

Gaining Perspective on Water Efficiency Through LEED v4.0

Exploring Water Efficiency...Understanding LEED v4...Reaching/Realizing High-Efficiency

Green building in general has become more mainstream and standard practice with the emergence and acceptance of design tools such as LEED® by the U.S. Green Building Council (USGBC). Since the LEED v1 pilot program launched in 1998, LEED has been transitioning from a rating system that encourages the design and construction of green buildings to a system that aids in the construction of buildings that provide significant environmental benefit. LEED v4 continues to transform the marketplace, seeking to push the building industry forward along the path of environmental responsibility by diving deeper into more focused sustainability issues than previous versions.

The changes to LEED v4 affected all categories — and with them come new rules, new challenges, and a wealth of new opportunities. As a major component of the LEED rating system, as well as an integral part of green building operations, the **Water Efficiency section** expanded to include all types of water use — not simply the water associated with fixtures and fittings, but also addressing process, appliances, cooling towers, and outdoor water, as well as fundamental building metering requirements. There is a new prescriptive compliance path for meeting selected flush or flow rates. Appliance and process water use are now addressed with special requirements for the Schools, Retail, Hospitality, and Healthcare market sectors.

Summary of WE Changes from LEED v2009 to LEED v4

Water Efficiency	Credit	Points	LEED 2009	Points	LEED v4
		Outdoor Water Use Reduction	2-4	Option 1. Reduce by 50%; Option 2. Reduce by 50% AND use no potable water OR no irrigation	Prerequisite 1-2
Indoor Water Use Reduction		Prerequisite	Reduce indoor water use by 20% below EPAAct baseline	Prerequisite	Reduce indoor water use by 20% below EPAAct baseline; WaterSense labels; requirements for appliance and process water
		1-4	Reduce indoor water use by 30-40%	1-7	Reduce indoor water by 25-50% below EPAAct baseline; WaterSense labels; requirements for appliance and process water, ASHRAE 189 cooling tower requirements
Water Metering				Prerequisite	Install building-level water meters and share data with USGBC for 5 years
			EBOM Only	1	Install permanent water meters for at least 2 selected water subsystems
Innovative Waste Water Technologies		2	Reduce water for building sewage conveyance by 50%		
Cooling Tower Water Use			EBOM Only	1-2	Perform potable water analysis, limit cycles

These changes have been widely analyzed, yet may still need clarification. As such, although the LEED v4 scope encompasses water-related initiatives in green building, the focus of this white paper is on the **significant** modifications in the water efficiency category pertaining to indoor water use.

Concentrating on the indoor water-related criteria, two of the prerequisites and the corresponding credits — (1) building-level water metering and (2) indoor water use reduction — will help projects reduce water consumption and realize water savings during the entire life of the project.

The prerequisite threshold for Indoor Water Use Reduction is **20** percent. This prerequisite was first established in LEED 2009; earlier versions of LEED actually awarded a point for a 20% reduction below 1992 EPAAct levels. By eliminating the point and making the 20% reduction the prerequisite, the document reflects the growing understanding of just how important water savings is. For example, there are currently 18 bills with the term “water savings” going through either at the federal level, or state level. Another nine have the term “water conservation.” There is no crossover in these bills. In other words, they are different bills trying to accomplish the same goal. Current legislation at the federal, state and local levels include more than 100 bills that address water conservation, water efficiency and/or LEED requirements.

Prerequisite 2 Indoor Water Use Reduction Baseline

Commercial Fixtures, Fittings, and Appliances	Current Baseline
Water closets (toilets)*	1.6 gallons per flush (gpf)
Urinal*	1.0 (gpf)
Public lavatory (restroom) faucet	0.5 gpm at 60 psi (all others except private applications)
Private lavatory faucet*	2.2 gpm at 60 psi
Kitchen faucet (excluding faucets used exclusively for filling operations)	2.2 gpm at 60 psi
Showerhead*	2.5 gpm at 80 psi per shower stall

* WaterSense label available for this product type.

Note: Flushometer-type water closets are not part of WaterSense at this time.

The differentiating factor from previous versions of LEED is the requirement to use products certified under the U.S. Environmental Protection Agency’s (EPA’s) WaterSense® program. (WaterSense helps consumers chose cost-effective products by labeling those certified to be at least 20 percent more efficient without sacrificing performance.) This requirement applies to the prerequisite and carries over the indoor water reduction credit criteria.

This means all urinals and tank toilets, plus some faucet applications, need to be WaterSense-certified **as well as reduce water usage compared to the allowable baseline**. Flushometer water closets do not currently have a WaterSense specification, but they would also be required to reduce water consumption compared to the allowable baseline. Projects can earn additional points for reducing indoor water usage by **25** to **50** percent for new construction and **10** to **30** percent for existing buildings.

Another significant update to this credit category is **water metering**. Metering data must be shared with the U.S. Green Building Council (USGBC) for **five** years. Projects can earn an additional point for installing water meters on at least two types of subsystems, such as irrigation, indoor plumbing, and reclaimed water. Existing buildings have an opportunity to earn an additional point for submetering four or more subsystems.

Meter data must be recorded on a regular basis and compiled into monthly and annual summaries. USGBC provides a data template that is submitted as completed via USGBC's Dropbox. The forms are due within 2-weeks of the request. As a general rule, USGBC will aim to collect data two-times per year.

High-Efficiency Solutions

Many water conservation strategies are no cost or provide a rapid payback while other strategies, such as biological wastewater treatment systems and graywater plumbing systems often require more substantial investments.

In any building, restrooms are a **cost center**. Water, electricity, paper, maintenance, and waste removal expenses add up quickly, impacting the bottom line. Upgrading restrooms with high-efficiency products conserve water, reduce electrical consumption, and eliminate waste. Less water also means reduced drainage, which translates to less energy for treatment and discharge.

If a facility is going to focus on such solutions, the plan should be on ultra-low-flow or waterless fixtures, as well as overall conservation with strategies like rainwater capture and graywater reuse (these tactics are documented as an alternative compliance path in LEED Online). Careful attention to fixture selection and building flow requirements are key factors in achieving water efficiency goals.

The flush volume of toilets has improved steadily from the 1950s when it took 7 gallons per flush to the current 1.6 gpf standard. A High-Efficiency Toilet (HET) is a fixture with an average flush volume of 1.28 gpf or less (dual-flush devices (1.6/1.1 gpf) are considered HETs) that meets the performance requirements of ASME 19.2/CSA B45.1 and Maximum Performance testing, known as MaP. MaP testing simulates solid waste, and the minimum benchmark adopted by the EPA for its WaterSense program is **350** grams.

Other considerations for tactics to employ include manual dual-flush toilets, which offer the option of a 1.6 gallon flush for solid waste or 30 percent less (1.1 gallon flush) for liquid waste. These options are available either as a complete valve or as a retrofit to an existing valve. Electronic dual-flush toilets, either battery powered or hardwired, carry the advantage of hands-free operation which, because it reduces contact in the restroom, promotes hygiene. Portland International Airport, for example, installed 330 manual and electronic dual-flush flushometers for a savings of more than 30,000 gallons of water a day.

By using an HET with 1.28 gpf, a building can save thousands of gallons a year over the standard 1.6 gpf toilet. However, if a facility is seeking LEED Water Efficiency points, using 1.28 gpf only helps to achieve the prerequisite. Further water reduction would be needed to achieve LEED point criteria!

One such tactic to employ is a 1.1 gpf HET in which there is a 30% water use reduction, thereby contributing to multiple points. New 1.1 gpf toilet systems, which combine a vitreous china toilet fixture with either a manual or sensor-operated low-flush 1.1 gpf flushometer, provide consistent, reliable performance designed for new construction projects to help lower water usage while maintaining performance expectations.

Sloan offers the broadest 1.1 gpf family available, with **three** overall water-efficient toilet systems. Sloan's latest innovations in this flushing technology are Royal® manual valves and

ECOS® and SOLIS® electronic valves – all paired with Sloan floor-mount, floor-mount ADA and wall-hung bowls delivering a total of **nine** different combinations. The combinations were created to meet all types of environments found in today’s facilities.

Regardless of which HET is chosen, however, the best case scenario is achieved when the flushometer and fixture are **optimized** to work together in order guarantee the flush volume of the flushometer is reached. Flushometers and vitreous china fixtures are sold both separately and as packaged products from many manufacturers, and professionals need to choose which approach best suits their needs. It’s not all about cost; **performance** is a key issue, especially in light of lower flush volumes.

New construction has the advantage of starting with the latest flushing technologies, and HETs are natural choices for both performance and water savings. Plumbing retrofit and renovation decisions are more difficult for existing buildings, however.

Existing facilities that want to reduce water consumption by moving to HETs, yet still have the older 3.5 gpf water closets, have little choice but to **completely change out their fixtures and fittings**. In that case, the decision comes down to: would a 1.28 gpf, 1.1 gpf or a 1.6/1.1 gpf dual-flush system work best? When making plumbing upgrades, it is important to factor in both the age of the building and the condition of the drains.

On the whole, however, the Water Efficiency credit category in LEED v4 is critical as it addresses not only the initial design and construction of the building, but also provides a foundation for the building’s future water use. As drought conditions persist, such as currently being experienced in the state of California, and the demands on limited water supplies are increased, LEED buildings that prioritize efficient water use can be an important tool in the development of society’s sustainable water use plan.

Why WaterSense?

Sloan has been a manufacturing partner of the WaterSense program since 2007, which is the same year the program was founded. Originally, the WaterSense program focused their efforts primarily on residential products. The 2009 release of a product specification for High-Efficiency Flushing Urinals and the soon to be released specification for flushometer-type toilets, however, marks the expansion of WaterSense into the commercial arena. As the WaterSense program continues to expand, it is expected to encompass other commercial products, including public faucets.

In order to be recognized as a WaterSense product, the product must first have a WaterSense product specification. In accordance with such a specification, the product must conform to specific water-efficient requirements. A full list of qualifying products can be searched at http://www.epa.gov/watersense/product_search.html.

As a WaterSense partner, Sloan is supportive of the efforts put forth by both the WaterSense program and the EPA alike. Sloan is an active participant in the development of the product standards that comprise this successful program.