Water

WE.P1 Outdoor Water Budget and Irrigation System Performance — Prerequisite

Applicability	Verification Required		
WE.P1.1 applies only to those projects that are installing irrigation systems on recreational fields. WE.P1.2 The water budget requirement applies to all projects.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Reduce and optimize potable water use for irrigating recreational areas.

A water budget is a reasonable estimate of the amount of irrigation water required for a specific landscape over a given time interval. Local governments may have a different ordinance from the state model for calculating a water budget.

New technologies to measure the amount of moisture in soil can be used to alert grounds staff to provide only the quantity of water, and only at the time it is necessary to sustain species life on recreational fields. The U.S. Environmental Protection Agency claims that water savings of 10-20% can be achieved through such technologies.

Requirement

Prerequisite	WE.P1.1 Any in-ground irrigation systems used for recreational fields must have soil moisture meters, weather stations, or equivalent technology (ET Controllers) to control and shut off operation of irrigation systems when adequate ambient moisture is available to the turf. This prerequisite is only required for fields irrigated with potable water sources.
Prerequisite	WE.P1.2 Develop a water budget for landscape (both non-recreational and recreational) and ornamental water use conforming to the minimum water allowance provided by the U.S. Environmental Protection Agency's WaterSense Water Budget Tool, unless a local water efficient landscape ordinance is more stringent.

Implementation

Develop a water budget for both recreational and non-recreational landscape and ornamental use in accordance with the U.S. Environmental Protection Agency's WaterSense Water Budget Tool including both the Landscape Water Requirement (LWR) and Landscape Water Allowance (LWA). The allowance is based on landscaped area, evapotransporation rates specific to Hawaii climates and historical rainfall.

Recreational areas include athletic fields, playing fields, practice fields, etc.

The water budget should be reflected in the school landscaping plan and in specifications for efficient irrigation equipment.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements

WE.P1.1	Construction drawings must include complete landscape drawings identifying irrigation system components and soil moisture meters if required.
WE.P1.2	Construction drawings must include complete landscape drawings including all outputs of the U.S. Environmental Protection Agency's WaterSense Water Budget Tool including both the Landscape Water Requirement (LWR) and Landscape Water Allowance (LWA). The outputs should reflect the landscape plans provided.
Construction Review Requirements	
WE.P1.1 and WE.P1.2	Provide proof of purchase, installation, pictures or other supporting documents that show compliance.

Resources

Hawaii Department of Education EDSPECS Chapter 11 Landscape Design Criteria:
http://fssb.k12.hi.us/educational_specifications.htm

LEED™ Reference Manual: Water Credit 1: Water Efficient Landscaping.

U.S. Environmental Protection Agency's WaterSense Water Budget Tool
http://www.epa.gov/WaterSense/nhspecs/wb_data_finder.html

Water

WE.P2 Minimum Reduction in Indoor Potable Water Use — Prerequisite

Applicability	Verification Required		
All projects.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Maximize water efficiency within buildings to reduce the burden on municipal water supply, aquifers, and wastewater treatment systems.

Efficient water consumption naturally reduces the amount of water pumped from the ground aquifers to cities and towns. In addition, water efficiency reduces the cost and amount of sewage needing treatment after use. Because water-efficient devices can vary in quality and performance, specify only durable, high performance fixtures.

Well designed water efficient systems may earn one or more points by reducing the overall amount of potable water used in the schools (WE.C1) and by reducing the amount of potable water used for sewage conveyance (WE.C2).

Requirement

Prerequisite	WE.P2.1 Employ strategies that in aggregate reduce potable water use by 20% for new construction, and 10% for major renovations beyond the baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992's fixture performance requirements and subsequent rules implemented by the U.S. Department of Energy.

Implementation

This prerequisite requires reductions in total indoor water use; therefore all significant water uses are included in the calculations. Differentiation was made between the necessary reductions for new construction and major renovations due to the difficulty of working with existing grading of pipes.

The HI-CHPS Verified Program provides templates for calculating the total water use for the baseline design and for the proposed efficient design, or create a spreadsheet that lists each fixture type, the flow rate, estimated duration of use, and any automatic controls. For the baseline design calculations assume the flow rates outlined by the EPAct of 1992's fixture performance requirements (Table 5). Food service appliances and fixtures should be considered to the extent that there is an existing baseline for those items such as clothes washers, dishwashers, and ice machines. Fixtures and appliances that are used for consumption, such as a soda machines or coffee makers, should not be included. Baseline recommendations for food service appliances and fixtures should not compromise school health regulations or codes. Then estimate the number of occupants that will use each fixture type and the number of uses per day. Use this data to calculate the water use for each fixture type and the total daily and annual water use of the school. Create a similar spreadsheet for the efficient design case using actual flow rates of the specified fixtures and equipment. The estimated number of occupants and daily uses remains the same for both cases.

Table 5 – Federal Energy Policy Act (EPAct) Performance Requirements as subsequently ruled and implemented by the U.S. Department of Energy

Fixture	1992 EPAct and Subsequent Plumbing Code Requirements (Maximums)
Toilets	1.6 gal/flush
Urinals	1.0 gal/flush
Showerheads	2.5 gal/min
Kitchen Faucets	2.2 gal/min
Lavatory Faucets	0.5 gallons/minute or 0.25 gallons/cycle
Replacement Aerators	0.5 gal/min
Metering Faucets	0.25 gal/cycle

** For lavatory faucets in public buildings.*

Note: Table 5 is not a comprehensive list. Among other fixtures found in schools, there are food service fixtures and appliances that consume a considerable amount of water and should be included in the baseline as outlined in the implementation section above where appropriate and established limits have been set.

Example Calculation

Question: How is the total potable water consumption savings calculated beyond the baseline established by the EPAct for the school in this example?

Example: Calculate the water use of the efficient design using high-efficiency fixtures where possible and the baseline design using Energy Policy Act guidelines. Divide the efficient design annual use by the baseline design annual use and subtract this from 1. The total savings in the following example is 34.1%, which meets this prerequisite. If reclaimed or recycled water, or graywater are used for irrigation in place of potable water, that volume of water is further subtracted from the efficient design. See Table 6 & 7 for the detailed calculations.

Table 6 – Baseline Design Case Total Water Consumption

Fixture Type	Flow-rate	Duration	Automatic Controls	Occupants	Daily uses	Water use
Conventional Toilet (male)	1.6 gal/flush *	1 flush	-	500	1	800
Conventional Urinal (male)	1.0 gal/flush *	1 flush	-	500	2	1000
Conventional Toilet (female)	1.6 gal/flush *	1 flush	-	500	3	2400
Bathroom Lavatory Sink	0.5 gal/min	.25 min	-	1000	3	375
Conventional Shower	2.5 gal/min *	5 min	-	100	1	1250
Kitchen Sink	2.2 gal/min *	45 min	-	2	2	198
Clothes Washer	40 gal/load	1 load	-	-	2	80
					Total Daily Volume	6,123
					Number of School Days	180
					Baseline Total Annual Volume	1,102,140

* Federal Energy Policy Act Requirements

Table 7 – Efficient Design Case Total Indoor Water Consumption

Fixture Type	Flow-rate	Duration	Automatic Controls	Occupants	Daily uses	Water use
High- Efficiency Toilet (male)	1.28 gal/flush	1 flush	-	500	1	640
High-Efficiency Urinal (male)	0.13 gal/flush	1 flush	-	500	2	130
High- Efficiency Toilet (female)	1.28 gal/flush	1 flush	-	500	3	1920
Bathroom Lavatory Sink	0.5 gal/min	.25 min	20% saved	1000	3	375
Low-flow Shower**	1.5 gal/min	5 min	-	100	1	750
Low-flow Kitchen Sink	1.5 gal/min	45 min	-	2	2	180
Efficient Clothes Washer	20 gal/load	1 load	-	-	2	40
					Total Daily Volume	4,035
					Number of School Days	180
					Design Total Annual Volume	726,300
					Percent Saved	34.1%

** Low Flow Showers at flow rates below 2.5gpm should not be installed without Automatic Compensating Valve certified at the same flow rate as the showerhead.

Comparing the two spreadsheets, the water-efficient fixtures reduced potable water use by:

% Savings = 100 – [(Efficient Design Total Annual Volume / Baseline Design Total Annual Volume) x 100]

% Savings = 100 – [(800,100/1,156,140) x 100] = 100 – (.692 x 100) = 30.8%

If a rainwater collection system part of the project, then provide justification for the volume of collected, useable rainwater over the school year. If seeking Site Credit SS.C8 Post-Construction Stormwater Management, documentation used to justify rainwater storage sizing may be used for this credit. Helpful documentation would include: a building rainwater reuse plan and a water balance analysis that includes integrated analysis of source, storage, and demand. A source analysis should take into consideration the contributing watershed, daily and/or weekly rainfall data, the variations in rainfall during the year, and rainfall abstraction.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.P2	Construction drawings must include the required HI-CHPS Verified Plan Sheet with indoor water calculations made available after registration through the HI-CHPS Verified program.
WE.P2	Construction drawings must include a plumbing fixture schedule that reflects the indoor water calculations.
Construction Review Requirements	
WE.P2	Provide pictures of installed fixtures, and manufacturer receipts/proof of purchase for the water-efficient products purchased.

Resources

LEED™ *Reference Guide*: Water Credit 3.

Water

WE.C1 Indoor Water Use Reduction — 5 Points

Applicability	Verification Required		
All projects.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Reduce the use of indoor potable water.

By increasing the efficiency of existing water consuming fixtures and equipment, the demand on water from reservoirs, ground water, lakes and streams is reduced. The federal Energy Policy Act (EPAct) of 1992 established water conservation standards for showerheads, faucets and other fixtures.

Requirement

	WE.C1.1 Exceed the potable water use reduction beyond the calculated baseline determined in Water Prerequisite WE.P2. This may include reaching the reduction through alterative sources such as rainwater.
2 points	30% new construction, 20% major renovations
Or 4 points	40% new construction, 30% major renovations
Or 5 points	50% new construction, 40% major renovations

Implementation

To earn a credit, specify fixtures that further reduce water consumption by 20-50% beyond the baseline established in water prerequisite WE.P2. Documentation for this credit is the same as for WE.P2.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.C1	Construction drawings must include the required HI-CHPS Verified Plan Sheet with indoor water calculations provided at the point of registration with the HI-CHPS Verified program.
WE.C1	Construction drawings must include a plumbing fixture schedule that reflects the indoor water calculations.
Construction Review Requirements	
WE.C1	Provide pictures of installed fixtures, and manufacturer receipts/proof of purchase for the water-efficient products purchased.

Resources

CHPS Best Practices Manual, Volume II: Guideline OS6: Efficient Terminal Devices; OS7: Waterless Urinals.

Utilize the U.S. Environmental Protection Agencies Water Sense[SM] program to assist in identify efficient fixtures at: http://www.epa.gov/watersense/

Water

WE.C2: Reduce Potable Water Use for Sewage Conveyance — 4 Points

Applicability	Verification Required		
All projects. A new building on an existing campus, and additions may be eligible for this credit if enough toilets and urinals are provided within the building to meet the occupant load. In cases where compliance with the toilet to occupant load ratio is determined on a campus wide basis the calculations for this credit should be performed for the entire school site.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Reduce wastewater generated and/or the amount of potable water used for sewage conveyance.

Water efficiency naturally reduces the overall amount of water needing to be pumped from its source or distributed around the city or state, thus resulting in lower energy needs. In addition, water efficiency reduces the cost and amount of sewage needing treatment after use. Because water-efficient devices can vary in quality and performance, specify only durable, high performance fixtures.

Use water-efficient fixtures and reclaimed water (where available) to reduce the amount of potable water used for sewage conveyance. Only those sources that produce black water, such as toilets and urinals, are included in this credit. Reclaimed water (tertiary treated wastewater) and/or recycled water from municipal sources (greywater, or harvested rainwater) or greywater generated and treated on-site are suitable for flushing toilets and urinals, which typically produce the largest amounts of wastewater in a school.

A new generation of High Efficiency Toilets (HETs) and Urinals (HEUs) that use a maximum volume of 1.25 and 0.5 gallons per flush, respectively, are now readily available. Third-party testing to determine the Maximum Performance (MAP) for different toilet fixtures has been available since 2003. Although testing has occurred for primarily tank-style toilets, more and more flushometer style toilets (toilets using flush valves) are now being tested and their performance quantified. For more information, see the following website: http://www.cuwcc.org/MAPTesting.lasso.

Requirement

Required to claim points for WE.C2.2 and WE.C2.3	WE.C2.1 Provide shut-off capabilities (manual or automatic) for water supply to all urinals and water closets to prevent water leakage when unoccupied, AND comply with either WE.C2.2 or WE.C2.3.
2 points	WE.C2.2 Reduce the use of potable water for building sewage conveyance by a minimum of 30% through the utilization of water-efficient fixtures, use of rainwater catchment systems, or both
Or 4 points	WE.C2.3 Reduce the use of potable water for building sewage conveyance by a minimum of 40% through the utilization of water-efficient fixtures, use of rainwater catchment systems, or both.

Implementation

Use water-efficient fixtures and/or site-collected water to reduce the amount of potable water used for sewage conveyance. Only those sources that produce blackwater, such as toilets and urinals, are included in this calculation. Rainwater is suitable for flushing toilets and urinals, which typically produce the largest amounts of wastewater in a school.

To quantify water use reductions, use the HI-CHPS Verified Program templates to determine baseline and design water consumption or recreate the spreadsheet below. List each fixture that produces blackwater, the amount of daily uses, number of occupants, and total water use. A water-efficient design for a 1,000-student school is shown in Table 8. The example assumes the use of low-flow toilets and waterless urinals, with all fixtures either using no water or using non-potable water.

Table 8—Design Sewage Conveyance Calculation

Fixture Type	Flow-rate	Duration	Occupants	Daily Uses	Water Use (gal)
Toilets (male)	1.6 gal/flush	1 flush	500	1	800
Waterless Urinals (male)	0.0 gal/flush	1 flush	500	2	0
Toilets (female)	1.6 gal/flush	1 flush	500	3	2400
Total Daily Volume					3200
				Number of School Days	180
				Design Total Annual Volume	576,000
				Minus Collected Rainwater	(396,000)
				Total Potable Water Used for Sewage Conveyance	180,000

Calculate Daily Water Use per fixture using the following equation:
Daily Water Use = (Flow-rate) (Duration)(Occupants)(Daily Uses)

- Sum Daily Water Volumes for each fixture to find Total Daily Volume.
- Multiply the Total Daily Volume by the number of school days for Total Annual Volume.
- Subtract the amount of reclaimed water used to find Total Potable Water Used for Sewage Conveyance.

For baseline indoor water consumption calculations, use a similar spreadsheet, but change only the type of fixture and its associated design details. For baseline calculations, assume flow rates outlined by the Energy Policy Act of 1992's fixture performance requirements:

Table 9—Baseline Sewage Conveyance Calculation

Fixture Type	Flow-rate	Duration	Occupants	Daily uses	Water use (gal)
Conventional Toilet (male)	1.6 gal/flush	1 flush	500	1	800
Conventional Urinal (male)	1.0 gal/flush	1 flush	500	2	1000
Conventional Toilet (female)	1.6 gal/flush	1 flush	500	3	2400
				Total Daily Volume	4200
				Number of School Days	180
				Baseline Total Annual Volume	756,000

Comparing the two spreadsheets, the water-efficient fixtures reduced potable water use for sewage conveyance by:

% Savings = 1 – (Design Total Annual Volume / Baseline Total Annual Volume) = 1 – (180,000/756,000) = 0.76 = 76%

Therefore, this design would earn one point because potable water used for sewage conveyance has been reduced by 76% through using reclaimed water in the toilets and urinals. Note that the low-flow fixtures by themselves were not enough to earn this credit.

Rainwater Collection and Water Storage – "Keep Water Local"

If a rainwater collection system is part of the project, then provide justification for the volume of collected, useable rainwater over the school year. If seeking Site Credit SS.C8 – Post-Construction Stormwater Management, documentation used to justify rainwater storage sizing may be used for this credit. Helpful documentation would include: a building rainwater reuse plan and a water balance analysis that includes integrated analysis of source, storage, and demand. A source analysis should take into consideration the contributing watershed, daily and/or weekly rainfall data, the variations in rainfall during the year, and rainfall abstraction.

The mantra of watershed protection organizations across the world is this: "Keep water local." In other words, harvest, use, treat, and re-infiltrate water close to the source of its use. Every step of extracting water, treating it, transporting it, and eventually reintegrating it into the water cycle uses energy. Transporting water, in particular, uses enormous electrical and infrastructure resources.

For some schools, installation of a rainwater catchment system with underground storage tanks is an economic option to provide water for flushing water closets and supplemental irrigation. Catchment systems can decrease some irrigation water demand depending on the size of the fields being irrigated. However, they are unlikely to contribute much to schools with many playing fields and large irrigation demands.

A rainwater catchment system should be designed with a water storage capacity for sewage conveyance and/or irrigation in typical years under average conditions. Oversizing water storage to meet drought conditions will be costly and undersizing storage may simply result in a system that is too small to significantly offset potable water consumption. In addition, rainwater collection and storage systems should be designed to avoid stagnation that could lead to mold growth and accumulation of bacteria. It will be important to check with your plumbing inspector early in the process if you pursue a catchment system.

The underground storage tanks and cisterns could at times run dry during drought conditions. Therefore, it is acceptable for tanks and cisterns to connect to wells or municipal water supplies.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.C2	Construction drawings must include the required HI-CHPS Verified Plan Sheet with indoor water calculations provided at the point of registration with the HI-CHPS Verified program.
WE.C2	Construction drawings must identify shut-off capabilities for restroom facilities.
WE.C2	Construction drawings must include a plumbing fixture schedule that reflects the indoor water calculations.
Construction Review Requirements	
WE.C2	Provide pictures of installed fixtures, and manufacturer receipts/proof of purchase for the water-efficient products purchased.

Resources

CHPS Best Practices Manual, Volume II: Guideline OS6: Efficient Terminal Devices; OS7: Waterless Urinals.

LEED™- Reference Guide: Water Credit 2: Innovative Waste Water Technologies.

Utilize the U.S. Environmental Protection Agencies Water Sense[SM] program to assist in identify efficient fixtures and sensors at: http://www.epa.gov/watersense/.

Low flow standards for fixtures are available through the American National Standards Institute (ANSI) as published by the International Association of Plumbing and Mechanical Officials (IAPMO): http://www.webstore.ansi.org.

Water

WE.C3: Reduce Potable Water Use for Non-Recreational Landscaping Areas — 3 Points

Applicability	Verification Required		
All projects. For a new building on an existing campus, additions, and major renovations, the calculations must be made for the entire school site, not just the area around the new building or the buildings being modernized.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Reduce or eliminate potable water use for landscape irrigation.

In the state of Hawaii the patterns of precipitation can very greatly from island to island and even from coastal areas to mountain tops. When the demand of potable water increases, more water is drawn to accommodate that demand and lakes, rivers and underground aquifers can be stressed to the point of creating the water shortages. To minimize the shortage and drought problem, the irrigation shall be designed with water efficient irrigation systems if landscape irrigation is necessary, or, do not install permanent irrigation systems for landscaping. Another way to minimize the use of the potable water is to specify the drought tolerant plants and consider the soil composition to support the plants. Irrigation when necessary should be limited to early morning and late evening hours to minimize evaporation.

Requirement

	WE.C3.1 Reduce potable water, natural surface water or groundwater consumption for irrigation of non-recreational landscape areas over landscape budget baselines with the use of water-efficient native (or adapted) climate-tolerant plantings, high-efficiency irrigation controllers, soil moisture meters/rainfall sensors, or using captured rain or reclaimed water.
1 point	20% for new construction, 10% for major renovations
Or 2 points	35% for new construction, 25% for major renovations
Or 3 points	50% for new construction, 40% for major renovations **OR** Do not install permanent irrigation systems for watering non-recreational landscaped areas (excluding designated school gardens) AND specify drought resistant plants or grasses in these areas so that irrigation is not needed beyond plant establishment.

Recreational areas include athletic fields, playing fields, and practice fields.

Implementation

See WE.P1.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.C3	If no permanent irrigation will be provided, provide a letter signed by landscape architect certifying that permanent irrigation systems have not been specified for non-playing field areas AND that only drought resistant plants and grasses have been specified for these areas. Letter must clearly state that no irrigation, manual or otherwise, will be needed in these areas after plants are established. Letter must also indicate the species of drought resistant plants and grasses that have been specified.
WE.C3	Construction drawings must include complete landscape drawings including all outputs of the U.S. Environmental Protection Agency's WaterSense Water Budget Tool including both the Landscape Water Requirement (LWR) and Landscape Water Allowance (LWA).
Construction Review Requirements	
WE.C3	Provide proof of purchase, installation, pictures or other supporting documents that show compliance.

Resources

Hawaii Board of Water Quality Oahu Planting Guide: http://www.hbws.org/cssweb/display.cfm?sid=1360

Local water utility staff, water efficient landscape consultants, Certified Irrigation Designers (www.irrigation.org), and Master Gardeners are also good resources for helping achieve this credit.

CHPS Best Practices Manual, Volume II: Guideline SP6: Drought Tolerant and Pest-Resistant Plants, Guideline SP10: Water-Efficient Irrigation Systems; Guideline SP12: Reclaimed Water for Irrigation.

Water

WE.C4 Reduce Potable Water Use for Recreational Landscaping Areas — 2 Points

Applicability	Verification Required		
All projects. For a new building on an existing campus, additions, and major renovations, the calculations must be made for the entire school site, not just the area around the new building or the buildings being modernized.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Reduce or eliminate potable water use for irrigating recreational areas.

Significant amounts of water are used to irrigate recreational fields. A typical natural turf recreation field needs up to 5,000 gallons of water/acre/day during the peak of the irrigation season and in many locations exceeds 7,000 to 8,000 gallons/acre/day.

Requirement

	WE.C4.1 Reduce potable water, natural surface water or groundwater consumption for irrigation of recreational areas over landscape budget baselines with the use of water-efficient native (or adapted) climate-tolerant plantings, artificial turf, high-efficiency irrigation technologies, soil moisture meters/rainfall sensors, or using captured rain or reclaimed water.
1 point	25% for new construction, 15% for major renovations
Or 2 points	50% for new construction, 40% for major renovations

Recreational areas include athletic fields, playing fields, and practice fields.

Implementation

Soil Types

The best types of soil for playing fields are 3% to 7% organic content and fall into the U.S. Department of Agriculture soil categories:

Table 10 - Watering Requirements by Soil Type

Soil Type	Watering Requirements
Loamy sand	1 in. per week
Sandy loam	1 in. per week
Loam	1 in. per week

Artificial Turf

Artificial sports turf can be considered as a substitute for soil-based athletic fields to achieve water savings. In calculations assume no water use, 0 in. per week.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.C4	Construction drawings must include complete landscape drawings including all outputs of the U.S. Environmental Protection Agency's WaterSense Water Budget Tool including both the Landscape Water Requirement (LWR) and Landscape Water Allowance (LWA).
Construction Review Requirements	
WE.C4	Provide proof of purchase, installation, pictures or other supporting documents that show compliance.

Resources

CHPS Best Practices Manual, Volume II: Guideline SP6: Drought Tolerant and Pest-Resistant Plants, Guideline SP10: Water-Efficient Irrigation Systems; Guideline SP12: Reclaimed Water for Irrigation.

Local water utility staff, water efficient landscape consultants, Certified Irrigation Designers (www.irrigation.org/), and Master Gardeners are also good resources for helping achieve this credit.

Water

WE.C5: Irrigation System Commissioning — 1 Point

Applicability	Verification Required		
This credit applies to projects that include irrigation systems. This credit cannot be claimed if there are no irrigation systems or controls for the project.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Verify that the site's irrigation systems and controls are operating as intended and that effective training has been provided.

Irrigation system testing and training is a rigorous quality assurance program administered by a knowledgeable party that ensures the irrigation systems perform as expected. Irrigation system testing can help to ensure that water efficiency measures are working properly and design water savings are achieved.

Requirement

1 point	WE.C5.1 Create an irrigation commissioning plan and complete installation review during construction, performance testing after installation, and documentation for ongoing operations and maintenance.

Implementation

Reference specifications for an irrigation commissioning plan. Designate the CSI number, section, and page number. State that irrigation commissioning plan must include:

Identify which entity will prepare the irrigation commissioning plan and who will perform the commissioning tasks.

Review of irrigation system installation during construction, with record of deficiencies found and corrected.

Performance testing and documentation of results (as compared to specified performance) at least once during the first year of installation, and

Site-specific documentation detailing maintenance requirements and frequency and operation procedures including a recommended irrigation schedule (i.e. to apply 1 inch of water per week to athletic fields).

Acceptance testing shall be included in the specifications and performed on the following, if applicable:

- Irrigation pipes and fittings. Under static conditions the system pressure loss shall not exceed 3 psi over a one hour time period.
- Irrigation heads and coverage. The system shall have a measured distribution uniformity (lower quarter) of no less than 65%.
- Back-flow devices.
- Automatic sensors, timers and other controls.

For equipment not listed, the design team shall provide acceptable test results, and the contractor shall certify that the tests were performed and the equipment performs as specified.

Supply a letter signed by commissioning agent verifying requirements for performance testing of irrigation equipment and actual performance have been met.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.C5	Provide a PDF of the Irrigation Commissioning Plan which includes items listed in the Implementation Section of the credit as well as who will be responsible for the commissioning and when it will occur.
Construction Review Requirements	
WE.C5	Provide final commissioning report.

Resources

Local water utility staff, water efficient landscape consultants, Certified Irrigation Designers (www.irrigation.org/), and Master Gardeners are also good resources for helping achieve this credit.

Water

WE.C6: Water Management System — 4 Points

Applicability	Verification Required		
All projects. For a new building on an existing campus, the water management system may only monitor the building's indoor water uses. For major renovation projects the water management system may monitor both indoor water uses and outdoor water uses depending on the scope of the project.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Provide ongoing accountability and optimization of the building and site water performance over time.

A water management system must monitor both indoor and outdoor water usage to detect leaks and improve efficiency. The U.S. Environmental Protection Agency ranks water monitoring as one of the Top 10 ways to save water. Water leaks can result in significant water losses and costs, and have the potential to cause structural damage and promote mold growth. Information obtained from water meters can be valuable in managing and optimizing water usage. When selecting a water management system take into consideration district and maintenance staff needs, training considerations, and how the system could be integrated with a energy management system. A water management system can potentially save significant water, but only if staff understands its reports and how to operate it. Proper training of district staff is critical, and high turnover rates continue to challenge school districts to provide retraining programs and on-site manuals.

Requirement

2 points	WE.C6.1 Install a Water Management System to monitor water for any equipment or system that exceeds 20% of the total amount of water used on the school site. At minimum, separate water meters (also called sub-meters) must monitor and report on water usage for the following: • Domestic water • Exterior irrigation
Or 4 points	WE.C6.2 Comply with OM.C2.2 and install a Water Management System to monitor water use of all indoor and outdoor water uses. Water meters should have a pulsed output for automatic meter readings (AMR). Separate water meters (also called sub-meters) must monitor and report on water usage for the following: • All indoor water usage except showers • Gyms / athletic facilities with showers • Landscaping if irrigated • Recreational fields if irrigated • Swimming pool • Cooling towers, if equipped.

Implementation

The plans and specifications should include a list of all sensors (measurements to be taken through the building and exterior) and actuators (devices to be controlled). It should also specify the protocol communication between the sensor, actuators, and the computer (controller).

The construction documents should also specify the requirements for the graphic user interface (GUI). The designers should work with the school district maintenance and operation staff to determine the desired features. School districts should consider standardizing on one type of system in order to reduce the need to learn and maintain different operating systems.

Monitoring capabilities should allow for comparison between indoor water usage, landscaping if irrigated and recreational fields if irrigated. This information is valuable and can be used to manage and optimize water use.

Verification

For projects seeking verification through the CHPS Verified Program (Pg 12), compliance documentation is required at design review and construction review.

Design Review Requirements	
WE.C6	Construction drawings must include the Water Management System and required features. The specifications should include a list of all the sensors (measurements to be taken throughout the building) and actuators (devices to be controlled). It should also specify the protocol for communication between the sensors, actuators and the computer (controller).
Construction Review Requirements	
WE.C6	Provide proof of installation / operation of the water management system.

Resources

None.