Irritrol Product Selections for Water-Efficient Landscapes in the LEED® Rating System

September, 2011

What is LEED® and the LEED Rating System?

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. This rating system is developed and maintained by the U.S. Green Building Council (http://www.usgbc.org).

LEED is the nationally-accepted benchmark for the design, construction and operation of high-performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: Sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

LEED and Irrigation

The USGBC's new (2009) LEED point rating system is as follows:

- Platinum (80-100 points)
- Gold (60-79 points)
- Silver (50-59 points)
- Certified (40-49 points)

There are various project categories (New Construction, Schools, Retail, Existing Buildings) in which irrigation can play a part. The ways in which Irritrol Irrigation products can play a role in helping to achieve credits is discussed below:

Water-Efficient Landscaping credits have been increased to a total of 10 points; 6 points are derived from landscape strategies, and up to 4 points may be earned by making efficient irrigation-related decisions (alternative water sources, irrigation product selection).

1. WE Credit 1.1 (Water-Efficient Landscaping; Reduce by 50%) – 2 Credits
2. WE Credit 1.2 (Water-Efficient Landscaping; No Potable Water Use or No Irrigation) – 4 Credits (includes meeting the requirements for WE Credit 1.1)

The Irritrol Irrigation products discussed in this packet, when properly used in an irrigation design, cumulatively help to achieve WE Credit 1.1 - a reduction in water consumption for irrigation by over 50%* from a calculated mid-summer baseline case.

***IMPORTANT NOTE:** *Water savings stated in this guide are cumulative and based on a system utilizing all products recommended for LEED Designs. Individual product (stand-alone) water savings may be higher or lower than listed. Please contact Irritrol if additional water savings details are needed for these or other Irritrol Irrigation Products.*

Irritrol
5825 Jasmine Street
Riverside, CA 92504
1-800-634-TURF (8873)
www.irritrol.com

WE CREDIT 1.1: WATER-EFFICIENT LANDSCAPING – REDUCE BY 50% (2 Points)

Intent

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. Use high-efficiency irrigation technology, OR, use captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means.

Requirements
Reduce potable water consumption for irrigation by 50% from a calculated, mid-summer baseline case. Reductions shall be attributed to any combination of the following items:

- Plant species 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

How to Calculate Savings for Credit

1. Calculate a baseline water use for an "average site" in your area, the same size as your design, in the month of highest average Evapo-Transpiration (ET) (typically July in the northern hemisphere).
2. Calculate the expected water use of your design in July, utilizing a reference evapo-transpiration (ET), landscape coefficients for your plant selections, and irrigation efficiency of your design.
3. Add in water savings (hottest month usage) based upon estimated volume of public agency conveyed non-potable water or water supplied by a gray water or storm water reuse system.
4. Determine Water Savings (%) based upon plant selections, irrigation efficiencies, and reuse.
5. Add additional savings (beyond efficiency savings) earned through irrigation product selection (e.g., use of an Irritrol Wireless Rain/Freeze Sensor can provide additional 10% savings).
6. Total savings must be equal to or greater than your baseline water use for an "average site".

Water Efficiency Notes:

- As part of WE 1.1 Credit, the designer should provide a planting plan, plant list, irrigation product selection, and narrative describing how water consumption is reduced by 50%.
- Irrigation Efficiency is a key component of calculating water-use savings. Proper head selection and spacing improves the overall water application efficiency of an irrigation system and minimizes irrigation water runoff.
- Guidance and worksheets for calculating water use can be found in reference guides on the USGBC website.
- Typically, water savings are calculated based on comparing baseline water use for an "average site" in your area, the same size as your design, in the month of July (month of highest average ET) versus the expected potable water use of your design in July.
- If the project uses a gray water or storm water reuse system, the estimated volume of reuse for the month of July should also be factored in.

EXAMPLE DESIGN:
The following system product selection provides an example of how to utilize Irritrol Irrigation Products to meet the requirements of Water Efficiency Credit 1.1. The products described are intended to maximize savings. Alternate products may be utilized which still achieve design requirements.

DESIGN PRODUCT #1

Product Description	Wireless Rain/Freeze Sensor with Water Conservation Modes
Irritrol Product Options	1. Irritrol RFS1000 Wireless Rain/Freeze Sensor 2. Irritrol RS1000 Wireless Rain Sensor (for regions without potential freeze hazard)
Additional Water Savings Provided	5-30% Depending on Regional Average Rainfall Events (Average 10% for LEED Design Specifications – Annual rainfall may drive a higher or lower expected savings.)
References	• *ABE325 – Residential Irrigation System Rainfall Shutoff Devices* (Michael D. Dukes and Dorota Z. Haman) • *Expanding Disk Rain Sensor Performance and Potential Irrigation Water Savings* (Bernard Cardenas-Lailhacar and Michael D. Dukes, P.E.)

Example Savings:
If a system irrigates a half-acre of turf and is set to run each zone so that a 1/2 inch of water is applied per cycle, one can calculate that 6,789 gallons are being applied over the half-acre of turf per cycle. This is the savings every time the sensor eliminates an irrigation event. If this amount is multiplied by the number of substantial rainfalls that occur in the area over one growing season, a significant amount of water can be saved.

Water Savings may be calculated by estimating yearly water usage, average savings per rain shutdown, and estimated annual rain shutdowns.

Shutdowns due to freezing temperatures may also be utilized for calculated water savings, provided a rain sensor with freeze shutoff is utilized.

DESIGN PRODUCT #2

Product Description	Weather-Adjusting Controller
Irritrol Product Options	1. Irritrol Climate Logic™ Wireless Weather-Sensing system with a compatible irrigation controller (compatible Irritrol controllers include Rain Dial®-R, Total Control®-R, KwikDial® or MC-E "Blue")
Water Usage	Use of a weather-adjusting controller will ensure irrigation occurs to plan design accounting for landscape coefficients and irrigation efficiencies. Cooler months and days will cause less irrigation.
Additional Water Savings Provided	• Weather-Adjusting Controllers can save an additional 20-35% by automatically adjusting irrigation runtimes/frequencies based on ET changes over the course of a year. Add (estimated) 25% additional water savings if using one of these controllers. • Irritrol CLIMATE LOGIC combines automatic adjustments in irrigation to follow the weather and replace water lost to E.T. with system shutoff because of rain or cold temperatures. For LEEDS average, add 10% additional water savings for the built-in rain shutdown device to the 25% average savings for the weather-adjusting capability. The extra 10% takes the place of an individual rain/freeze sensor.
References	• *Irrigation by Evapo-Transpiration-Based Irrigation Controllers in Florida (*S.L. Davis, M.D. Dukes, G. L. Miller, 2008) • I.A. SWAT Performance Summaries- Irritrol CLIMATE LOGIC

Example Savings:

WATER USE REDUCTION USING WEATHER-ADJUSTING CONTROLLERS

AVERAGE U.S. EVAPOTRANSPIRATION

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Daily ET (in/day)	0.02	0.02	0.05	0.09	0.14	0.19	0.21	0.19	0.13	0.08	0.03	0.02
Days in Month	31	28	31	30	31	30	31	31	30	31	30	31
Monthly Avg ET (in/mo)	0.62	0.56	1.55	2.7	4.34	5.7	6.51	5.89	3.9	2.48	0.9	0.62

	Sq. Feet
Assumed Landcaped Size	10,000

Baseline Usage: *(Assume adjust runtimes once per season)*

Season	Highest Monthly ET	Sq. Feet	Conv (gal)	Water Usage (3 Mon.)	Yearly Usage (gal)
Spring	4.34	10,000	0.6233	81,154	
Summer	6.51	10,000	0.6233	121,730	
Fall	3.90	10,000	0.6233	72,926	
Winter	0.62	10,000	0.6233	11,593	287,404

Weather Adjusted Usage:

Month	Highest Monthly ET	Sq. Feet	Conv (gal)	Water Usage	Yearly Usage (gal)
January	0.62	10,000	0.6233	3,864	
February	0.56	10,000	0.6233	3,490	
March	1.55	10,000	0.6233	9,661	
April	2.7	10,000	0.6233	16,829	
May	4.34	10,000	0.6233	27,051	
June	5.7	10,000	0.6233	35,528	
July	6.51	10,000	0.6233	40,577	
August	5.89	10,000	0.6233	36,712	
September	3.9	10,000	0.6233	24,309	
October	2.48	10,000	0.6233	15,458	
November	0.9	10,000	0.6233	5,610	
December	0.62	10,000	0.6233	3,864	222,954

Water Use Reduction (Baseline Usage - Weather Adjusted Usage):		64,449
Water Use Reduction %:		22.4%

DESIGN SYSTEM PRODUCT #3

Product Description	Pressure-Regulating Master Valve
Irritrol Product Options	1. Irritrol 100 Series with Omni-Reg Pressure Regulator 2. Irritrol 700 Series with Omni-Reg Pressure Regulator
Non-Potable Indicator	Yes – Available
Additional Water Savings Provided *	• 5-20% over baseline efficiencies (assume 5% for LEED Design Specifications – higher savings may be justified based on supply pressure.)
References	• With a minimum of 10 psi differential (inlet vs. discharge pressure), water usage is reduced by about 1-2% for each 1 psi reduction. http://www.engineeringtoolbox.com/bernouilli-equation-d_183.html

Example Savings:

15H Sprays regulated to 30 PSI
- 1.86 GPM
- 10 minutes
- 18.6 gallons each
- 20 sprinklers
- 372 gallons per zone

15H Sprays non-regulated @ 40 PSI
- 2.27 GPM
- 10 minutes
- 22.7 gallons each
- 20 sprinklers
- 454 gallons per zone

= 82 gallons or 18% savings per cycle

Note: *Water Savings due to Master Valve Pressure Regulation are not realized solely due to volume saved by operating sprinklers at designed operational pressures. Operation at optimum pressures also reduced misting from nozzles and subsequent water loss due to wind drift, and sprinkler efficiency is maximized by operating at designed pressures.*

DESIGN PRODUCT # 4

Product Description	Flow Sensor (used in combination with a flow-sensing controller*)
Irritrol Product Options	1. Rain Master FS Series Flow Sensor
Additional Water Savings Provided *	• Assume 2% for LEED Design Specifications based on expectation of lateral or mainline breaks that are identified and isolated yearly.
References	• Hazen-Williams Equation http://www.engineeringtoolbox.com/pvc-schedule-40-pipe-friction-loss-diagram-d_1147.html

Irritrol's flow-sensing controller is the MC-E "Blue" commercial controller (4-48-station sizes).

Example Savings:

How much water can a flow sensor save if there is a pipe break that is seen and isolated?

Sch. 40 Pipe Size	ID (range)	OD	GPM (with minimal pressure loss and noise) Assumes Avg. 40 psi
1/2"	.50-.60"	.85"	**14 gpm**
1"	1.00-1.03"	1.33"	**37 gpm**
1.5"	1.50-1.60"	1.90"	**81 gpm**
2"	1.95-2.05"	2.38"	**127 gpm**
3"	2.90-3.05"	3.50"	**273 gpm**
4"	3.85-3.95"	4.50"	**480 gpm**
6"	5.85-5.95"	6.61"	**1100 gpm**

DESIGN SYSTEM PRODUCT #5

Product Description	Zone Valves
Irritrol Product Options	1. 2400 Valve Series 2. 2500 Valve Series 3. 2700 Valve Series
Non-Potable Indicator	Yes – Available
Additional Water Savings Provided *	None. Proper zoning of an irrigation system helps ensure optimum system efficiency.
References	

DESIGN SYSTEM PRODUCT #6

Product Description	Drip Zone Valve Kit (Zone Valve, Filter and Pressure Regulator)
Irritrol Product Options	1. 2500 DK-1-LF (MF) 2. 2507DK-LF (MF) 3. 2711APRDK-LF (MF) 4. 2713APRDK-LF (MF) 5. 700DK-075-LF 6. 700DK-1-LF (MF) 7. DK-LV-LF (MF)
Non-Potable Indicator	Yes – Available
Additional Water Savings Provided *	• Negligible. Water Savings due to pressure regulation assumed to be part of Landscape Drip or Micro Irrigation savings.
References	• With a minimum of 10 psi differential (inlet vs. discharge pressure), water usage is reduced by at least 1% for each 1 psi pressure reduction. http://www.engineeringtoolbox.com/bernouilli-equation-d_183.html

DESIGN PRODUCT #7

Product Description	Fixed Spray with Pressure Regulation and Check Valve
Irritrol Product Options	1. Irritrol I-PRO-PR-CV
Design Radius	N/A – Covered By Nozzle Radius
Non-Potable Indicator	Yes – Available
Additional Water Savings Provided *	• Assume 5% for LEED Design Specifications
References	• With a minimum of 10 psi differential (inlet vs. discharge pressure), water usage is reduced by about 1-2% for each 1 psi reduction. http://www.engineeringtoolbox.com/bernouilli-equation-d_183.html

Example Savings:

Pressure Regulation:

15H Sprays regulated to 30 PSI
- 1.86 GPM
- 10 minutes
- 18.6 gallons each
- 20 sprinklers
- 372 gallons per zone

15H Sprays non-regulated @ 40 PSI
- 2.27 GPM
- 10 minutes
- 22.7 gallons each
- 20 sprinklers
- 454 gallons per zone

= 82 gallons or 18% savings per cycle

Check Valve

- Check Valve prevents low head drainage and keeps water in the lines:
  - Checks up to 14' (4.3m) of elevation = Water is saved for the next irrigation cycle.
  - A 12" x 2" (ID) piece of pipe has a volume of 37.6992 cu. in.
    - 1 gal of water = 231 cu. in.
    - The 2" (IS) pipe will hold 0.1632 gal per ft.
    - 14' = 2.28 gallons saved per cycle

Note: *Check Valve savings are only provided if sprinklers are installed on a slope where gravity pressure on a static system will drive water to the sprinklers.*

DESIGN PRODUCT #8

Product Description	**Rotary Sprinkler with Check Valve**	
Irritrol Product Options	1. Irritrol 550R w/Check Valve (550R-CV)	
Design Radius	25' – 50'	
Non-Potable Indicator	Yes – Available	
Irrigation Efficiency	**Minimum IE: 0.550**	**Maximum IE: 0.750**
Additional Water Savings Provided *	• Assume 2% for LEED Design Specifications	
References	• *Using Distribution Uniformity to Evaluate the Quality of a Sprinkler System* (Brent Mecham; Paper presented at the 25th Annual International Irrigation Show, 2004)	

Example Savings:
Check Valve

- Check Valve prevents low head drainage and keeps water in the lines:
  - Checks up to 10' (3m) of elevation = Water is saved for the next irrigation cycle
  - A 12" x 2" (ID) piece of pipe has a volume of 37.6992 cu. in.
    - 1 gal of water = 231 cu. in.
    - The 2" (ID) pipe will hold 0.1632 gal per ft.
    - 10' = 1.6 gallons saved per cycle

Note: *Check Valve savings are only provided if rotary sprinklers are installed on a slope where gravity pressure on a static system will drive water to the sprinklers.*

BASIC ESTIMATED WATER USE REDUCTION *(EXAMPLE ONLY)*:
Actual designed savings may be more or less depending upon product selection and regional effects of evapo-transpiration and plant selection.

1. BASELINE POTABLE WATER USE:

Highest Monthly ET (July) (inches)	Sq. Feet Landscape	Conv. (to gallons)	Water Usage (gallons)
0.21"/Day = 6.51"	5,000	0.6233	20,288

2. DESIGN WATER USE

Landscape Type	Area [SF]	Species Factor (K_s)	Density Factor (K_d)	Sprinkler Type	IE	Microclimate	Microclimate Factor (K_{mc})	K_L	ET_L	TWA [gallons]
Native Shrubs	2,000	0.5	1.0	Spray Heads	0.750	Shady 75%	0.75	0.4	0.08	4,058
Warm Season Turf	1,000	0.7	1.0	Rotating Sprinklers	0.650	Sunny 100%	1.50	1.1	0.22	6,556
Native Trees	1,750	0.5	1.0	Drip	0.900	Sunny 100%	1.50	0.8	0.16	5,918
High Use Annuals	250	0.9	1.0	Drip	0.900	Sunny 75%	1.25	1.1	0.24	1,268
Total	**5,000**								**TWA**	**17,800**

3. NON-POTABLE, GRAY WATER OR STORM WATER REUSE

- Assume 0 Gallon savings for this example because of the use of potable water.

4. WATER SAVINGS

$$\frac{\text{Baseline Use} - \text{Design Use}}{\text{Baseline Use}} = \frac{20{,}288 - 17{,}800}{20{,}288} = \frac{2{,}488}{20{,}288} = \textbf{12.3\% Savings}$$

5. ADDITIONAL IRRIGATION PRODUCT SAVINGS

Product	Additional Savings
Irritrol Wireless Rain/Freeze Sensor	10% if separate and not built-in
Irritrol CLIMATE LOGIC Weather Sensor w/ Controller (weather adjusting and rain shutoff)	25% (+10% for built-in rain sensor for system shutoff)
Irritrol 100 Series Pressure-Regulating Master Valve	5%
Rain Master FS Series Flow Sensor	2%
Irritrol I-Pro-PR-CV Sprays	5%
TOTAL ADDITIONAL SAVINGS	**47%**

6. TOTAL WATER USE REDUCTION

- 12.3% Design Savings + 47% Product Selection Savings = 59.3% Water Use Reduction

OTHER POTENTIAL LEED CREDIT POINTS RELATED TO IRRIGATION AND LANDSCAPE

Water Efficiency Credit 1.2: Water-Efficient Landscaping; Non-Potable Water Use or No Irrigation
If the irrigation system design is intended to use non-potable water (designed utilizing only public agency-supplied non-potable water and/or rainwater/gray water harvesting), Irritrol has irrigation products specifically designed for operation in these environments. Benefits include materials resistant to the chemicals used to treat reclaimed water and optional identifiers (lavender-colored markings) denoting non-potable water in use. The Irritrol Professional Irrigation Products Catalog (Form #12*-TL1500) identifies models with effluent (non-potable) indicators.
**("12" is for "2012". Insert 2-digit suffix for current-year catalog.)*

The following Irritrol products meet these requirements:

Category	Model	Non-Potable Water Applicability
Sprays	I-PRO Series	Optional Effluent Water Indicators (Lavender)
Rotor	550R Series	Optional Effluent Water Indicators (Lavender)
	Platinum Sport Series	Optional Effluent Water Indicators (Lavender)
Valves	2400/2600 Series	Chloramine-Resistant Diaphragm
		Optional Effluent Solenoid Assembly & Tag (Lavender)
	2500 Series	Chloramine-Resistant Diaphragm
		Debris-Resistant Design optimal for Dirty-Water Applications
		Optional Effluent Solenoid Assembly & Tag (Lavender)
	205 Series	Optional Effluent Solenoid Assembly & Tag (Lavender)
	2700 Series	Chloramine-Resistant Diaphragm
		Optional Effluent Solenoid Assembly & Tag (Lavender)
	311A Series	Optional Effluent Solenoid Assembly & Tag (Lavender)
		Optional Omni-Reg Pressure Regulator
	2623 Series	Chloramine-Resistant Diaphragm
		Optional Effluent Solenoid Assembly & Tag (Lavender)
	200B Series	Chloramine-Resistant Diaphragm
		Optional Omni-Reg Pressure Regulator
		Optional Effluent Solenoid Assembly & Tag (Lavender)
	Drip Zone Kits	Optional Effluent Solenoid Assembly & Tag (Lavender)

Innovation and Design Credit 1: Innovation in Design
Additional points may be achieved for Innovation in Design by explaining unique features of specific Irritrol irrigation products (for 'Innovation in Design' credits) and/or use of these products in landscaping strategies which demonstrate quantifiable environmental benefits above and beyond the Water Efficiency requirements already set by the LEED Green Building Rating System.

Sustainable Credits 5.1: Site Development: Protect or Restore Habitat (1 point)
Efficient irrigation systems and landscape design can play a key role in conserving existing natural areas and restoring damaged areas. Irrigation design that eliminates runoff protects habitats from pollution and associated harm. Use of native plants in landscape design can potentially provide habitat space and foster the restoration of habitats.

Sustainable Sites Credit 6.1: Storm Water Design: Quantity Control (1 point)
Limiting disruption of natural water hydrology and managing storm water runoff can earn points for Sustainable Sites Credit 6.1. Irrigation systems designed to utilize rainwater harvesting as an irrigation source can eliminate storm water run-off by using all captured rainwater and run-off for irrigating the landscape.

Sustainable Sites Credit 7.2: Heat Island Effect (1 point)
Battery-operated irrigation controllers (Irritrol JRDC-1 or JRDC-4) and landscape drip or micro irrigation systems can be utilized for "green" roofs or rooftop gardens, provided benefit towards achieving Sustainable Sites Credit 7.2.

Energy and Atmosphere Credit 1: Optimize Energy Performance (up to 10 points)
Achieve increasing levels of energy performance above the baseline is the prerequisite standard to reducing environmental and economic impacts associated with excessive energy use. Up to 10 points can be awarded based on the percentage of improvement over the prerequisite requirements. Landscaping design can have a significant impact on HVAC requirements due to the cooling effects of landscape and turf, especially shading of buildings with mature trees. The overall temperature of urban areas may be as much as 5 to 70C warmer than that of nearby rural areas. Through the cooling process of transpiration, turfgrasses dissipate high levels of radiant heat in urban areas. The transpirational cooling effect of green turfs and landscapes can save energy by reductions in the energy input required for interior mechanical cooling of adjacent homes and buildings (*The Role of Turfgrasses in Environmental Protection and Their Benefits to Humans,* James B. Beard and Robert L. Green, 1994)