Baseline's Guide to the Water Efficiency Credits in LEED® v3/2009

This document describes the LEED® v3/2009 Water Efficiency credits and explains how irrigation specifiers can use Baseline products to achieve points in these credits.

Use this document for projects registered under LEED v3/2009.

Note: LEED v4, launched in late 2013, is the current version of LEED. Teams may still register projects under LEED v3/2009 until October 31, 2016.

Summary

Irrigation designs using Baseline controllers can add up to four LEED points (WE 1: Option 1 & Option 2) when used in conjunction with appropriate application technologies and/or reclaimed water sources. Baseline controllers have unique features that make them particularly suited to LEED projects. Baseline controllers provide additional benefits in the form of dramatic seasonal water use reduction and comprehensive water management functionality as well.

Baseline controllers equipped with soil moisture sensors, in conjunction with an appropriately designed irrigation system with distribution uniformity (DU) of 45% or more, will reduce water use by 30% compared to average implementations of conventional controls.

Baseline controllers with soil moisture sensors can replenish ET with zero error or drift, allowing a properly configured system to achieve near perfect irrigation management. Correct application of water will also improve plant efficiency through the promotion of deeper root systems, which improves both water efficiency and plant health and beauty.

LEED v3/2009 Water Efficiency Credit Summary

For the various LEED Rating Systems (New Construction, Retail, Schools, etc.), there are five credits available for Water Efficiency. Of these credits, two apply to irrigation (WE 1: Option 1 & Option 2):

Credit	Title	Summary
WE 1	Water Efficient Landscaping	To limit or eliminate the use of potable water or other natural surface or subsurface water resources available on or near the project site for landscape irrigation
Option 1	Reduce by 50%	Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case.

Option 2	No Potable Water Use or No Irrigation	Eliminate the use of potable water, or other natural surface or subsurface water resources available on or near the project site, for landscape irrigation.
WE 2	Innovative Wastewater Technologies	Reduce potable water use for building sewage conveyance by 50%.
WE 3	Water Use Reduction	Employ strategies that in aggregate use less water than the water use baseline calculated for the building (not including irrigation

WE CREDIT 1: WATER EFFICIENT LANDSCAPING

Option 1: Reduce by 50% (2 points)

Intent

To limit or eliminate the use of potable water or other natural surface or subsurface water resources available on or near the project site for landscape irrigation.

Requirements

Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case.

Reductions must be attributed to any combination of the following items:

- Plant species, density, and microclimate factor
- Irrigation efficiency
- Use of captured rainwater
- Use of recycled wastewater
- Use of water treated and conveyed by a public agency specifically for non-potable uses

Potential Technologies & Strategies

Perform a soil/climate analysis to determine appropriate plant material and design the landscape with native or adapted plants to reduce or eliminate irrigation requirements. Where irrigation is required, use high-efficiency equipment and/or climate-based controllers.

The designer will need to provide an irrigation plan and legend, as well as calculations, a description of the baseline, and cut sheets of the irrigation system demonstrating how water consumption is reduced by 50%.

Baseline Notes

Baseline's Soil Moisture Sensors (SMS) are ideal tools to reduce water use. Through proper design and implementation, a Baseline irrigation controller can reduce seasonal water use by up to 70%[1]. LEED further requires that peak (July) water use be reduced by 50% in order to achieve the WE 1 Option 1 credit. With built-in water management features, automatic calibration of sensor thresholds, and in conjunction with appropriately designed distribution systems with a distribution uniformity (du) of 45% or higher, all Baseline controllers with Soil Moisture Sensors will meet or exceed LEED requirements for WE 1 Option 1.

All water savings figures are predicted for peak seasonal use (July).

Category	Model	Water Savings	Summary
Irrigation Controllers	BaseStation 1000 BL-1000 BaseStation 3200 BL-3200	15%	Average savings seen using integrated water management features included in Baseline controllers. Key features include intelligent soak cycling and day interval calendar.
Soil Moisture Sensors	BL-5315B	35%-45%	Average additional savings for using soil moisture sensors with Baseline controllers. A distribution uniformity of 45% or greater is required to achieve target results.
Soil Moisture Sensor Add-on Device	WaterTec S100	Up to 50%	Average savings for using soil moisture sensors with a properly configured irrigation timer

1 – Dukes, M. et. al., (2008) Evaluation of Soil Moisture-Based on-demand Irrigation Controllers

Notes for determining water use savings based on plant selections and system design

- Guidance and worksheets for calculating water use can be found in the reference guides on the USGBC website.
- Typically, water savings is calculated based on comparing baseline water use for an "average site" in your area with the same size as your design in the month of July versus the expected water use of your design in July, using the reference evapotranspiration (ETo) landscape coefficients for your plant selections, and efficiency of your irrigation design.
- Do not forget to factor in savings for the system from the use of smart controllers, weather stations, sensors, etc.
- If the project uses a gray water or storm water reuse system, factor in the estimated volume of reuse for the month of July.

Option 2: No Potable Water Use or No Irrigation (4 points)

Meet the requirements for Option 1

Intent

Use only captured rain or recycled site water for an additional 50% reduction (100% total reduction) of potable water for site irrigation needs, OR, do not install permanent landscape irrigation systems.

Requirements

Achieve WE 1 Credit Option 1 and:

Use only captured rainwater, recycled wastewater, recycled greywater, or water treated and conveyed by a public agency specifically for non-potable uses for irrigation.

-OR-

Install landscaping that does not require permanent irrigation systems. Temporary irrigation systems used for plant establishment are allowed only if removed within a period not to exceed 18 months of installation.

Potential Technologies & Strategies

Perform a soil/climate analysis to determine appropriate landscape types and design the landscape with indigenous plants to reduce or eliminate irrigation requirements. Consider using stormwater, greywater, and/or condensate water for irrigation.

Baseline Notes

Baseline irrigation controllers have watering features to control and support multiple types of alternate water sources.

Using irrigation products designed for operation in non-potable systems can contribute to this credit. The following Baseline products meet these requirements:

Category	Model	Non-Potable Water Applicability
Irrigation Controllers	BaseStation 1000 BL-1000 BaseStation 3200 BL-3200	Advanced control algorithms and soil moisture sensors allow minimum water use from water storage systems, collection cisterns or ponds. Flexible and powerful programming features allow intelligent use of secondary water.
Pause & Pump Relay biCoders	BL-5402 and BL-5201PR, used with BL-1000 BL-3200 controllers	A multi-purpose pause biCoder used with a float switch or similar device, and a pump relay biCoder used to protect the pump and control fill for alternate water sources such as rainwater or condensate collection cisterns or open air collection ponds. For use in conjunction with BaseStation 1000, 1000R, 3200, or 3200R, which have pump management and advanced scheduling features to support these uses.

Flow biCoders	BL-5308 BL-5309	Flow biCoders for use with industry standard flow sensors or meters, including controlled flow systems for use with greywater applications as required and regulated in some markets. Used in conjunction with integrated overflow protection algorithms in BaseStation 1000, 1000R, 3200, or 3200R controllers.

Contact Baseline for more information on watering using secondary water sources, cisterns, or collection ponds.

Calculating Reduction in Irrigation Demand for LEED v3/2009

Step 1: Determine the reference evapotranspiration rate (ET_o) for the month of June or July at the project location

ET_o is a calculation of the total amount of water needed to grow a reference plant in the area. Typically turf grass is used as a reference plant because its biophysical characteristics have been studied extensively.

To find the ET_o for your project location, use one of the following online resources:

- The United States Environmental Protection Agency Water Budget Data Finder (http://www.epa.gov/watersense/new_homes/wb_data_finder.html)
- The International Water Management Institute's Online Climate Summary Service Portal (http://wcatlas.iwmi.org/Default.asp). On the submission form, make sure to select **Penman-Montieth** in the Climate Variables list. When the results display, you will find the ET_o value in the Penman ET_o column. Make sure to use the value for the month of June or July.

Step 2: Calculate the baseline irrigation water usage

Baseline Usage = Landscaped Area * ET_o * 0.62
where ET_o = Reference Evapotranspiration Rate

Calculate the area in square footage of the landscape. If the landscape is broken up into separate sections with different plant types (for example: turf grass in one area and mixed perennials in another), then calculate each area separately.

Step 3: Calculate the Controller Efficiency (CE)

Note: The terms Controller Efficiency (CE) and Control Factor (CF) are used in various versions of LEED documentation. Both terms refer to the percent reduction in water use from any weather based controllers or moisture sensor-based systems.

Controller Efficiency (CE) is the percent reduction in water use from any weather based controllers or moisture sensor-based systems. It is equal to 1 minus the estimated percentage of overall irrigation water saved by the controller (CE = 1 - % Savings).

Based on the water savings data collected from Baseline customers, we estimate that our BaseStation 1000 or BaseStation 3200 irrigation controllers equipped with Baseline's biSensor™ soil moisture sensors support an average water savings of 30%.

The CE for Baseline controllers with biSensors would be 0.7 (CE = 1 – 0.3 = 0.7).

Step 4: Calculate the design case irrigation water usage

Design Case Usage = (Landscaped Area * ETL ÷ IE) * CE * 0.62

where ETL = ET0 * KL and KL = KS * KMC .

Refer to the tables below for the formula values:

- Table 4 for the KS value
- Table 5 for the KMC value
- Table 6 for the IE value

Note: The tables are from the USGBC web site.

Table 4. Species Factor

Vegetation type	Species factor (KS)		
	Low	Average	High
Trees	0.2	0.5	0.9
Shrubs	0.2	0.5	0.7
Groundcover	0.2	0.5	0.7
Turf	0.6	0.7	0.8

Table 5. Microclimate Factor

Example microclimate impacts	Microclimate factor (KMC)		
	Low	Average	High
Shading	0.5	0.8	1.0
High sun exposure	1.0	1.2	1.5
Protection from wind	0.8	0.9	1.0
Windy area	1.0	1.2	1.5

Table 6. Irrigation Efficiency

Irrigation type	Irrigation efficiency (IE)	
	Low	High
Fixed spray	0.4	0.6
Impact and microspray	0.5	0.7
Rotors	0.6	0.8
Multistream rotators	0.6	0.8
Low volume and point source (e.g., drip)	0.7	0.9

Step 5: Calculate the percentage reduction in irrigation water usage

Percentage Reduction = (1 – Design Case Usage ÷ Baseline Usage) * 100