an examples of graywater and may be used as flush water in toilets or urinals.

By installing graywater treatment systems, the used water can be filtered and then sent back to the building for reuse. The definition of graywater changes from state to state, and some states do not allow the use of graywater as toilet flush water.

Blackwater is the term to describe the used water that has meet waste. Thus, the water collected from the urinals and toilets can be classified as blackwater. **Reclaimed water** is former blackwater that as been treated and purified for reuse and can even be used for irrigation.



Indoor water use



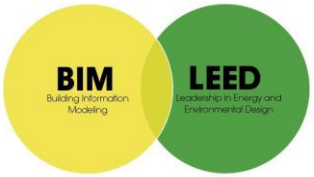
Indoor water use

Reducing **process water** usage is also essential in reducing potable water usage. Process water is the type of water used for mechanical systems.

Using reclaimed water, harvested rainwater, or graywater as process water can make a great contribution to reducing potable water consumption. If the projects also choose to install **closed-loop** systems, which use and circulate the same process water inside, instead of using **open-loop** systems, then even more potable water can be saved.

Installing submeters would be another plus for the projects to track and log water use trends and check fixture performance.

When doing water-use calculations for LEED, the water usage of **flush fixtures** such as toilets and urinals is measured in **gallons per flush (gpf)**. For **flow fixtures**, such as sink faucets, showerheads, and aerators, the water usage is measured in **gallons per minute (gpm).**



Outdoor water use

Water reductions in irrigation can be established through water-wise landscaping designs, water-efficient irrigation technologies, non-potable water use (such as using reclaimed water, graywater, or harvested rainwater), and installation of submeters to track and log irrigation trands.

The use of native and adapted plants, or **xeriscaping** (type of landscaping that does not need any irrigation) and clearing out any invasive plants can help considerably.

Outdoor water use

Areas covered with turf or grass will need high amounts of irrigation water.

Outdoor water use

Mulching around a plant, which is a protective layer applied to the surface of soil, will help to keep the roots of the plants cool and therefore prevent evaporation.

Outdoor water use

Using high-performance irrigation technologies such as **drip irrigation systems**, **bubbler distribution systems**, and **channel water directly to root systems** are other strategies to consider.

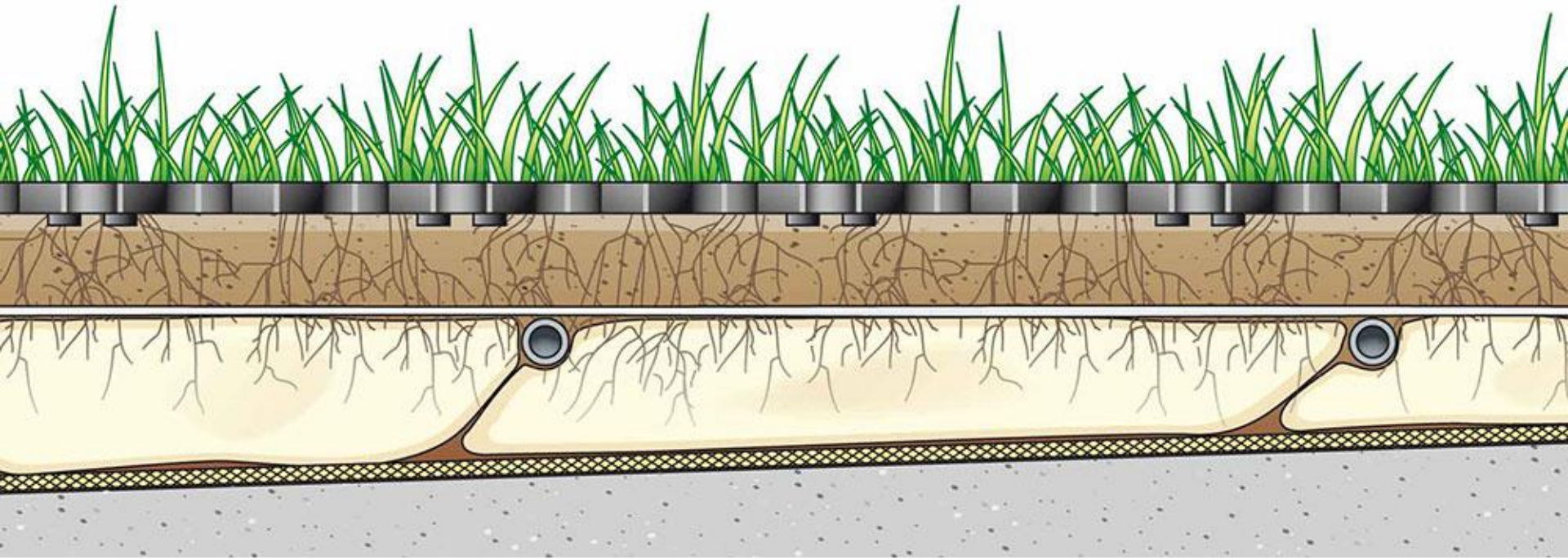
The use of weather-based irrigation controllers, to respond to weather conditions, will avoid watering the vegetation while it raining.

Drip irrigation systems are the types of micro-irrigation systems that drip water to the roots of plants to minimize the use of irrigation water and fertilizers. Scheduling of the irrigation is also important.

Outdoor water use

Outdoor water use

Outdoor water use



Strategy to address water efficiency

- Install efficient plumbing fixtures such as dual-flush toilets, high-efficiency toilets, waterless urinals, composting toilet systems, low-flow showerheads and faucets, and faucets with low-flow aerators and/or motion sensors
- Use non-potable water such as reclaimed water, harvested rainwater, and graywater as indoor water
- Install submeters to individually track indoor water consumption
- Use native or adapted plants and avoid invasive plants
- Use xeriscaping
- Install high-efficiency irrigation systems such as drip irrigation systems, bubbler distribution systems, and systems that channel water directly to root systems with weather-based irrigation controllers
- Use non-potable water such as reclaimed water, harvested rainwater, and graywater as outdoor water
- Install submeters to track and log outdoor water consumption