Washington Sustainable Schools Protocol

Criteria for High-Performance Schools

2015 Edition

Designing Schools for Student Success
Washington Sustainable Schools Protocol

Criteria for High Performance Schools

2015 Edition

- Released April 15, 2015. Effective July 1, 2015. Applicable to state-funded SCAP projects and skill centers and other major projects that are non-SCAP, state-funded projects, receiving full or partial design or construction funding.


Projects receiving state capital funds through the School Construction Assistance Program (SCAP) will apply the version of WSSP in effect at the time the D4 approval is issued. Projects receiving state capital funds through a direct appropriation or through another grant program will apply the version of WSSP in effect at the time of budget appropriation.

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Acknowledgments

The Washington State K–12 High-Performance Schools Protocol, referred to as Washington Sustainable Schools Protocol (WSSP) or WA-CHPS, is an adaption of the CHPS Criteria. The state of Washington Office of Superintendent of Public Instruction (OSPI) has been granted license by The Collaborative for High Performance Schools (CHPS) to use, disclose, reproduce, prepare derivative works, and distribute copies to the public. The Collaborative for High Performance Schools®, CHPS®, the CHPS logo, and the Green Apple Awards® are registered trademarks with the United States Patent and Trademark Office. The CHPS CriteriaTM, CHPS National Core CriteriaTM, CHPS VerifiedTM, CHPS Verified LeaderTM, CHPS Designe dTM, CHPS PreFABTM, Operations Report CardTM, and ORCTM are copyrighted by CHPS, Inc. End users of WSSP are permitted to use and/or copy the content without further consent. However, CHPS, Inc. prior permission must be granted in order to relicense, publish, or develop derivative works from CHPS materials.

Original Advisors

The Washington Sustainable Schools Protocol was developed under a collaboration of many agencies and organizations within the state of Washington and the Pacific Northwest.

The following individuals participated on the original Washington Sustainable Schools Advisory Committee and/or Washington Sustainable Schools Protocol Team (2004-2006), providing valuable guidance and support for the project. Place of employment listed was at the time of original publication and may have changed.

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The Working Draft of this Protocol, that incorporated guidance from the Washington Sustainable Schools Protocol Committee, was developed by the New Buildings Institute, O’Brien & Company, and Eley Associates under contract to the Northwest Energy Efficiency Alliance. The Final Protocol, that incorporated lessons learned from the Washington Sustainable Schools Protocol Pilot Projects and guidance from the Washington Sustainable Schools Protocol Team was produced by O’Brien & Company, under separate contract to the Northwest Energy Efficiency Alliance. In addition, several individuals contributed technical expertise on specific issues, including: Daniel C. Bruck, BRC Acoustics & Technology Consulting; Stan Price, Executive Director of Northwest Energy Efficiency Council; Joel Loveland, Better Bricks Integrated Design Lab and University of Washington, Seattle; Jim Benya, Benya Lighting; and Kevin Van Dem Wymelenberg, University of Idaho.

WSSP 2015 Update Team

A WSSP Update Team convened between April 2014 and April 2015 to make updates and changes to the 2010 version of WSSP. The team referred to the most recent version of the CHPS National Core Criteria and LEED for Schools in updating the WSSP.

Team Members:

- **Carter Bagg**, ESD 112
- **Nancy Bernard**, Washington State Department of Health
- **Greg Brown**, Spokane Public Schools
- **Brian Carter**, Integrus Architecture
- **Tom Carver**, Office of Superintendent of Public Instruction
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Special recognition for their contributions:

- **Sandra Anthony**, Coffman Engineers, Inc.
- **Kas Kinkead**, Cascade Design Collaborative
- **Mike Melder**, HDJ Design Group, PLLC
- **Doug Smith**, Meng Analysis
Overview

This document is designed to help school districts plan and implement the requirements in Chapter 39.35D RCW, High Performance Public Buildings. State-assisted school construction projects are required to meet a green building standard. Schools can use the Washington Sustainable Schools Protocol (WSSP) or the Leadership in Energy and Environmental Design (LEED) standard.

The “High-Performance Guidelines for School Districts”, the “WSSP Workplan”, the “WSSP Annual Reporting Workbook”, and other high performance school resources are available on the [OSPI high performance schools website](http://www.ospi.k12.wa.us/hs/high_performance.schoo).

The WSSP is based on the Collaborative for High Performance Schools (CHPS) Criteria, but explicitly defines a high performance school for the state of Washington. The original WSSP was created by members of the WSSP Protocol Committee and vetted by members of the Implementation Team. The WSSP 2010 Update Committee included many members of the original team, as well as some new participants with experience implementing the WSSP on projects. That is also true of the WSSP 2015 Update Committee.

The Collaborative for High Performance Schools (CHPS) began in November 1999 in California. Interest in high performance design grew and CHPS expanded its focus, developing a National Core Criteria. There are currently 9 state or region specific versions, US-CHPS that may be used by any state that does not have state or regional CHPS Criteria, CHPS Relocatable, and CHPS PreFAB criteria for prefabricated, modular classroom buildings.

This Update

A pilot version of WSSP was produced in 2004 and was used until WSSP 2006 was finalized. It was necessary to undertake an update in 2010 to keep up with changing code requirements and incorporate lessons learned. The basic premises and goals are the same. Many more points were added in 2010, as well as additional ways to achieve points, making WSSP more adaptable to specific needs and conditions. The 2015 update focuses on Washington State energy and building code changes, new technology that is more readily available within budget constraints, and new ways to provide students and staff with healthy environments.

Energy Code

At the time of this publication (April 2015), the 2012 International Energy Conservation Code (IECC) has been adopted statewide. The code is referred to as 2012 Washington State Energy Code (WSEC). The City of Seattle has adopted an even more stringent energy code. The 2015 Washington State Energy Code was adopted and became effective July 1, 2016.

School Health and Safety Code

The State Board of Health adopted modernized rules governing environmental health and safety for primary and secondary schools in August 2009, and will be promulgated under WAC 246-366A. As of this publication, those rules have not been implemented under restrictions imposed by the Legislature. However, existing school health rules continue to apply. It is not
known when the Board’s modernized rules will replace the existing rules. The existing rule as of this publication (April 2015) is WAC 246-366.

**Credits, Point Requirements, and Documentation**

The **WSSP is useful as a goal-setting and planning tool.** Districts can use it to clearly communicate their design goals. It allows designers to deliver a Washington Sustainable School while addressing the regional, district, and site-specific constraints relevant to a particular district. Districts are reminded to work with their local jurisdictions to ensure they are meeting local requirements when implementing innovative strategies. In addition, local jurisdictions may set higher requirements than the state or WSSP, and therefore, may be higher than those expressed in the “Required Credits” of this protocol.

The WSSP Protocol addresses the multiple facets of high performance schools by providing credits in the categories of energy efficiency, water efficiency, site planning, materials, and indoor environmental quality. It offers a section that emphasizes district and school comprehensive planning, operations, and educational activities that cross the categories. In addition, schools may take innovative actions that go above and beyond what is described in existing credits offered within the main categories.

WSSP 2015 includes 66 optional credits, 19 required (R) credits, and 135 available points. A Class I district with 2,000 full-time equivalent (FTE) pupils or more must earn a minimum of 45 points, and Class II districts, with fewer than 2,000 FTE pupils, the minimum is 40 points. No more than four points out of a possible 10 can be derived from credit PEO3.3, Project or District Operational Activities category. School district planners are encouraged to earn as many points as possible and appropriate for a given project above the required threshold. In other words, treat the minimum point thresholds as a target to beat.

Required (R) credits, also referred to as prerequisites, often reflect actions that are required by federal, state, or local laws and codes, although they may exceed, or be slightly different, than those requirements. A project granted an exemption, variance, or exception to the underlying legal requirements that are the full basis of the credit, may be deemed to be in compliance with the prerequisite WSSP requirements. An “E”, “V”, or “EX” should be noted on the project scorecard.

WSSP is a self-certified CHPS-Designed protocol. Schools pass or fail based on meeting the required prerequisite credits and minimum point levels. Third-party CHPS-Verified compliance is not currently available for WSSP projects.

**New School (Facility)**

A new school must meet all the required credits and must earn the minimum number of points established for each district class. Required credits, often referred to as prerequisites, are identified on the scorecard with an “R”, and do not have point value, unless, for some credits, projects can earn points for designing beyond minimum requirements.
New Building on an Existing Facility

A new building on an existing facility may not affect certain attributes or characteristics addressed by a required credit, particularly in the Site and Water categories. A new building on an existing facility must meet all of the applicable required credits based on the scope of the project, per Table 1. These projects must also earn at least the same minimum number of points established for each district class as a new school.

Modernization

Major modernizations are subject to the high-performance building requirements. The high performance public building RCW defines a major modernization as greater than 5,000 gross square feet of occupied or conditioned space as defined in the Washington state energy code and the cost to modernize is greater than 50% of the assessed value. Major modernizations are typically a substantial improvement to an existing school of at least two of the following major components: lighting, HVAC, building envelope, interior surfaces, and site. A modernization may have no work associated with one or more of the WSSP credit categories. Therefore, the scope of the project work dictates the required credits that need to be met, per Table I. The minimum number of points for compliance has also been reduced given the reduced scope of work and opportunity to earn points. Class I districts must earn a minimum of 34 points and Class II districts must earn a minimum of 29 points in addition to meeting the applicable required credits. Building additions are considered modernizations when determining minimum point requirements for WSSP compliance.

Projects that are a combination of a new building and a modernization may use the modernization rules for credit compliance if the modernization is greater than 50% of the resulting project square feet.

Documentation

Schools are expected to document compliance with WSSP. Compliance documentation may be as simple as a copy of a joint-use agreement. Compliance documentation for a more complicated credit, such as superior energy performance, may be in the form of engineering calculations performed as part of an Energy Life Cycle Cost Analysis (ELCCA). All compliance documentation should be maintained with the project files.

The Washington State Office of Superintendent of Public Instruction (OSPI) requires certain levels of documentation be provided through the School Construction Assistance Program (SCAP) D-Form Process. Details of the documentation required by OSPI are outlined in the High-Performance Guidelines for School Districts.
<table>
<thead>
<tr>
<th>Required/Prerequisite Credit</th>
<th>Building System or Attribute</th>
<th>New Building on Existing Facility</th>
<th>Modernization</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1.0 Code Compliance</td>
<td></td>
<td>Always required</td>
<td>Always required</td>
</tr>
<tr>
<td>S3.0 Construction Stormwater Pollution Prevention</td>
<td>Site</td>
<td>Required only when site work is being performed (grading, landscaping, parking lots) and local permit is required</td>
<td>Required only when site work is being performed (grading, landscaping, parking lots) and local permit is required</td>
</tr>
<tr>
<td>S3.1 On-site Stormwater Management and Flow Control</td>
<td>Site</td>
<td>Always required unless exempt by state or local jurisdiction</td>
<td>Not required unless specifically required by jurisdiction</td>
</tr>
<tr>
<td>S3.2 Stormwater Treatment</td>
<td>Site</td>
<td>Always required unless exempt by state or local jurisdiction</td>
<td>Not required unless specifically required by jurisdiction</td>
</tr>
<tr>
<td>W1.0 Landscape Water Use Budget</td>
<td>Site</td>
<td>Required only for outdoor water system improvements</td>
<td>Required only for outdoor water system improvements</td>
</tr>
<tr>
<td>M1.0 Storage and Collection of Recyclables and Compostables</td>
<td></td>
<td>Always required</td>
<td>Comply with local codes</td>
</tr>
<tr>
<td>E1.0 Minimum Energy Performance</td>
<td></td>
<td>Always required</td>
<td>See 2015 WSEC for requirements and exceptions.</td>
</tr>
<tr>
<td>E2.0 Daylight Responsive Controls</td>
<td>Lighting</td>
<td>Always required</td>
<td>See 2015 WSEC for requirements and exceptions.</td>
</tr>
<tr>
<td>E4.0 Fundamental Commissioning</td>
<td>HVAC, All Electrical Lighting, Water, Heating</td>
<td>Always required</td>
<td>Always required</td>
</tr>
<tr>
<td>Required/Prerequisite Credit</td>
<td>Building System or Attribute</td>
<td>New Building on Existing Facility</td>
<td>Modernization</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>----------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>E5.1 Energy Management Systems (EMS)</td>
<td>HVAC</td>
<td>Required only for buildings with GSF conditioned &gt;50,000</td>
<td>See 2015 WSEC section C409.5.</td>
</tr>
<tr>
<td>IEQ1.2 Permanent Shading</td>
<td></td>
<td>Required if applicable (WAC 246-366-050(9))</td>
<td>Required if applicable (WAC 246-366-050(9))</td>
</tr>
<tr>
<td>IEQ1.3 Outdoor View Windows</td>
<td></td>
<td>Always required (WAC 246-366-050 (8))</td>
<td>Always required (WAC 246-366-050 (8))</td>
</tr>
<tr>
<td>IEQ2.1 Electric Lighting Quality</td>
<td></td>
<td>Always required (WAC 246-366-120)</td>
<td>Always required (WAC 246-366-120)</td>
</tr>
<tr>
<td>IEQ3.0 Minimum Requirements Ventilation, Filtration, and Moisture Control</td>
<td>HVAC, Envelope</td>
<td>Always required</td>
<td>Always required</td>
</tr>
<tr>
<td>IEQ4.0 Minimum Acoustic Performance</td>
<td></td>
<td>Always required (WAC 246-366-110)</td>
<td>Always required (WAC 246-366-110)</td>
</tr>
<tr>
<td>IEQ5.0 Thermal Code Compliance</td>
<td></td>
<td>Always required</td>
<td>Always required</td>
</tr>
<tr>
<td>PEO3.0 Operational Performance Monitoring</td>
<td></td>
<td>Always required</td>
<td>Always required</td>
</tr>
<tr>
<td>PEO3.2 ELCCA/LCCA</td>
<td>All Energy Using</td>
<td>ELCCA required only for buildings =/&gt;25,000 GSF</td>
<td>ELCCA required only for modernizations =/&gt;25,000 GSF, cost &gt;50% of the assessed value and affects energy-using systems</td>
</tr>
<tr>
<td>PEO3.3 Maintenance Plan - APP</td>
<td></td>
<td>Always required</td>
<td>Not required</td>
</tr>
</tbody>
</table>
WSSP, CHPS, and LEED

The WSSP is based on the Collaborative for High-Performance Schools (CHPS) criteria and is organized similar to the USGBC’s LEED rating system. WSSP 2015 does not follow the CHPS National Core Criteria version 2.0. No interchangeability between WSSP, CHPS, and LEED is expressed or implied. A school complying with WSSP may contain many of the elements needed for LEED certification, but there is no reciprocity between the two systems. Teams wishing to pursue LEED certification, to be CHPS Verified, or to specify high performance prefabricated classrooms under CHPS PreFAB program, must do so independently. The USGBC and CHPS have developed excellent support materials that could be useful as background for understanding related WSSP credits. To obtain technical resources, visit the USGBC or CHPS website.

Priorities

Washington Sustainable Schools Protocol spans a wide variety of areas, from site planning and energy use, to material specifications and indoor environmental quality. There are also credits that relate directly to high priorities expressed by school planners, designers, and legislators.

Listed below are school facility attributes that are WSSP priorities. These characteristics optimize performance of schools in the state.

**Daylighting**

Quality daylighting designs have been shown to improve student productivity and well-being. When integrated properly with the electric lighting system, daylighting can save significant energy.

**Energy Efficiency**

Energy efficiency is considered a cornerstone of a Washington Sustainable School to reduce operational expenses, conserve natural resources, and reduce local and global pollution and greenhouse gas emissions. All schools are commissioned to ensure the design meets the expectations of the district, and the school is built as it was designed. Commissioning ensures that all building systems are working properly and that school staff know how to operate and maintain them. Applicable credit categories include:

- Superior Energy Performance
- Controls
- Commissioning
- Operations and Management

**Indoor Air Quality**

Good indoor air quality is essential for healthy schools and occupants. Indoor air quality can be impacted by design and construction choices, as well as material choices and maintenance practices. Particular care in choosing interior building materials and controlling sources of pollutants is essential. Applicable credit categories include:
• Ventilation and filtration
• Low-emitting finishes
• Source control
• Operations

**Acoustics**

If not controlled, noise from loud ventilation systems, outdoor sources, and neighboring rooms can significantly impede communication between teachers and students. Young learners, students with hearing difficulties, and those learning English as a second language are particularly vulnerable. Classrooms must be designed to enable all students to hear clearly.

**Sustainable Materials**

Hidden within all materials are the resources, energy, chemicals, and environmental impacts related to their production. When reuse is possible (of building materials, the building itself, or furniture and equipment), this can represent avoided costs for new materials and disposal costs, as well as avoided environmental impacts of producing new building materials. Applicable credit categories include:

• Waste and Material Reduction
• Environmentally Preferable Material Procurement
• Material and Product Declarations

**Site Selection**

A high-performance school will avoid degrading natural ecosystems, while seeking to incorporate natural conditions to enhance the building’s performance. In addition, the school design will encourage non-polluting transportation alternatives. Applicable credit categories include:

• Selection & Use
• Transportation Alternatives
• Stormwater Management

**Water Efficiency**

Basic efficiency measures can significantly reduce a school’s water use. These reductions help the local environment while reducing operating expenses. Applicable credit categories include:

• Outdoor System Use
• Indoor System Efficiencies
Planning, Education, and Operational Activities

Credits included in this category focus on planning during design and operations after occupancy. The points in PEO 3.3, Project and District Level Operational Activities are generally the activities that require “plans”: Integrated Pest Management, Resource Conservation, Green House Gas (GHG) Reductions, etc. A project may earn up to four (out of 10) points in PEO 3.3. Annual reporting for five years is required for most of the Operational Activities credits earned.
## WSSP 2015 Scorecard

**District:** __________________________  **Contact Name & Phone:** __________________________  **Date:** ________________

**Project Name and Type:** __________________________

*Use this scorecard for Design (D5) submittal.*

*Please use the 2015 Workplan for D9 and D11 reporting. The Workplan includes this scorecard, tabs for credit worksheets, cost analysis and design premiums.*

<table>
<thead>
<tr>
<th>Category</th>
<th>Group</th>
<th>Credit Number</th>
<th>Credit Name</th>
<th>Possible Points</th>
<th>Yes</th>
<th>No</th>
<th>Maybe</th>
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<tbody>
<tr>
<td>Site</td>
<td>1) Selection &amp; Use</td>
<td>S1.0</td>
<td>Code Compliance</td>
<td>R</td>
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<td></td>
<td></td>
<td>S1.1</td>
<td>Sensitive Areas</td>
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<td></td>
<td>S1.2</td>
<td>Greenfields</td>
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<tr>
<td></td>
<td></td>
<td>S1.3</td>
<td>Central Location</td>
<td>1</td>
<td></td>
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<td>S1.4</td>
<td>Joint Use On-Site</td>
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<td></td>
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<td>S1.6</td>
<td>Minimal Footprint</td>
<td>1-2</td>
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<td>2) Transportation</td>
<td>S2.1</td>
<td>Public Transportation</td>
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<td></td>
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<td></td>
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<td>Bike and Walk to School</td>
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**GRAND TOTAL. Possible Points**

| 135 | 0 | 0 | 0 |

Minimum required for Washington Sustainable School

Two tier system:

New Facility and new Building on Existing Facility
- For Class I Districts: Minimum 45 points
- For Class II Districts: Minimum 40 points

Modernization
- For Class I Districts: Minimum 34 points
- For Class II Districts: Minimum 29 points

Max “Project or District Operational Activity” points that can be claimed toward the minimum requirement is 4; however, a district could implement all of the credits.
Site

Site Selection

**Purpose:** Choose sites that protect students and staff from outdoor pollution and minimally impact the environment. Channel development to centrally located areas with existing infrastructure to protect greenfields, minimize transportation requirements, and preserve habitat and natural resources.

The site is a crucial element in determining the overall sustainability of the school design. Sites are sometimes purchased years in advance, and some of these credits may be out of the control of the districts and/or designers at the time the school is being built. In addition, some of these credits may be more difficult for rural/suburban areas where distances between home and school can be significant. However, districts considering multiple sites can substantially lower the environmental impact of the school by choosing centrally located sites, sharing parks or facilities with community organizations, preserving open space, and protecting environmentally sensitive areas.

### S1.0: Code Compliance

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**Resources**


S1.1: Sensitive Areas

1 point

Environmentally sensitive or important areas should be avoided. Do not develop buildings or improvements on sites that meet any of the following criteria:

- Washington State Growth Management Act Critical Areas as identified by the city and county, per WAC 365-190.
- Important farmland as defined by the US Department of Agriculture.
- Land whose elevation is lower than five feet above the elevation of the 100-year flood as defined by FEMA.
- Land that provides habitat for any species on the federal or state threatened or endangered list.
- Within 100 feet of any wetland as defined by 40 CFR, Parts 230-233 and Part 22, OR as defined by local or state rule or law—whichever is more stringent.

Resources

Important Soils: The Natural Resources Conservation Services (NRCS) division of the United States Department of Agriculture maintains the definitions and soil surveys that designate areas as “important farmland.” Lists of Prime and Statewide Important Farmland Soils are maintained for each soil survey area and may be obtained from the Field Office Technical Guide located in each NRCS field office. County and state offices of the NRCS keep maps showing the status of land within their jurisdiction.

100-Year Flood Plains: Washington is in FEMA’s Region X, [https://msc.fema.gov/portal](https://msc.fema.gov/portal)

Wetlands: The term wetlands is defined in Title 40 CFR as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” [Source: CFR: Title 40.330.41].

The US Army Corps of Engineers, the Washington State Department of Ecology, Fish and Wildlife, and the Department of Natural Resources, all work in parallel to regulate waterways (which include wetlands) in Washington. Federally, the primary laws are the Clean Water Act and the Coastal Zone Management Act. The main state laws are the State Water Pollution Control Act, the Growth Management Act, and the Shoreline Management Act. (Resource: How

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1 The Code of Federal Regulations (CFR) is a publication of the United States Federal Government that lists rules authorized by the executive departments and agencies.

---

S1.2: Greenfields

| 1 point | Do not build on greenfields. |

When choosing between multiple sites, use previously developed sites instead of greenfields.

**Greenfields** are sites that are undeveloped, or graded, that could support open space, habitat, or agriculture, and are being considered as a site for expanding urban development.

An urban redevelopment site reduces environmental impacts by utilizing established infrastructure and preserving undeveloped lands. If the chosen site already contains a building, additional points may be earned with Materials Credit M1.3: Building Reuse.

---

S1.3: Central Location

<table>
<thead>
<tr>
<th>1 point</th>
<th>Locate sites where at least 50% of students live within the following distances from the school:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Elementary Schools: within <strong>one mile</strong></td>
</tr>
<tr>
<td></td>
<td>• Middle Schools/Junior High: within <strong>two miles</strong></td>
</tr>
<tr>
<td></td>
<td>• High Schools: within <strong>four miles</strong></td>
</tr>
</tbody>
</table>

School districts and families invest significant time, energy, and money transporting students to and from school. Cars driven by parents, guardians, or the students themselves are the largest resource users and sources of school transportation-related pollution. Centrally located sites allow more students to walk or bike to school as well as reducing the distance cars must travel.

For rural districts, this credit may be difficult to achieve since distances between home and school are much greater.

To earn this point, calculations must be based on the planned number of students indicated on the D5 submittal. Additional transportation-related points are covered in Site Credit 2: Transportation, as well as a transportation options credit (see Planning, Education, and Operations section).
S1.4: Joint Use On-Site

| Shared Use = 1 point | Make portion(s) of the school building or grounds available for either shared or dedicated use by community and other appropriate organizations. One point if the space is "shared" use. |
| Shared and Dedicated Use = 2 points | An additional point *(total of two points)* if the space is dedicated for use by the community and other appropriate organizations. |

Across the country, schools are being integrated with a variety of facilities, from laundromats and coffee shops, to police stations and park districts. These credits apply to both existing and newly created parks. Joint use can have significant benefits, including increased campus security, improved community integration, and reduced site acquisition and construction costs. School districts should have formal agreements for all building users in place before occupancy. Dedicated use does not preclude school use if it is appropriate, but the other organization should be the primary and priority user. A formal written agreement is required to achieve this credit.

S1.5: Joint Use Off-Site

| 1 point | Share park or recreation space with local park boards or other organizations (off-site). |

Using parks or other spaces off-site may help reduce the development footprint of the school project and make better use of existing community assets. The school or district must have a letter of agreement with the off-site facilities management.

S1.6: Minimal Footprint

| 80% = 1 point | Provide multi-story construction to reduce the area of the site disturbed by construction. Receive 1 point for ground floor footprint that does not exceed 80% of the building’s total square footage, or 2 points for a ground floor footprint that does not exceed 60% of the total building area. |
| 60% = 2 points |

A multi-story building reduces the ground floor footprint, minimizing the impact of construction and overall site disturbance. Design the building such that the floor area of the ground floor (not including any overhangs) is 61-80% of the total building area for 1 point, or 60% or fewer for 2 points.
Transportation

**Purpose:** Reduce dependence on fossil fuels and reduce pollution and land development impacts from automobile use.

### S2.1: Public Transportation

| 1 point | In urban areas, locate the school within ½ mile of a commuter rail or light rail station or within ¼ mile of one or more bus lines. In rural and suburban areas, with limited or non-existent rail/bus service, provide busing to the school. |

When available, public transportation can provide significant reductions in energy impacts. Some school districts offer reduced or subsidized fares for students and staff using public transportation. If sufficient capacity exists, schools can use public transportation to replace district-provided bus service.

**Notes:** Schools near high traffic areas must ensure safe student access. In addition, transportation-related pollution (and the site’s air quality) must be considered when investigating the project’s potential for natural ventilation.

### S2.2: Bike and Walk to School

| 1 point | Provide bike lanes or sidewalks that extend to the end of the property And provide suitable means for securing bicycles for at least 5% of students above grade 3 and staff (at peak periods) in an elementary or middle school, and 3% of building staff and students (at peak periods) in a high school. And either Integrate the Engineering and infrastructure component of the Washington Safe Routes to School in the planning and design process. The education and enforcement components can be implemented for credit under PEO3.3 Transportation Options. Or Complete a School Walk Route Map or Plan in accordance with WAC 392-151-025 and/or WAC 392-141-340. |

Bicycle racks/storage should be safe, convenient, and at accessible locations, near building entrances, in well-lit locations, and preferably within site-lines of administrative offices.

Walking and biking to school can be healthy alternatives to getting back and forth from school, and provides environmental benefits as well. The School Walk and Bike Routes guide, updated in February 2015, produced by Washington State Department of Transportation, Washington Traffic Safety Commission, Washington State Department of Health, and OSPI explains the laws,
identifies potential partnerships, suggests processes, and recommends procedures for biking and walking to school programs.

Bicycles are a popular and pollution-free form of transportation. To protect pedestrians and bicyclists, bike lanes and sidewalks must extend to the end of the school property. Work with local planners to develop safe pedestrian and bike connections to likely destinations, such as public transportation and town centers.

Resources


S2.3: Minimize Parking

1 point

Provide preferred parking totaling **5% of staff and student spaces** for carpools or vanpools and alternative fuel vehicles,

And

Size parking capacity not to exceed **2.25 spaces** per classroom plus parking for 20% of students at High Schools, or three spaces per classroom for Elementary and Junior/Middle Schools.

Or

Provide preferred parking totaling **5% of staff and student spaces** for carpools, vanpools, and alternative fuel vehicles, and size parking capacity not to exceed local codes.

Or

Add no new parking for modernization projects and provide preferred parking totaling **5% of staff and student spaces** for carpools, vanpools, and alternative fuel vehicles.

Excess parking spaces encourage increased automobile use, contribute to urban heat island effects, and can increase pollution from stormwater runoff. To accommodate overflow parking, strategies include dual use of school space (such as playgrounds), using pervious paving (such as grass pavers), and/or developing inter-local agreements with neighboring businesses and institutions.

Design parking so as not to exceed listed amounts and include clearly marked, preferred parking areas for carpools, vanpools, and alternative fuel vehicles. Alternative fuel vehicles get better fuel mileage than conventional gasoline vehicles and reduce the pollution associated with automobile use.
Stormwater Management

Purpose: Manage stormwater during and after construction to control erosion and runoff, reducing the negative impacts on water and air quality.

### S3.0: Construction Stormwater Pollution Prevention

<table>
<thead>
<tr>
<th>Required</th>
<th></th>
</tr>
</thead>
</table>

Construction site stormwater runoff is regulated at the state and local levels. Check with your local agencies for local permit requirements. Construction sites disturbing one-acre or more and discharging to waters of the state will likely need coverage under the [Construction Stormwater General Permit](http://www.ecy.wa.gov/programs/wq/stormwater/manual.html) issued by Department of Ecology. Projects exempted by state or local jurisdictions are exempt from this requirement.

### S3.1: On-Site Stormwater Management and Flow Control

<table>
<thead>
<tr>
<th>Required</th>
<th>1 point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet state and local requirements for on-site management and flow control of stormwater on the developed site. Projects exempted by state or local jurisdictions are exempt from this requirement.</td>
<td></td>
</tr>
<tr>
<td>Apply Low Impact Development (LID) performance standards for either Eastern or Western Washington to enhance stormwater management and flow control.</td>
<td></td>
</tr>
</tbody>
</table>

**Resources**


Washington’s stormwater management requirements are among the most stringent in the US. Stormwater runoff is water that flows across surfaces, moves laterally through the upper soil horizons, through pipes or other features into a defined surface water body, constructed drainage facility, or natural low area. Stormwater can carry sediment and pollutants from the site into drainage facilities, onto adjacent properties, and/or into local bodies of water.

On-site infiltration reduces the rate and quantity of stormwater runoff that could leave the site. Stormwater treatment reduces the contaminants leaving the site, thus addressing water quality. Reducing the amount of runoff is the most effective way to minimize the negative impacts of runoff.

**Resources**


<table>
<thead>
<tr>
<th><strong>S3.2: Stormwater Treatment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required</strong></td>
</tr>
<tr>
<td><strong>1 point</strong></td>
</tr>
</tbody>
</table>

Treatment best management practices (BMPs) can accomplish significant levels of pollutant load reductions if properly designed, installed, and maintained. Common treatment systems include infiltration basins and trenches, porous pavement, vegetated filter strips, grassy swales, filtration basins, constructed wetlands, rain gardens, and compost amended filter strips.

**Resources**

*See Management and Flow Control*
S3.3: Soil Management

1 point

Implement the Department of Ecology’s BMP T5.13 “Post-Construction Soil Quality and Depth” that provides guidelines for amending soils with compost post-construction, or local government guidelines and procedures similar to those recommended in Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13.

Soil quality is directly related to stormwater impacts, and so to, the health of streams and aquatic resources and the sizes of our stormwater facilities. Soil quality also determines landscape success: plant survival, growth, disease resistance, and the reduction of maintenance.

This BMP is required in some Washington counties, including King County, City of Seattle, Snohomish County, Kirkland, Marysville, and Issaquah.

Proper soil management can:

- Provide high rates of water infiltration and retention.
- Minimize surface water runoff and erosion.
- Trap sediments, heavy metals, and excess nutrients; and biodegrade chemical contaminants.
- Encourage vigorous protective vegetative cover.
- Support beneficial soil life that fight pests and disease, and enhances the availability of plant nutrients—reducing need for fertilizers and pesticides.

Resources

Outdoor Surfaces

**Purpose:** Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.

### S4.1: Reduce Heat Islands–Site

| 1 point | Provide shade (at plant maturity) on at least 30% of non-roof, impervious surfaces on the site, including parking lots, walkways, plazas, etc.  
Or  
Use light-colored/high-albedo materials (reflectance of at least 0.3) for 30% of the site’s non-roof, impervious surfaces.  
Or  
Use an open-grid pavement system (net impervious area of less than 50%) for a minimum of 50% of the parking lot area. |

Employ design strategies, materials, and landscaping designs that reduce heat absorption. Note albedo/reflectance requirements in the drawings and specifications. Provide shade using native or climate-tolerant trees and large shrubs, vegetated trellises, or other exterior structures supporting vegetation. Substitute vegetated surfaces for hard surfaces. Use concrete, or explore elimination of blacktop and the use of new coatings and integral colorants for asphalt to achieve light colored surfaces. Use pervious pavers or pervious concrete. Optimize interior landscape island spacing to maximize the shaded area in the parking lot.
On low-sloped roofs (2:12 or lower) install an ENERGY STAR® labeled Cool Roof for a minimum of 75% of the roof surface, with a minimum initial solar reflectance of 0.65, and after 3 years 0.5 (ENERGY STAR Table 1, low-sloped roof).

Or

Install a “green” (vegetated) roof for at least 50% of the roof area.

Or

Install high-albedo (reflectivity) and vegetated roof surface that, in combination, meet the following criteria:

\[
\text{Area Roof Meeting Minimum SRI} + \text{Area of Vegetated Roof} \geq \text{Total Roof Area}
\]

\[
0.75 + 0.5
\]

<table>
<thead>
<tr>
<th>Roof Type</th>
<th>Slope</th>
<th>SRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-sloped roof</td>
<td>≤2:12</td>
<td>78</td>
</tr>
<tr>
<td>Steep-sloped roof</td>
<td>&gt;2:12</td>
<td>29</td>
</tr>
</tbody>
</table>

There is more than one definition of a “cool roof”. The California Energy Commission’s minimum cool roof requirements, in terms of SRI, are 64 for low-sloped and 29 for steep sloped. The USGBC’s LEED uses 78 for low-sloped and 29 for steep sloped. The DOE uses 64 for low-slopped and a three-year aged SRI of 29 for steep slopes. Energy Star minimums, listed above in the credit language, do not consider thermal emittance.

Cool roofs can significantly reduce school cooling loads and urban heat island effects by reflecting the sun’s energy, instead of absorbing, retaining, and radiating it into the occupied spaces below. With cool roofs, both the reflectivity and emissivity are important. Solar reflectance is the ratio of the electromagnetic energy reflected by a surface to the total amount incident upon it. A solar reflectance of 0.0 means all the solar energy hitting the surface is absorbed and none is reflected. Emissivity is the ability of a material to shed infrared radiation. In other words, surfaces with high emissivity lower their surface temperatures by shedding infrared radiation. Bare metals, for example, have low emissivity and stay hotter for longer periods than materials with high emissivity. The EPA’s ENERGY STAR® program includes a database of high-reflectance roofing materials. To ensure high emissivity, do not use bare metal roofing products.

Climate has the biggest impact on energy savings from cool roofs. Cool roofs achieve the greatest cooling savings in hot climate zones one through three, but can increase energy costs in colder climates due to reduced beneficial wintertime heat gains. Washington State is in climate zones four, five, and six. Use a cool roof calculator to determine the life-cycle cost. EPA ENERGY STAR rating defines ENERGY STAR labeled products as “roof products [that] save
money and energy by reducing the amount of air conditioning needed to keep a building comfortable.”

The calculator for ENERGY STAR labeled roof products states: “No savings are available for a building that is not air conditioned . . .” Cool roofs can also increase heat loss during heating months. This needs to be evaluated against the cost savings anticipated during the cooling months.

Green roofs can reduce heat gain/loss and cooling needs. Green roofs can also act as sound insulation. Other potential benefits are reduction in the size of HVAC equipment, insulation, and roof drains. Green roofs can potentially incorporate cooling and/or water treatment functions and stormwater management requirements, depending on the local jurisdiction.

**Resources**


Lawrence Berkeley Labs Heat Island Group, [https://heatisland.lbl.gov/](https://heatisland.lbl.gov/)


Outdoor Lighting

**Purpose**: Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

### S5.1: Light Pollution Reduction

**1 point**

Do not exceed *Illuminating Engineering Society of North America* (IESNA) foot-candle level requirements as stated in the *IESNA RP-33 Recommended Practice for Exterior Environmental Lighting* or applicable sections of the IESNA Lighting Handbook, Current Edition; and

Design interior and exterior lighting (*excluding sports fields*) such that zero direct-beam illumination leaves the building site.

Consult IESNA *Recommended Practice Manual: Lighting for Exterior Environments for Commission International de l’Eclairage* (CIE) zone and pre- and post-curfew hour descriptions and associated ambient lighting level requirements. Ambient lighting for pre-curfew hours for CIE zones range between 0.01 foot-candles for areas with dark landscapes such as parks, rural, and residential areas, and 1.5 foot-candles for areas with high ambient brightness such as urban areas with high levels of nighttime activity.

Design site lighting and select lighting styles and technologies to have minimal impact off-site and minimal contribution to sky glow. Minimize lighting of architectural and landscape features. There are fixtures that are certified dark sky compliant listed at the *International Dark Sky Association* web site (below). Lighter colored surfaces used to achieve credit S4.1 may also help reduce lighting requirements.

Although sports fields are excluded from this point, sports fields have a significant impact on the environment. It is recommended that steps be taken to reduce the impact of sports field lighting through field placement, beam shielding, and timing controls consistent with current technology.

**Resources**


The International Dark Sky Association, ([http://www.darksky.org/](http://www.darksky.org/))


Outdoor Systems

Purpose: Reduce water use for landscaping and ornamentation.

**W1.0: Landscape Water Use Budget**

| Required | Develop a landscape water budget that conforms to the requirements set forth in the Irrigation Association Best Management Practices, Appendix B. Develop a landscape plan and Estimated Water Use for the site specific landscaping. |

The following are exempt:

- Those portions of a site irrigated with water that is not supplied by the utility.
- Turf portions of school-owned sports and athletic fields.
- Water Budget Requirements: For each proposed landscape design not exempted, a state-registered landscape architect, Washington-certified nurseryman (WCN), or Washington-certified landscaper (WCL) will certify that the estimated annual water use will not exceed the irrigation water budget, as calculated pursuant to the methodology contained in the engineering standards. Copies of supporting calculations will be submitted to the utility.

To comply with this credit, calculate the estimated water use (EWU) landscape and the Maximum Applied Water Allowance (MAWA) for the landscape. The EWU must not exceed the MAWA. Once a water budget is established, design the landscape to meet established budget baselines.

MAWA is the most irrigation water allowed for the landscape on an annual basis. It takes into account local conditions and the size of the landscape area and is calculated as follows:

\[
\text{MAWA} = (\text{ET}) (\text{LA}) (0.8) (0.62)
\]

Where:

- **MAWA** = Maximum Applied Water Allowance (gallons per year).
- **ET** = Evapotranspiration Rate for the site (inches per year): The amount of water that transpires from plants and evaporates from adjacent soil surfaces. ET takes into account local soil conditions and the local, average annual net rainfall (total rainfall minus runoff).
- **LA** = Landscaped Area (sf).
- 0.8 = ET Adjustment Factor. This factor adjusts for plant factors and irrigation efficiency.
- 0.62 = Conversion Factor. This converts the maximum applied water allowance to units of gallons per year.
To estimate total annual irrigation water use, calculate the EWU for each plant zone according to the equation below, then sum up the EWUs for all zones in the landscaped area:

\[
EWU = \frac{(ET) (PF) (LA) (0.62)}{IE}
\]

Where:

- **EWU** = Estimated Water Use (gallons per year).
- **ET** = Evapotranspiration Rate for the site (inches per year).
- **PF** = Plant Factor for the zone (For low water use plants PF = 0 to 0.3, medium water use plants, PF = 0.4 to 0.6, high water use plants, PF = 0.7 to 1; all irrigated turf grass, PF = 0.8 to 1).
- **LA** = Landscape Area (sf) for the zone.
- **0.62** = Conversion Factor (to gallons per sf). This converts EWU to units of gallons per year.
- **IE** = Irrigation Efficiency (0.625 for conventional overhead spray systems, 0.925 for low volume or drip irrigation systems).

Sports or activity fields are considered recreational areas and may require water in addition to the MAWA. A statement should be included with the landscape design plan, designating recreational areas to be used for such purposes and specifying any needed amount of additional water above the MAWA.

**Example:** What is the annual water use budget for a 50,000 sf landscaped area in Bellevue?

The ET for Bellevue is 14.5”, so the MAWA is about 0.36 million gallons/year

\[
MAWA = \frac{(ET) (LA) (0.8) (0.62)}{IE}
\]

\[
MAWA = \frac{14.5" (50,000) (0.8) (0.62)}{0.625} = 359,600 \text{ gallons/year}
\]

\[
359,600 \text{ gallons/year} \times 0.001337 \text{ CCF/gal} = 479.7 \text{ CCF/year}
\]

**Resources**


Good sources for site-specific data to calculate the net evapotranspiration: golf course weather stations; local weather stations; parks departments; USDA Natural Resources Conservation Service; and the Washington State University, Agricultural Extension Office.
W1.1: Irrigation Water Reduction

| 50% reduction = 1 point | Reduce water consumption of water supplied for irrigation by a water district or utility, after plant establishment period, by 50% of Maximum Applied Water Allowance as determined in credit W1.0. |
| 100% reduction or no permanent use = 2 points | For an additional point, eliminate water consumption for irrigation use of water supplied by water district or utility, after plant establishment period. |
| Or | Do not use permanent landscape irrigation systems after two years. |

A water district is a local government institution that supplies water to farms, homes, and businesses in a rural area. For the purposes of this credit, plant establishment is defined as two years from building occupancy. The irrigation water use during this period of time is exempt from this credit for the purposes of adequately establishing plants. Plant establishment is critical for the long-term health and performance of plantings.

Once the Maximum Applied Water Allowance has been determined for the site, develop a landscape plan that will allow for a 50% reduction of water use by using native, drought tolerant plantings in place of ornamental plants and turf.

Achieve 100% reduction consumption of water supplied by water district by installing a greywater or non-potable irrigation system, or turning off the permanent irrigation system after two years.

Water resources are a growing concern in Washington, even in the rain-drenched west, as expanding populations and multiple uses increase the demand for limited supplies. Precipitation patterns in much of Washington make it difficult to store enough rainwater for irrigation through the dry summers, though school grounds may not require irrigation during summer months. High efficiency irrigation technologies such as micro irrigation, moisture sensors, and weather-data based controllers save water by reducing evaporation losses or operating only when needed. However, these systems require careful design, as well as additional operations and maintenance requirements. For example, some drip irrigation systems may be more vulnerable to vandalism; moisture sensors must be carefully placed to represent the soil type and exposure of individual irrigation zones accurately; and timers and controls, if not weather-data based, need to be adjusted seasonally.

Resources

Irrigation Water Management Society, (http://www.iwms.org/)

EPA Water Sense, Landscape Irrigation Services, (http://www.epa.gov/watersense/pp/irrprof.htm)

Local water utility staff, water efficient landscape consultants, certified irrigation designers (http://www.irrigation.org/), and master gardeners would also be good resources for helping achieve this credit.

Washington Native Plant Society, (http://www.wnps.org/)

Using rainwater and gray water, American Rainwater Catchment Systems Association, (http://www.arcsa.org)

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**W1.2: Control Irrigation Water Use**

| 1 point | Develop an irrigation schedule, by zone, based on historic rates of evapotranspiration, plant water requirements, soil type, and system efficiency. And input into controller after plant establishment. Or Install a climate-based or soil-based control system. |

Irrigation scheduling takes into account the following: DU (distribution uniformity of system or efficiency); soil type and depth (intake rate and water holding capacity); and precipitation rate of each zone based on head type and area and plant water requirements.

Using the formulas provided by the Irrigation Association, calculate the yearly schedule for the system. Establish the date the irrigation system is turned on and off and determine the appropriate schedule for the system based on ET for the established water window. Use the seasonal adjust setting on the controller and set based on the time of year and required water.

Even with a climate-based or soil-based control system, knowledge of the irrigation system and site conditions (and potentially a full schedule) is still necessary to set-up the controller to properly manage irrigation water use.

See the Irrigation Association Landscape Irrigation Best Management Practices, Appendix C for a discussion of different ways to manage the irrigation; dependent on the type of controller installed on the project.

Irrigation design takes the following into consideration: DU - Distribution uniformity; root zone depth of plants; intake rate and water holding capacity of soils; precipitation rates of emitters, sprays or rotors; efficiency of irrigation system; soil characteristics, including the percentages of sand, loam, and clay - and depth of soil, combined with the percentage of volume of organics and the hydraulic conductivity of the soil; plant types (lawn vs. ornamental); slopes of planting beds or lawn areas; rainfall patterns; climate factors; and evapotranspiration.
To properly manage water usage, a seasonally dependent time factor also needs to be managed - namely when the system is on or off, and how much, how often, and when irrigation water needs to be delivered during different periods of the year. The management of this time sequence is done by setting the irrigation controller's schedule for the months of operation relative to the factors listed above. Commonly, the establishment and implementation of such a schedule for each site can realize upwards of 40% savings. All automatic irrigation systems have an irrigation controller. This credit requires that detailed calculations are made and input into the controller.

Using the formulas as provided by the Irrigation Association, or others, calculate the yearly schedule for the irrigation controller. Establish the date the irrigation system is turned on and turned off, and determine the appropriate schedule for irrigation during the watering system for a minimum of four different watering programs.

Controllers should provide at least four separate programs in order to establish a minimum of four separate periods during the watering season. For example, in Puget Sound Lowlands, calculate the appropriate schedule for a monthly grouping of April, May, and June as one period, July and August as a second, September and October as a third, and the period that the system is off as a fourth. Input the soil, plant, and climate characteristics, especially the evapotranspiration rates for each of the program periods, as outlined in the Irrigation Association’s Landscape Irrigation Scheduling and Water Management, March 2005.

Resources

Smart Controller Efficiency testing for Sensor-Based Controllers, (http://www.irrigation.org/swat/control_sensor/)

Irrigation Water Management Society, Conservation Controller Tips, (http://www.iwms.org/)

Irrigation Association: Landscape Irrigation Scheduling and Water Management, (http://www.irrigation.org)

Washington Native Plant Society, (http://www.wnps.org/)
W1.3: Irrigation Systems Testing and Training

| 1 point | Create an irrigation commissioning plan to verify the irrigation system and controls are operating as intended and that effective training for system upkeep and maintenance has been provided. |

Irrigation Commissioning is the process of verifying all the components, and the system as a whole, achieve the project requirements as designed by the landscape architect.

Commissioning of the irrigation system includes testing and monitoring of the system during construction, training of the maintenance staff, and post installation audit. Follow the recommendations of the Irrigation Association, Landscape Irrigation Best Management Practices, Appendix A.

An audit should be performed on the irrigation system after installation to ensure proper head spacing was achieved during construction. Audit to be performed based on the Irrigation Association Irrigation Audit Guidelines.

Required Low Quarter Distribution Uniformities as follows: (verify compliance with local ordinances).

- Sprays: 55%
- Rotors: 70%
- Drip: 80% Emission Uniformity

Irrigation Commissioning must be included in the design contract and the construction specifications.
Indoor Systems

**Purpose:** Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

**W2.1: Potable Water Use Reduction for Sewage Conveyance**

| 25% = 1 point | Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 25% (1 point) or 45% (2 points) beyond the baseline calculated for the building (not including irrigation). Baseline flow rates listed below are the 2015 Uniform Plumbing Code with WA Amendments fixture performance requirements in effect as of July 1, 2016. |
| 45% = 2 points |

Well designed, water efficient systems can earn points by reducing the amount of potable water used for sewage conveyance.

Use water-efficient fixtures and/or municipally supplied reclaimed water or rainwater supplementation to reduce the amount of potable water used for sewage conveyance. **Only those fixtures that convey sewage, such as toilets and urinals, are included in this credit.** The use of reclaimed water for flushing toilets and urinals automatically qualifies the project for this point because it results in a 100% reduction in the use of municipally provided potable water for this purpose.

Calculate and compare the baseline and design water uses as described below. To qualify for the credit, the calculated design water use must be at least **25% below the baseline.**

**EXAMPLE:** A water-efficient design for a 1,000-student school.

**Baseline Water Use.** For baseline calculations, assume flow rates outlined by the 2015 UPC with WA amendments fixture performance requirements.

<table>
<thead>
<tr>
<th>Fixture</th>
<th>WA 2015 UPC Requirements</th>
<th>WA 2015 UPC Sustainable Practice (Appendix L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilets</td>
<td>1.6 gal/flush</td>
<td>1.28 gal/flush</td>
</tr>
<tr>
<td>Urinals</td>
<td>1.0 gal/flush</td>
<td>0.5 gal/flush</td>
</tr>
<tr>
<td>Showerheads</td>
<td>2.5 gal/min</td>
<td>2.0 gal/min</td>
</tr>
<tr>
<td>Public Lavatory Faucets (other than Metering)</td>
<td>0.5 gal/min</td>
<td>0.5 gal/min</td>
</tr>
<tr>
<td>Kitchen and Janitor Sink Faucets</td>
<td>2.5 gal/min</td>
<td>2.5 gal/min</td>
</tr>
<tr>
<td>Metering Faucets</td>
<td>0.25 gal/cycle</td>
<td>0.25 gal/cycle</td>
</tr>
</tbody>
</table>

**To calculate the baseline water use:**

1. Calculate Daily Water Use per fixture based on occupancy and estimated frequency of use: \( \text{Daily Water Use} = (\text{Flow-rate}) \times (\text{Duration}) \times (\text{Occupants}) \times (\text{Daily Uses}) \)
2. Sum Daily Water Volumes for each fixture to find Total Daily Volume.
3. Multiply the Total Daily Volume by the number of school days for Total Annual Volume.
EXAMPLE:

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

**Design Water Use (Efficient Fixtures).** Now assume the design case is based on the use of extra-efficient fixtures. In this case:

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Flow-rate</th>
<th>Occupants</th>
<th>Daily Uses</th>
<th>Water Use (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Flow Toilet (male)</td>
<td>1.28 gal/flush</td>
<td>500</td>
<td>1</td>
<td>640</td>
</tr>
<tr>
<td>Low Flow Urinal (male)</td>
<td>0.5 gal/flush</td>
<td>500</td>
<td>2</td>
<td>500</td>
</tr>
<tr>
<td>Low Flow Toilet (female)</td>
<td>1.28 gal/flush</td>
<td>500</td>
<td>3</td>
<td>1,920</td>
</tr>
<tr>
<td><strong>Total Daily Volume</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>3060</strong></td>
</tr>
<tr>
<td><strong>Number of School Days</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>180</strong></td>
</tr>
<tr>
<td><strong>Design Total Annual Volume</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>550,800</strong></td>
</tr>
</tbody>
</table>

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

\[
\% \text{ Savings} = 1 - \left( \frac{\text{Design Total Annual Volume}}{\text{Baseline Total Annual Volume}} \right) = 0.271 = 27\%
\]

Therefore, this design would earn one point because potable water used for sewage conveyance has been reduced more than 25% through the use of extra-efficient toilets and urinals.

**Design Water Use (Fixtures & Reclaimed or Rainwater Supplementation).** Now assume the design case is based on the use of low flow urinals and the use of 166,000 gallons per year of reclaimed water or captured rainwater. In this case:

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Flow-rate</th>
<th>Occupants</th>
<th>Daily Uses</th>
<th>Water Use (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low flow Toilet (male)</td>
<td>1.28 gal/flush</td>
<td>500</td>
<td>1</td>
<td>640</td>
</tr>
<tr>
<td>Ultra-Low Flow Urinal (male)</td>
<td>0.125 gal/flush</td>
<td>500</td>
<td>2</td>
<td>125</td>
</tr>
<tr>
<td>Low flow Toilet (female)</td>
<td>1.28 gal/flush</td>
<td>500</td>
<td>3</td>
<td>1,920</td>
</tr>
<tr>
<td><strong>Total Daily Volume</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>2,685</strong></td>
</tr>
<tr>
<td><strong>Number of School Days</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>180</strong></td>
</tr>
<tr>
<td><strong>Design Total Annual Volume</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>483,300</strong></td>
</tr>
<tr>
<td><strong>Supplemental Non-Potable Water Use</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>166,000</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>371,300</strong></td>
</tr>
</tbody>
</table>

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

\[
\% \text{ Savings} = 1 - \left( \frac{\text{Design Total Annual Volume}}{\text{Baseline Total Annual Volume}} \right) = 0.0509 = 51\%
\]

Therefore, this design would earn two points because potable water used for sewage conveyance has been reduced more than 45% through the use of waterless urinals and supplemental non-potable water for toilet flushing.
W2.2: Potable Water Indoor Use Reduction

<table>
<thead>
<tr>
<th>Reduction</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>1 point</td>
</tr>
<tr>
<td>30%</td>
<td>2 points</td>
</tr>
<tr>
<td>40%</td>
<td>3 points</td>
</tr>
</tbody>
</table>

Employ strategies that, in aggregate, **reduce potable water** use by at least 20% (or 30% or 40%) beyond the baseline calculated for the building (**not including irrigation**). Baseline fixture flow rates listed below are the 2015 UPC with WA Amendments fixture performance requirements in effect as of July 1, 2016. For baseline fixture calculations, use the table for 2015 UPC with WA Amendments requirements (fixture performance) shown in credit W2.1.

Develop a water-use baseline including all water consuming fixtures, equipment, and seasonal conditions according to methodology outlined below. Specify water conserving plumbing fixtures that exceed the WA amendments to the 2012 UPC fixture requirements in combination with ultra-high efficiency or dry fixture and control technologies. Specify high water-efficiency equipment and appliances (dishwashers, laundry, cooling towers).

Because water-efficient devices can vary in quality and performance, specify only durable, high performance fixtures. Design and maintenance issues will be different with low flow toilets compared to toilets with higher flow.

This credit awards reductions in total potable water use (**not including irrigation**), therefore, all water-consuming fixture uses are included in the calculations. To quantify water use reductions, calculate and compare baseline and design water uses. List each water-using appliance or fixture, the amount of daily uses, number of occupants, and calculate the total water use. Any reclaimed water used for sewage conveyance is subtracted from the total amount of water used.

Rainwater collection can be a tool for reducing potable water use. It is an eco-friendly way to provide a water supply and can be a sound financial investment in certain areas. The Department of Ecology’s website includes information on rainwater harvesting and water rights as well as other information sources.

**A water-efficient design for the school in the previous example is shown below. Revised Table**
### Fixture Type | Flow-rate | Duration | Automatic Controls | Occupants | Daily uses | Water use
---|---|---|---|---|---|---
Low Flow Toilet (male) | 1.28 gal/flush | 1 flush | - | 500 | 1 | 640
Ultra-Low Flow Urinal (male) | 0.125 gal/flush | 1 flush | - | 500 | 2 | 125
Low Flow Toilet (female) | 1.28 gal/flush | 1 flush | - | 500 | 3 | 1,920
Bathroom Sink | 0.50 gal/min | 0.25 min | - | 1000 | 3 | 375
Low Flow Shower | 1.8 gal/min | 5 min | - | 100 | 1 | 900
Low Flow Kitchen Sink | 1.8 gal/min | 45 min | - | 2 | 2 | 324
Efficient Washing Machine | 20 gal/load | 1 load | - | - | 10 | 200

**Total Daily Volume**

**Number of School Days**

**Subtotal**

807,120

Issued 11/15/16

For the baseline calculation, create a similar spreadsheet but change only the type of fixture and its associated design details. The baseline calculation for this example would therefore be per the revised table below.

### 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 Sink | 0.50 gal/min | 0.25 min | - | 1000 | 3 | 375
Conventional Shower | 2.5 gal/min | 5 min | - | 100 | 1 | 1250
Kitchen Sink | 2.5 gal/min | 45 min | - | 2 | 2 | 450
Clothes Washer | 40 gal/load | 1 load | - | - | 10 | 400

**Total Daily Volume**

**Number of School Days**

**Baseline Total Annual Volume**

1,201,500

Issued 11/15/16

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

\[
% \text{ Savings} = 1 - \left( \frac{\text{Design Total Annual Volume}}{\text{Baseline Total Annual Volume}} \right) \\
= 1 - \left( \frac{807,120}{1,201,500} \right) = 33\%
\]

Therefore, this design would earn two points because total potable water use has been reduced by more than 30%.

Additional potable water-saving measures may also be included in a similar manner; for example, geo-exchange water source heat pumps. A common HVAC system for schools is a water source heat pump. The system consists of compressorized heat pumps, boilers, and cooling towers. The cooling towers traditionally use large amounts of potable water as make-up water for the evaporation process. Using a subset of this technology (such as earth-coupled, lake-coupled, or aquifer-coupled) replaces the cooling tower with a geo-heat exchanger. If this alternate technology is employed, the traditional water use of a cooling tower would be modeled and included as part of the baseline. This kind of closed loop system has other benefits such as lower maintenance and reduced chemical use and discharge into the sanitary sewer system.
Provide training for maintenance and operations staff since best practices are critical to saving water with low flow devices.

Resources


MATERIALS

Waste Reduction and Efficient Material Use

**Purpose**: Reduce the amount of construction and occupant waste entering the landfill and promote the efficient reuse of materials and buildings.

### M1.0: Storage and Collection of Recyclables and Compostables

<table>
<thead>
<tr>
<th>Required</th>
<th>Space shall be provided for the storage of recycled materials, compost and solid waste for all new buildings.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>And</strong></td>
</tr>
<tr>
<td></td>
<td>Provide dedicated, easily accessible areas, within the building/facility, for the separation, collection, and storage of materials for recycling. Also provide at least one centralized collection point for all materials to be staged for removal from the site (e.g. loading dock). <strong>The storage area shall be designed to meet the needs of the occupancy, efficiency for pickup, and shall be available to occupants and haulers.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>And</strong></td>
</tr>
<tr>
<td></td>
<td>Regularly inform all building occupants about what materials can and cannot be recycled, and educate building occupants about the environmental and economic benefits of recycling.</td>
</tr>
</tbody>
</table>

In Washington, all jurisdictions shall require that space be provided for the storage of recycled materials, compost and solid waste for new buildings. Modernizations must follow local ordinances for existing building renovations and alterations. Schools may refer to the Washington Green Schools webpage (http://www.wagreenschools.org/) for resources, tools, and tips on writing and implementing a recycling or composting program.

Reserve space for recycling and composting functions during the space programming process and show areas dedicated to the collection of recycled materials on space utilization plans.

Plan for and provide adequate and accessible space indoors for building occupants to deposit garbage and recyclable materials. In appropriate areas, provide space for compostable materials. Each recycling or compost collection bin should be placed next to a garbage bin, should be labeled with the materials that can be recycled or composted in that bin, should accommodate a 75% diversion rate, and should be easily accessible to students, teachers, staff, compost and recycling collection workers. Consider bin designs that allow for easy cleaning to avoid health concerns. Color-coding bins works well. Ensure the spaces are compatible with the policies of local waste handling companies. Control odors by separately venting these areas. Solid waste, compost and recycling materials should not be located near the ventilation air.
Understand compost and how to manage this waste. Organic materials typically account for 30% of the overall waste stream.

**Innovation:** Schools are encouraged to go beyond the minimum requirements. If an innovative system is developed consider applying for an innovation or operational credit in the Planning, Education, and Operations category.

**Resources**


U.S. Environmental Protection Agency: Recycling and composting [https://www.epa.gov/recycle](https://www.epa.gov/recycle)
M1.1: Construction Site Waste Management

| >50% = 1 point | >75% = 2 points
|----------------|----------------|

Develop and implement a construction site waste management plan and provide documentation of waste disposal at the conclusion of the project. **And**

Document the percent (by weight) of construction and demolition waste diverted from the landfill, excluding hazardous or dangerous materials and land clearing debris.

Include construction site waste management in the construction bid documents. Prior to construction commencing on site, the general contractor, or his designee, will develop and have reviewed and approved a construction site waste management plan. The plan will cover all contractor work on site. The plan will identify licensed haulers and processors of recyclables; identify markets for salvaged materials; identify deconstruction, salvage, and recycling strategies and processes; include waste auditing; and document the cost for recycling, salvaging, and reusing materials. Source reduction on the job site should be an integral part of the plan.

The plan should address recycling of corrugated cardboard, metals, concrete, brick, asphalt, beverage containers, clean dimensional wood, plastic, glass, gypsum board, and carpet. It should also evaluate the availability and cost-effectiveness of recycling rigid insulation, engineered wood products, and other materials.

Compliance calculations for this credit must be based on weight. Many recycling and landfill facilities weigh incoming materials. Shipments that cannot be weighed can be estimated based on their volume and density. Land-clearing debris (soils and vegetation) should not be included in the calculation; however, land clearing debris may often be reused on another site or chipped for reuse to avoid taking it to the landfill. Burning is not allowed. Hazardous and dangerous waste should not be included.

\[
\text{Diversion Rate (\%)} = \frac{\text{Diverted Materials (by weight)}}{\text{Diverted Materials (by weight)} + \text{Landfill Garbage (by weight)}} \times 100
\]

**Resources**

King County *Green Tools Program* Construction Recycling web page,  

Seattle Public Utilities Reduce Waste,  

Washington Department of Ecology Managing Construction and Demolition Waste,  

State of Delaware, Division of Facilities Management, Specification section 01 74 19,  
([http://dfm.delaware.gov/docs/section_017419_cwm_060112.pdf](http://dfm.delaware.gov/docs/section_017419_cwm_060112.pdf))
M1.2: Building Reuse – Structure and Shell

| 50% = 1 point | Maintain a minimum of 50%, (or 75% or 95%) of existing building structure and shell (exterior skin and framing, excluding window assemblies). |
| 75% = 2 points |
| 95% = 3 points |

Reusing parts of the building can save significant money and resources while greatly reducing the amount of construction waste. When materials are reused, the environmental benefits start with resource savings and extend down through the entire lifecycle of the material. One of the benefits is reduced energy spent extracting, processing, and shipping the materials to the site. Depending on the amount of building reused, school districts can significantly reduce their construction and material costs. However, the building envelope will significantly affect many important high performance areas, such as space programming, energy performance, opportunities for daylighting, and other indoor environmental qualities. In addition, care must be taken to ensure that any environmental hazards such as toxins, lead, asbestos and PCB’s have been identified and addressed. Develop a list of benefits and tradeoffs, and make the decision based upon the overall integrated design tradeoffs.

Calculating the percent of building reused is a three-step process.

**Step 1.** Approximate total structural materials and reused structural materials (foundation, slab on grade, beams, floor and roof decks, etc.) in terms of cubic feet. Divide the reused structural materials (cf), by the total structural materials (cf), to get the percent of structural materials that are reused.

\[
\text{Structural Material Reuse (\%)} = \frac{\text{Reused Structural Materials (cf)}}{\text{Total Structural Materials (cf)}}
\]

**Step 2.** Approximate total shell materials and reused shell materials (roof and exterior walls) in terms of square feet. Divide the reused shell materials (sf), by the total shell materials (sf), to get the percent of shell materials that are reused.

\[
\text{Shell Materials Reuse (\%)} = \frac{\text{Reused Shell Materials (sqft)}}{\text{Total Shell Materials (sqft)}}
\]

**Step 3.** Calculate the approximate building reuse percentage by adding together the structural and shell reuse percentages from Step 1 and Step 2 and dividing the sum by two.

\[
\text{Building Reuse (\%)} = \frac{\text{Shell Material Reuse \%} + \text{Structural Materials Reuse \%}}{2}
\]

**Resources**


M1.3: Building Reuse – Interior Non-Structural Elements

1 point

Maintain and reuse at least 50% of interior non-structural (walls, interior partitions, doors, relites, floor coverings, and ceiling systems) materials.

Percentage of maintained and reused non-structural building portions will be calculated as the total area (sf) of reused non-structural materials divided by the total area (sf) of the non-structural elements.

\[
\text{Interior NS Building Reuse (\%) =} \frac{\text{Reused Interior Non-Structural (sf)}}{\text{Total Interior Non-Structural (sf)}}
\]

This credit does not include the use of salvaged materials installed from offsite.

All building elements for reuse should be free of hazardous and dangerous components, and be free of mold and mildew. Do not reuse materials such as lamps, ballasts, flooring, ceiling tile and insulation that may contain PCB’s and asbestos. Do not reuse walls and other pervious building surfaces and materials that may have been exposed to high moisture levels.

Keep demolition plans and calculations that were used in the determination.

Resources


Washington State Department of Ecology on PCB’s in construction materials, [http://www.ecy.wa.gov/Programs/swfa/pbt/pcb.html](http://www.ecy.wa.gov/Programs/swfa/pbt/pcb.html)
<table>
<thead>
<tr>
<th>1 point:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5% Performance</td>
</tr>
<tr>
<td>Or</td>
</tr>
<tr>
<td>Prescriptive approach #1</td>
</tr>
</tbody>
</table>

Install salvaged or refurbished materials using either a percentage approach or prescriptive approach for one or two points. Calculate using material costs.

**Performance Approach (#1):** Install salvaged or refurbished materials for 5% of building materials.

**Or**

**Prescriptive Approach (#1):** Specify salvaged or refurbished materials for 25% of one of the following major interior finish materials:

- Flooring (sf)
- Casework (sf)
- Acoustical ceiling tile (sf)
- Wall coverings (sf)
- Tile (sf)

<table>
<thead>
<tr>
<th>2 points:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% Performance</td>
</tr>
<tr>
<td>Or</td>
</tr>
<tr>
<td>Prescriptive approach #2</td>
</tr>
</tbody>
</table>

**Performance Approach (#2):** Install salvaged or refurbished materials for 10% of building materials.

**Or**

**Prescriptive Approach (#2):** Specify salvaged or refurbished materials for 50% of one (or 25% of two) of the following major interior finish materials:

- Flooring (sf)
- Casework (sf)
- Acoustical ceiling tile (sf)
- Wall coverings (sf)
- Tile (sf)

This credit applies to materials that are salvaged and refurbished from off the project site and salvaged materials from the same building site used for a different purpose. For example, doors, cabinets, and wood flooring from an old office building in the downtown area are used for the same purpose in the new school building. Those items may be counted as material reuse. The same school project uses crushed concrete for backfill. The crushed concrete is from the old public tennis court that existed on the site where this new school is being built. That concrete also counts towards earning this credit.

For materials salvaged within the construction site, and used for the same purpose, refer to credit M1.3 Building Reuse – Interior Non-Structural.
Calculate percentages for this credit using total and refurbished/salvaged materials costs. Exclude all construction labor costs, all contractor mechanical and electrical material costs, and contractor fees (overhead, profit, insurance, and bond). If the cost of the salvaged or refurbished material is below market value, use replacement cost to estimate the material value; otherwise, use actual cost to the project. A default value of 35% of the Total Construction Cost can be used for the Total Project Material Cost.

Salvaged materials or products are re-used for a similar purpose or application rather than processed or remanufactured for a different use (beams and post, brick, doors). Commonly refurbished building materials include wood flooring/paneling/cabinets, doors and frames, mantels, ironwork, and decorative lighting fixtures. Ensure the materials, especially structural elements, comply with all applicable codes and all reused materials are free of hazardous or dangerous elements. Research the existing materials before choosing to reuse them.

Calculate Performance Approach percentages using materials costs, as illustrated below:

\[
\text{Materials Reuse Rate (\%) = } \frac{\text{Salvaged & Refurbished Materials Cost (\$)}}{\text{Total Material Cost (\$)}} \times 100
\]

**Resources**


**M1.5: Resource Reuse - Furniture and Equipment**

**1 point**

Install salvaged, refurbished, or used furniture and equipment for at least 30% of the total furniture and equipment cost.

In order to reduce the demand for virgin materials and reduce waste, and the associated impacts of harvesting, processing, and manufacturing new materials, install salvaged, used, and refurbished furniture and equipment. Furniture and equipment include items like case pieces, desks and chairs, tables, filing systems, decorative lighting and accessories, as well as computers, printers, copiers, fax machines, and other equipment common in schools.

As above, calculate percentages using furniture & equipment costs:

\[
\text{Reuse Rate (\%) = } \frac{\text{Reused Furniture & Equipment (\$)}}{\text{Total Furniture & Equipment (\$)}} \times 100
\]
Sustainable Materials Procurement

Purpose: Create healthy indoor learning environments and increase demand for environmentally preferable building products by specifying building products with recycled content, rapidly renewable raw materials, wood and wood based products from sustainably managed forests and local or Washington manufactured products. Understand the content of building materials by choosing those that provide transparent reporting of multiple environmental attributes including the effects on human health, the effects on the environment and social sustainability.

Credits that rely on the total cost of materials may be calculated using the actual total materials cost or a 35% factor may be applied to the total construction costs to establish a default total materials cost for the project. The approach selected (actual or 35% default) must be used consistently across all credits based on total materials cost.

<table>
<thead>
<tr>
<th><strong>M2.1: Recycled Content</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>10% = 1 point</td>
</tr>
<tr>
<td>20% = 2 points</td>
</tr>
<tr>
<td>Or</td>
</tr>
<tr>
<td>4 materials = 1 point</td>
</tr>
<tr>
<td>8 materials = 2 points</td>
</tr>
<tr>
<td>Performance Approach: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer recycled content constitutes at least 10% (or 20%) of the total cost of the materials in the project.</td>
</tr>
<tr>
<td>Or</td>
</tr>
<tr>
<td>Prescriptive Approach: Install at least four (or eight) building products or materials from the Construction Products category of the EPA Comprehensive Procurement Guidelines. For the 2 points, at least six of the eight materials must be from the Construction Products Category. Products and materials MUST meet or beat the recycled-content recommendations included in the EPA guideline.</td>
</tr>
</tbody>
</table>

To calculate the cost of materials: exclude all labor costs, all mechanical and electrical material costs, and all contractor fees (overhead, profit, insurance, and bond).

The number and variety of products using recycled content materials expands every year. Using these materials closes the recycling loop by creating markets for materials collected through recycling programs across the country. It also reduces the use of virgin materials and landfill waste. Recycled-content alternatives exist for all major building materials and surfaces.

Recycled content is classified as either post-consumer (collected from end users) or pre-consumer. Pre-consumer (formerly known as post-industrial) is collected from manufacturers and industry. The objective is to maximize post-consumer recycled content.

Fly ash generated from municipal solid waste incinerator or as a coal-combustion by-product from hazardous or medical waste or tire-derived fuel is not acceptable.
Recycled content claims must be in accordance with the International Organization of Standards (ISO) document ISO 14021-1999 – Environmental labels and declarations.

The US EPA’s Comprehensive Procurement Guidelines program provides fact sheets for various product categories, as well as a list of materials with recommended recycled content levels.

A default value of 35% of the Total Construction Cost can be used for the Total Project Material Cost.

**Performance Approach**

The total recycled content value is calculated in five steps. Exclude all labor costs, mechanical and electrical material costs, and all contractor fees (overhead, profit, insurance, and bond) in these calculations.

- **Step 1.** For each material, identify the percentage of post-consumer recycled content (by weight), the percentage of pre-consumer recycled content (by weight), and the material cost.

- **Step 2.** For each material, use info from Step 1 to calculate the post-consumer Recycled Content Value, as shown below:

\[
\text{Post-Consumer Recycled Content Value} \ [\$] = \text{Material Cost} \ [\$] \times \text{Post-Consumer Recycled Content} \ [%]
\]

- **Step 3.** For each material, use info from Step 1 to calculate the pre-consumer Recycled Content Value, as shown below:

\[
\text{Pre Consumer Recycled Content Value} \ [\$] = \text{Material Cost} \ [\$] \times \text{Pre Consumer Recycled Content} \ [%]
\]

- **Step 4.** Sum the total value of all materials.

- **Step 5.** Calculate Recycled Content Percentage for this Credit by combining the value of post-consumer recycled content (from Step 2) plus one-half of pre-consumer recycled content (from Step 3) as a percentage of total value of all materials, as shown below.

\[
\text{Recycled Content} \ % = \frac{\text{Post-consumer value} \ [\$] + \frac{1}{2} \text{Pre-consumer value} \ [\$]}{\text{Total Project Material Cost} \ [\$]} \times 100
\]

**Prescriptive Approach**

Install at least four materials designated in the Construction Products category of the EPA Comprehensive Procurement Guidelines. The project-specified products must meet the recycled-content recommendations in the EPA guideline. For the purposes of these prescriptive points, nylon carpeting with at least 50% recycled-content materials can be used in addition to the carpet with recycled polyester (PET resin) materials listed on the EPA’s site. (Some PET carpets are not sufficiently durable for school applications.)

For the additional point, install at least 8 materials included in the EPA guideline. Six must be from the Construction Products Category. All products must meet the recycled-content recommendations in the EPA guideline.
Resources

Type II, ISO 14021: Verifiable single-attribute environmental claims for issues such as energy consumption, emissions, or recycled content. Can be first-party, self-declared manufacturer claims. However, many manufacturers are beginning to seek third-party verification of those claims in response to industry demand.

EPA’s Comprehensive Procurement Guidelines (CPG), (http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm)


California CalRecycle Matrix of Recycled Content Levels and Product Availability, (http://www.calrecycle.ca.gov/greenbuilding/Materials/Matrix.htm)


CHPS High Performance Products Database, (http://www.chps.net/dev/Drupal/node/445)
# M2.2: Rapidly Renewable Materials

| 1 point | Install rapidly renewable building materials for 5% of the total value of all building materials, excluding mechanical and electrical.  

**Or**  
**Prescriptive Approach:** Specify rapidly renewable materials for 50% of one of the following major interior finish or structural materials:  
- Flooring, casework, acoustical ceiling tile, wall covering, tile, exterior walls, and roof.  

A product must contain **25%** rapidly renewable raw materials based on weight to qualify under the prescriptive approach. |

Rapidly renewable resources are those materials that substantially replenish themselves faster than traditional demand (*planted and harvested in no greater than a 10-year cycle*). Products in this category include, but are not limited to, bamboo used for flooring and casework, wheat grass used for casework, wood products made from fast-growing trees such as poplar and Monterey pine, and sheet flooring made from linseed oil. Ensure the products are low emitting and durable.

To earn this credit, determine the percentage of total building materials from rapidly renewable sources. Exclude all labor costs, all mechanical and electrical material costs, and all contractor fees (overhead, profit, insurance, and bond).

\[
\text{Rapidly Renewable Materials \%} = \frac{\text{Rapidly Renewable Material Cost (\$)}}{\text{Total Project Material Cost (\$)}} \times 100
\]

A default value of 35% of the Total Construction Cost can be used for the Total Project Material Cost.
M2.3: Certified Wood

| 50% = 1 point | At least 50% of the cost of wood and wood-based materials and products are from a sustainable forest certified by a third party.
| Chain-of-custody | One additional point is available if all of the certified wood also has chain-of-custody tracking. |

Certified wood and wood-based material is available for a variety of applications including framing and interior finishes (ceilings, casework, millwork, and flooring).

**Compliance for this credit is based on the cost of the certified products as a percentage of the total cost of new wood and wood-based products.** The following equation can be used to determine point level.

\[
\text{Certified Wood \%} = \frac{\text{Certified Wood and Wood-based Material Cost (\$)}}{\text{Total Wood and Wood-based Material Cost (\$)}} \times 100
\]

Wood-based products include all new wood consumed by the overall project including, but not limited to: casework, formwork, shoring, structural framing and general dimensional framing, flooring, finishes, fixed furnishings, and non-rented temporary pedestrian barriers used in construction.

There are three main sustainable forestry management systems in North America:

**The Forest Stewardship Council (FSC)** international system provides standards for the sustainable growth and harvest, and provides a chain-of-custody process for certified wood products that tracks the wood from harvesting through milling, distribution, and retail. The sustainable forests in the FSC system are certified by a third party. ([https://us.fsc.org/](https://us.fsc.org/))

**The Sustainable Forestry Initiative (SFI)** is required for all American Forest & Paper Association (AF&PA) members. Verification of conformance with SFI program requirements is first, second, or third party audited. However, for certification and to claim this point, third party auditing is required to ensure conformance with the SFI Standard. SFI program participants who have successfully completed independent third party certification to the SFI Standard may also choose to have their facilities certified for chain-of-custody. ([http://www.sfiprogram.org/](http://www.sfiprogram.org/))

**The Canadian Standards Association (CSA)** is an independent non-profit organization accredited by the Standards Council of Canada. CSA is primarily focused on Canadian forests. Third-party certification is required. Chain of custody is available. ([http://www.csagroup.org/](http://www.csagroup.org/))

American Tree Farm System is a program of the American Forest Foundation and is primarily focused on non-industrial forests in the US. Third-party certification is required. Chain of custody is available on a limited scale. ([http://www.treefarmsystem.org/](http://www.treefarmsystem.org/)). Another certification program is the PEFC – Programme for the Endorsement of Forest Certification Schemes PEFC: ([http://www.pefc.org/index.php](http://www.pefc.org/index.php)).
Forests regulated under Chapter 76.09 RCW – Forest practices will also be recognized as complying.

**Resources**

Certified Sustainable Wood, (http://www.idsa.org/content/content1/certified-sustainable-wood-lumber-and-bamboo-website-links)

National Wood Flooring Association-Responsible Procurement Program for wood flooring, (http://www.nwfa.org/rpp.aspx)

CHPS High-Performance Products Database, (http://www.chps.net/dev/Drupal/node/445)
**M2.4: Regional/Local Materials**

<table>
<thead>
<tr>
<th>20% Manufactured = 1 point</th>
<th>For one point: 20% of the building materials that are installed are manufactured within a 500-mile radius of the site.</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% Manufactured and extracted, harvested, or recovered = 2 points</td>
<td>For two points: 20% of the building materials are manufactured, extracted, harvested, or recovered from within a 500-mile radius of the site.</td>
</tr>
<tr>
<td>Or</td>
<td></td>
</tr>
<tr>
<td>20% Manufactured and extracted, harvested, or recovered in Washington State = 2 points</td>
<td>Or</td>
</tr>
<tr>
<td>Maximum of 2 points</td>
<td>Use resources, building materials, products that are Washington State manufactured and extracted, harvested, or recovered for 20% of the construction materials.</td>
</tr>
</tbody>
</table>

This credit applies to new materials only. To earn this credit, show that the required percentage of project materials, by cost, are manufactured (or manufactured and extracted) within a 500-mile radius of the project, or are extracted, harvested, or recovered, and manufactured in Washington State. Do not include any contractor labor costs, mechanical and electrical materials, and contractor fees (overhead, profit, insurance, bonds, etc).

Regional and locally produced materials support the local economy while helping to reduce resource and energy consumption by minimizing transportation distances.

Buying regional/local materials is only one aspect of sustainable purchasing. Some materials may be local, but are not chosen because more distant products have higher recycled content, longer lifespan, or lower costs. It will be up to the team to determine the project’s priorities.

Base percentage calculations in terms of dollar value:

\[
\text{Regional or WA Material} \% = \frac{\text{Regional or WA Material Cost (\$)}}{\text{Total Project Material Cost (\$)}} \times 100
\]

For items such as window wall systems that have multiple materials forming the final building product, the manufacturing location refers to the location of final assembly of components into the building product that is furnished and installed.

A default value of 35% of the Total Construction Cost can be used for the Total Project Material Cost.
M2.5: Environmentally Preferable Products – Multiple Attributes

| 1–2 points | Earn one point for each major building product that is certified as an Environmentally Preferable Product (EPP) under a nationally recognized multi-attribute certification program (see below Table 2). Maximum of two points. |
| 1–2 points | And/Or Provide a third-party certified Environmental Product Declaration (EPD) for one or more major building products. Earn one point per product, maximum of two points. See Table 3 |

A “major” product is defined as those building products covering more than 50% of a building surface (such as flooring, roofing, walls, ceiling) or serving a structural function throughout the majority of the building.

Multi-attribute Environmentally Preferable Products (EPP)

If claiming points under this credit you may not claim points for the same materials under M1.4, M2.1 – M2.2. This environmentally preferable products credit offers points for specifying and installing multi-attribute building products that are certified under applicable Environmentally Preferable Products (EPP) certification programs. Environmentally Preferable Product (EPP) is defined in accordance with ASTM as a “material, component, system, or service that has measurable and statistically significant, positive, or reduced negative environmental impacts when compared with other material(s), component(s), and system or service(s) that serve similar purpose(s).”

The product comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service. Many green products have similar prices to the non-green products, and perform as well or better.

Standards and certification programs are useful when you are purchasing environmentally preferable products (EPP) and writing specifications for bid documents. Standards establish human health, environmental, and social criteria used to evaluate and certify products and services.
Nationally Recognized Certification Programs:

Table 2: Summary of Multi-Attribute Green Product Certifications

The following table outlines some of the most commonly used and respected multi-attribute green product certifications in the marketplace.

<table>
<thead>
<tr>
<th>Product Certification</th>
<th>Type of Standard or Certification</th>
<th>Managing Organization</th>
<th>Issue of Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Material Content Certification</td>
<td>Third-party certification</td>
<td>Scientific Certification Systems</td>
<td>Wide range of products (i.e. carpets, textiles, wood products, insulation, and more)</td>
</tr>
<tr>
<td>Green Seal</td>
<td>Third-party ISO Type 1 certification</td>
<td>Green Seal</td>
<td>Wide range of sectors (paints, adhesives, lamps, electric chillers, windows, window films, occupancy sensors)</td>
</tr>
<tr>
<td>Cradle to Cradle</td>
<td>Moving toward third-party certification; based on a proprietary standard</td>
<td>Cradle to Cradle Products Innovation Institute C2CPII</td>
<td>Wide range of sectors (metals, fibers, dyes, plastics)</td>
</tr>
<tr>
<td>Greenguard</td>
<td>Third party certification</td>
<td>Greenguard Environmental Institute (GEI)</td>
<td>Indoor air quality, children and schools focus</td>
</tr>
</tbody>
</table>


Environmental Product Declaration (EPD)

To earn points for EPD the document must be third-party certified, must conform to the requirements of ISO 14025 Type III and/or ISO 21930, must address the requirements found in Appendix A of the ISO Standards, and must justify the omission of any impact category.
Table 3: ISO-defined Types of Green Product Certification Labels

<table>
<thead>
<tr>
<th>Type</th>
<th>ISO Number</th>
<th>What the Label Does</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>ISO 14024</td>
<td>Seal of approval for multi-attribute requirements.</td>
</tr>
<tr>
<td>Type II</td>
<td>ISO 14021</td>
<td>Verifiable single-attribute environmental claims for issues such as energy consumption, emissions, or recycled content. Can be first-party, self-declared manufacturer claims. However, many manufacturers are beginning to seek third-party verification of those claims in response to industry demand.</td>
</tr>
<tr>
<td>Type III</td>
<td>ISO &gt;14025</td>
<td>Comprehensive environmental product disclosure and detailed product information. Similar to an Environmental Product Declaration (EPD).</td>
</tr>
</tbody>
</table>

Resources

EPD Using and Creating EPDs, (http://www.environdec.com/)

International Standards Organization, (http://www.iso.org/iso/home.htm)

Floorscore with SCS, (http://www.scsglobalservices.com/floorscore)
M2.6: Building Materials Health Product Disclosure

1 point

**Performance Approach**

Provide a published Health Product Declaration (HPD) with a disclosure level of 1000ppm for at least 20 permanently installed products from at least five different manufacturers in accordance with the Health Product Declaration Standard Version 1.0.

Products with an HPD with full disclosure of known hazards will count as two products for these calculations.

Or

**Prescriptive Approach**

Specify that a published Health Product Declaration (HPD) with a disclosure level of 1000ppm must be provided for 50% (by cost) of one of the following major interior finish or structural materials. Products with an HPD with full disclosure of known hazards may be selected and counted as double value.

**Adhesives & Sealants**

- Paints & Coatings
- Flooring Systems
- Composite Wood and Agrifiber Products
- Furniture & Furnishings
- Ceiling & Wall Systems

The Health Product Declaration Open Standard v1.0 is a streamlined methodology for reporting language to enable transparent disclosure of the content in a material and the related health information. The standard was developed by the Health Product Declaration Collaborative. The standard is a free resource for manufacturers to use as a reporting tool.

Designers and specifiers may collect the completed HPD Template directly from the manufacturer. The Health Product Declaration does not need to be third-party certified to be applicable to this criterion. Third-party certification of a Health Product Declaration is not required at this time.

**Definitions:**

“Published” means the HPD is publicly accessible – either published by the manufacturer on the manufacturer website with other technical data and/or in a registry such as Pharos provides.

“Complete” means the HPD has been completed as required in the HPD Standard. See the “Checklist for a Complete HPD” in the Health Product Declaration Standard v1.0.
“Full Disclosure of Intentional Ingredients” means the HPD discloses the identity of each ingredient added to the product by the manufacturer or suppliers that exist in the product as delivered for final use.

“Full Disclosure of Known Hazards” means the HPD discloses the role and hazard traits of each ingredient but may mask the identity of certain ingredients that are restricted by IP and/or trade secret policies.

“Full disclosure of intentional ingredients” means the HPD discloses the role and hazard traits of every ingredient in the product. This is a much higher standard that is not required by this credit, but its use is encouraged where appropriate.

Resources

Health Product Declaration Collaborative, (http://hpdcollaborative.org/)

Declare, (https://access.living-future.org/declare-products)

Cradle to Cradle Products Innovation Institute, (http://www.c2ccertified.org/)

Green Screen For Safer Chemicals, (http://www.greenscreenchemicals.org/)
Energy

Energy Efficiency

**Purpose:** To reduce the amount of energy used to operate the building through better building design and more efficient systems and equipment. Reducing the building load and energy use reduces the associated costs and environmental impacts.

### E1.0: Minimum Energy Performance

<table>
<thead>
<tr>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>The school design and construction must meet the currently adopted edition of the <strong>Washington State Energy Code (WSEC) Commercial Provisions.</strong> WSEC compliance will be without exception, specifically all thermal envelope assemblies will comply prescriptively, HVAC &amp; Plumbing equipment will meet WSEC Table efficiencies, and Lighting will not exceed WSEC space-by-space lighting power allowance (LPA). Additionally, local jurisdiction requirements beyond WSEC minimum will also be met.</td>
</tr>
</tbody>
</table>

* * Use the edition of the Washington State Energy Code that is in effect at the time the project is permitted. As of July 1, 2016 the 2015 WSEC has been adopted by all jurisdictions. Within the City of Seattle meet the Seattle Energy Code, Commercial Provisions in effect at the time of permit (as of the date of this addendum the latest version of the updated code was in Final Draft, dated October 10, 2016) **

Energy-efficient schools save money while conserving non-renewable energy resources and reducing atmospheric emissions of pollutants and greenhouse gases. The Washington State Energy Code has been a major factor in advancing energy efficiency in schools. Support for the WSEC is provided by the Northwest Energy Efficiency Council (NEEC).

Most energy utilities (power and natural gas), offer significant financial incentive in the form of rebates, grants, and technical support to design, construct, and commission facilities that exceed WSEC “code minimum”.

While the WSEC is considered an aggressive baseline for energy efficient construction practices, there are numerous cost-effective, practical, and straightforward measures that can reduce energy use by 10-50% from the WSEC. Refer to E1.1 for strategies to achieve this.

Whether you are meeting the code or going beyond the code, it will be important to ensure the energy efficiency designed in is actually achieved in practice. Commissioning, maintenance, and training are vitally important to the performance of the school and its systems. Enhanced Commissioning (E-Cx) ensures that operability and maintenance are considered in the design of the building, and after construction systems operate to their design intent. Once built, no building can perform optimally without maintenance. In addition, training is critically important to ensure that teachers and facilities staff understand how to operate and maintain building systems. When turnover occurs, appropriate documentation must be on hand to ensure that new staff is properly trained.
Where local jurisdiction energy efficiency requirements exceed WSEC, credit may be taken under E1.1 for performance beyond state code minimums; for example, the Seattle Energy Code (SEC) exceeds WSEC.

**Resources**

The Northwest Energy Efficiency Council (NEEC) provides support for the Washington Non-Residential Energy Code and offers compliance forms (Excel and pdf) and information on obtaining a comprehensive Technical Reference Manual, [http://www.neec.net/energy-codes](http://www.neec.net/energy-codes)


Better Bricks, tools, and resources for energy efficiency, [http://www.betterbricks.com/](http://www.betterbricks.com/)


WA State DES, [http://des.wa.gov/services/facilities/Energy/Pages/default.aspx](http://des.wa.gov/services/facilities/Energy/Pages/default.aspx)

## E1.1: Superior Energy Performance

<table>
<thead>
<tr>
<th>Percentage Range</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5–9%</td>
<td>4 points</td>
</tr>
<tr>
<td>10–13%</td>
<td>5 points</td>
</tr>
<tr>
<td>14–16%</td>
<td>6 points</td>
</tr>
<tr>
<td>17–18%</td>
<td>7 points</td>
</tr>
<tr>
<td>19–20%</td>
<td>8 points</td>
</tr>
<tr>
<td>21–22%</td>
<td>9 points</td>
</tr>
<tr>
<td>23–24%</td>
<td>10 points</td>
</tr>
<tr>
<td>25–27%</td>
<td>11 points</td>
</tr>
<tr>
<td>28–30%</td>
<td>12 points</td>
</tr>
<tr>
<td>31–33%</td>
<td>13 points</td>
</tr>
<tr>
<td>34–35%</td>
<td>14 points</td>
</tr>
<tr>
<td>36–37%</td>
<td>15 points</td>
</tr>
<tr>
<td>38–39%</td>
<td>16 points</td>
</tr>
<tr>
<td>40% or more</td>
<td>20 points</td>
</tr>
</tbody>
</table>

**E1.1.1 Superior Energy Performance.**

Reduce the site energy use of the proposed design to be below what is required by the current **WSEC Commercial Provisions** by increasing energy efficiency through the integrated design of system components. Achieve between a 5% - 40%, or more, **reduction in total net energy use compared to a code-minimum baseline**, for up to 20 points.

The percent below code and the applicable points were developed using the 2015 WSEC standard reference design (SRD), section C407.

**E1.1.2 Superior Energy Performance: Energy Star Design**

Use the EPA Portfolio Manager Target Finder to demonstrate the energy design intent achieves an Energy Star score of 75 or greater.

Investments in energy efficiency measures provide good long-term value, and net reductions of 5% to 50% are feasible. When energy efficiency goals are established in the Owner’s Project Requirements (OPR), and followed in the design process, a wide array of measures can reduce energy use. The amount of energy saved depends on local climate, the quality of the design, whether the interactions between the building systems have been optimized, the extent of...
commissioning, and the amount of training given to teachers and facilities staff. Consider opportunities throughout the school in the following areas:

**Integrated Design**
Select site, building shape, orientation, massing, fenestration, and materials including color, plus landscaping, to minimize energy loads, then down-size mechanical, electrical and plumbing (MEP) systems and equipment accordingly. Integrated design measures can increase the energy efficiency of the school through better collaboration. Perform an annual energy analysis comparing a code minimum baseline design to the proposed system design.

**Daylighting**
Optimize daylighting to reduce reliance on electric lighting during daylight hours. Use daylighting controls designed to dim or turn off electric lights when sufficient daylight is available. Remember to minimize glare and eliminate direct beam light in the classroom.

**HVAC Systems**
Use high efficiency equipment, correctly sized for the estimated demands of the facility; use economizers and other controls that optimize system performance. Consider radiant heating and cooling for learning spaces where students spend time on the floor.

**Electric Lighting**
Use high efficiency products, optimize the number of light fixtures in each room, use occupant sensors and other control devices that ensure peak system performance, successfully integrate electric lighting and daylighting strategies. LED technology is now providing cost effective solutions for lighting. These fixtures should be utilized to the extent possible.

**Enclosure**
Ensure that walls, floors, roofs, and windows of the school are as energy efficient as cost-effectively as possible. Energy efficient enclosure can have a greater effect on the total energy than any other solution.

**Plug Loads**
Specify Energy Star and Water Sense appliance, fixtures, and technology systems to reduce “plug load”; train building occupants (staff & students) accordingly.

**Commissioning**
Commissioning is increasingly demanded as more savings are expected through energy conservation measures. Commissioning ensures that operability and maintenance are considered in the design of the building, and after construction, systems operate to their design intent. See Energy Credit 4: Commissioning for more information.

**Resources**
BetterBricks, tools and resources for energy efficiency, (http://www.betterbricks.com/)

Energy Design Resources, (http://www.energydesignresources.com/)

The Northwest Energy Efficiency Council (NEEC) provides support for Washington’s Non-Residential Energy Code, (http://www.neec.net/energy-codes), and provides compliance forms

Building Operator Certification includes facilities’ operator training that has been proven to result in energy savings for school districts in the state. More information at: (www.TheBOC.info)


Architecture 2030 manages The 2030 Challenge program, (http://architecture2030.org/)

International Living Future Institute manages the Living Building Challenge program, (http://living-future.org/ilfi)

Utilities – visit your local energy utility website or call their energy efficiency assistance team to learn more about financial incentives.
Controls

**Purpose**: To reduce the amount of energy used to operate the building through the use of user-friendly or automatic controls of energy consuming fixtures and equipment. Reducing the building load both reduces the associated costs and environmental impacts of using non-renewable energy sources. It often also serves as an educational function, in that it evidences the District’s value of energy conservation.

All Direct Digital Control (DDC) Systems shall comply with the requirements of the current version of the WSEC. DDC control requirements can be found in the 2015 WSEC under section C403.2.4.12.2.

### E2.0: Daylight-Responsive Controls

<table>
<thead>
<tr>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>In day lit areas, automatic daylight responsive lighting controls will be installed that automatically reduce electrical lighting power in response to available daylight in a day lit area. Controls must be capable of reducing the light output of controlled luminaires, control only luminaires in the day lighted area, and incorporates time-delay circuits.</td>
</tr>
</tbody>
</table>

A combination of dimming ballasts and daylight-sensing automatic controls that is capable of automatically reducing the power of general lighting in the day lit zone continuously to less than 15% of rated power at maximum light output.

Or

A combination of multi-level switching and daylight-sensing controls that are capable of reducing the lighting power automatically in response to available daylight. If the control is a switching control, it shall provide at least two control steps per zone and be installed in a manner such that each step provides uniform illumination between 0 and 100%. Each step shall reduce the lighting power in equal increments (plus or minus 10%).

**Exceptions**:

- Day light spaces enclosed by floor to ceiling partitions containing only one luminaire.
- Lighting required by a health or life safety statute, ordinance or regulation, including, but not limited to, emergency lighting.
- Lighting for steps or stairs that require illumination during daylight hours
- Lighting for theatrical purposes, including performances, stage, film production and video.
In addition to providing natural illumination, which is an important aspect of indoor environmental quality, daylitining can be a source of energy savings, potentially reducing the annual lighting budget from 10% to 50%. However, this only occurs when electric lighting is adjusted to account for the illumination daylitining provides.

This can be done manually. However, more institutions are finding it more reliable to use automatic daylitining controls. These regulate the level of illumination provided by electric lights in response to the presence of daylit. They usually consist of a sensing device that monitors either the total light level in the space or the available daylit level at the daylit opening, and a control module that switches or dims the electric lighting to maintain the required illumination.

**Resources**

(http://www.newbuildings.org/)

BetterBricks, (http://www.betterbricks.com/)

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**E2.1: HVAC Controls and Operable Windows**

| 1 point | Install controls/devices on HVAC systems that are responsive to operable windows or doors when opened. |

The Protocol recognizes the benefit of providing natural ventilation (IEQ3.7) and user control (IEQ6.1) by providing each classroom with an operable window. However, care must be taken to avoid energy penalties due to exterior windows or doors being opened while HVAC systems are operating. Controls or devices on HVAC systems that respond when operable windows or doors are opened can prevent energy penalties and support the energy savings associated with a naturally ventilated space.

**Controls should be installed to set back HVAC systems to unoccupied settings when windows and doors are opened for extended periods**. The controls should be set so that normal use of doors does not cause HVAC systems to cycle on and off unnecessarily. The controls should not turn off ventilation fans, but adjust the thermostat settings to unoccupied levels or what is commonly called the “night set-back” when windows and doors are opened. Adequate amounts of ventilation must be supplied to the classroom when occupied. Insufficient ventilation can have adverse health effects on students, teachers, and other staff members.

**Consider integrating security and HVAC controls** with regard to door and window position monitoring.
See Credit IEQ6.2 (user control of temperature). Overall system as detailed in this credit may not account for CO₂ sensors that may provide additional energy savings. Design (and energy use calculations) should consider the impact of multiple strategies when proposed.

Resources


<table>
<thead>
<tr>
<th>E2.2: Occupancy Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 point</strong></td>
</tr>
<tr>
<td>Provide occupancy sensor-based controls for lighting beyond energy code minimum.</td>
</tr>
<tr>
<td><strong>1 point</strong></td>
</tr>
<tr>
<td>Provide occupancy sensor-based controls for HVAC beyond energy code minimum.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E2.3: Demand Control Ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 point</strong></td>
</tr>
<tr>
<td>Provide CO₂ sensor-based demand control ventilation (DVC) for spaces not required by WSEC.</td>
</tr>
</tbody>
</table>
Alternative Sources of Energy

**Purpose:** To increase the amount of renewable energy used in place of finite and polluting non-renewable energy sources. On-site sources of energy reduce transmission losses and also serve an educational function.

### E3.1: On-Site Renewable Energy

<table>
<thead>
<tr>
<th>Renewable Ready</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 point</td>
<td>5%</td>
</tr>
<tr>
<td>2 points</td>
<td>7.5%</td>
</tr>
<tr>
<td>3 points</td>
<td>10%</td>
</tr>
<tr>
<td>4 points</td>
<td>15%</td>
</tr>
</tbody>
</table>

Use on-site renewable energy for a portion of a school’s energy use. Point levels correspond to the percentage of net energy use supplied by this method. **One point is available for “solar ready” design and construction that meets the requirements of the 2015 International Building Code with Washington State Amendments, Appendix N.**

Employ on-site renewable energy technologies to supply part of the building energy. Renewable Energy Systems include:

- Photovoltaic
- Wind
- Geothermal
- Fuel cells utilizing biogas
- Micro-hydro
- Solar thermal
- 100% biodiesel or ethanol
- Biomass

On-site renewable energy has many benefits. Renewable sources, such as photovoltaic, wind turbines, and geothermal sources use the sun, air, and earth instead of non-renewable, polluting sources, such as coal or natural gas. Fuel cells can be powered by (renewable) biogas as well as non-renewable natural gas.

**Sources covered under this credit must be located at the school site,** eliminating the environmental impacts and transmission losses associated with remote sources. On-site sources can become effective components of school curriculums, educating students on a wide variety of energy and science issues.

The costs and feasibility of on-site renewable energy and distributed generation vary significantly with location, technology, site-specific constraints, and maintenance concerns.
Sources should be installed using net metering. Net metering attaches the on-site system to the electrical power grid. When the school produces more energy than it uses, the excess energy is traded back to the local energy provider. In essence, this “spins the meter backwards” and is vital to the cost-effectiveness of the system. In general, facilities with on-site renewable energy and net metering can only receive credit up to the amount of energy they use. In other words, buildings can only “zero-out” their utility bill and not make a profit from selling their excess energy. Check with your utility to determine if they participate in net metering and how they would account for your building’s net contribution to the grid.

Renewable ready must provide pathways, spaces, and structure to support future retrofit of renewable energy systems and equipment, for example, large roof areas sloping south with structure capacity for future photovoltaic array, electrical conduit from this area to electrical room with space for PV system inverters and controls, and space in main switchboard for net-metering equipment.

Credit Calculation:

- Use the energy modeling from E1.0 and E1.1 for the school building systems to estimate the amount of energy used annually.
- Calculate the amount of energy the particular on-site renewable system can supply annually,
- Calculate the net amount of energy provided by renewable energy.
E3.2: Green Power Contract

<table>
<thead>
<tr>
<th>1 point (50%)</th>
<th>Provide at least 50% of the building’s annual electricity (regulated power) from renewable sources by engaging in a minimum two-year contract to purchase green power as defined by the local utility or a recognized green power provider.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 points (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Using renewable energy reduces environmental impacts associated with production and consumption of conventional fuels, including air and water pollution, and natural resource destruction. Perhaps more directly relevant to school districts, these environmental impacts have associated economic and human health impacts for our general population, and when located near schools, for our students.

An alternative to producing renewable energy on-site (see WSSP Credit E3.1) and still support the use of renewable energy in Washington State is to purchase it through a utility green pricing program, or as renewable energy certificates available through certificate marketers listed by the U.S. Department of Energy’s Green Power Network (See Resources).

Chapter 19.29A.090 RCW - Voluntary option to purchase qualified alternative energy sources requires electric utilities to offer customers renewable “green” power options.

Resources


### E3.3: Distributed Generation

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>1</td>
</tr>
<tr>
<td>7.5%</td>
<td>2</td>
</tr>
<tr>
<td>10%</td>
<td>3</td>
</tr>
</tbody>
</table>

Use on-site distributed generation (cogeneration) for a portion of a school’s energy use. Point levels correspond to the percentage of net energy use supplied by this method. Systems must include waste heat recovery, unless greater than 90% efficient.

#### Distributed Generation Systems:
- Fuel cells utilizing non-renewable fuels and waste heat recovery.
- Micro-turbine utilizing waste heat recovery.
- Diesel generator utilizing waste heat recovery.

The distributed generation systems listed above use non-renewable (fossil) fuels. However, their improved efficiencies and technologies produce fewer air pollutants than traditional, centrally located coal or natural gas plants. Fuel cells can be powered by either renewable (biogas) or non-renewable (natural gas) sources, see Credit E3.1.

**Sources covered under this credit must be located at the school site**, eliminating the environmental impacts and transmission losses associated with remote sources. On-site sources can become very effective components of school curriculums, educating students on a wide variety of energy and science issues.

The costs and feasibility of distributed generation sources vary significantly with location, technology, site-specific constraints, and maintenance concerns.

**To earn points with this credit:**
- Model the school building systems (no plug loads) to estimate the amount of energy used annually.
- Calculate the amount of energy the particular on-site distributed generation system can supply annually.
- Calculate the net amount of energy provided by distributed generation.
Commissioning

**Purpose:** To optimize the building’s performance by verifying that fundamental building elements and systems are designed, installed, and operate as intended by the design and the owners’ project requirements.

### E4.0: Fundamental Commissioning

<table>
<thead>
<tr>
<th>Required</th>
<th>The design team and the school district will comply with requirements outlined in WSEC and WAC 392-343-080 regarding:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Cx Plan</td>
</tr>
<tr>
<td></td>
<td>• Systems Balancing (TAB)</td>
</tr>
<tr>
<td></td>
<td>• Functional Testing (FT)</td>
</tr>
<tr>
<td></td>
<td>• Supporting Documents (system documentation, record documents, and training)</td>
</tr>
<tr>
<td></td>
<td>• Cx Report</td>
</tr>
<tr>
<td></td>
<td>• <strong>Systems Operation Training</strong></td>
</tr>
</tbody>
</table>

And

The Owner will develop the Owner’s Project Requirements (OPR) and the Design Team will develop the Basis of Design (BOD) documents.

- New buildings, additions, renovations, alterations and modernizations shall comply with RCW 39.35D for commissioning, when applicable. The provisions in the WSEC take precedence over the bulleted items listed below.

- Schools are encouraged to follow the ASHRAE Guideline 0 three-step process: 1) Workshop, 2) Draft OPR, and 3) OPR Approval.

- **Drawings:** Construction documents will require that within 90 days after the date of system completion, record drawings of the actual installation be provided to the building owner. However, WSEC allows a maximum of 180 days.

- Record drawings will include, as a minimum, the location and performance data on each piece of equipment; general configuration of duct and pipe distribution system, including sizes; and the terminal air and water design flow rates.

- **Manuals:** Construction documents will require that an operating manual and a maintenance manual be provided to the building owner. The manuals will be in accordance with industry accepted standards and will include, at a minimum, the following:
  - Submittal data includes equipment size and selected options for each piece of equipment requiring maintenance.
- Operation and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions will be clearly identified.

- Names and addresses of at least one service agency.

- HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined set points will be permanently recorded on control drawings at control devices, or, for digital control systems, in programming comments.

- A complete narrative of how each system is intended to operate including suggested set points.

**Systems Operation Training.**

- Training of the maintenance staff for equipment included in the manuals shall comply with requirements in WSEC, at a minimum.

**System Balancing:** Construction documents will require that all HVAC systems be balanced in accordance with generally accepted engineering standards. Air and water flow rates will be measured and adjusted to deliver final flow rates within 10% of design rates.

- Air System Balancing: Air systems will be balanced in a manner to first minimize throttling losses. For fans with system power of greater than 1 hp, fan speed will be adjusted to meet design flow conditions.

- Hydronic System Balancing: Hydronic systems will be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller will be trimmed or pump speed will be adjusted to meet design flow conditions. Each hydronic system will have either the ability to measure pressure across the pump, or have test ports at each side of each pump.

**Systems Commissioning:** Commissioning will include documentation, reports, and acceptance as specified by Washington’s applicable energy code and WAC 392-343-080, and the commissioning agent must be a professional agent or authority not contractually or otherwise associated with the project design team or contractor. In addition, per WAC 392-344-067, the commissioning program will include the Essential Attributes defined by the Building Commissioning Association (BCA).

**Prepare a final commissioning report following** the Building Commissioning Final Report Guidelines available from NEEC, or comparative format. Review with the school district, verifying that systems are operational to the Owner’s Project Requirements (OPR) and Basis of Design (BOD) and work is complete. Follow applicable energy code requirements for final report.

The Building Commissioning Association (BCA) provides templates and examples for the OPR and BOD documents.

**Resources**


Building Commissioning Association, (www.bcxa.org)
## E4.1: Enhanced Commissioning

Three points are possible in Enhanced Commissioning. E4.0 must be achieved first before going to E4.1.

<table>
<thead>
<tr>
<th>Point</th>
<th><strong>E4.1.1 Conduct a Commissioning Design Review</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The Independent Commissioning Authority (CxA) required by E4.0 and State regulations as referenced in E4.0 will:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Conduct a commissioning design review</strong> of the Owner’s Project Requirements (OPR), Basis of Design (BOD), and design documents prior to mid-construction documents phase and back-check the review comments in the subsequent design submission.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Review contractor submittals</strong> applicable to systems being commissioned for compliance with OPR and BOD. This review will be concurrent with A/E reviews and submitted to the design team and owner.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Point</th>
<th><strong>E4.1.2 Verification and Assurances</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The Commissioning Authority (CxA) will:</td>
</tr>
<tr>
<td></td>
<td>• Verify functional and maintenance training of O&amp;M Staff, and verify that such training is completed in the Final Commissioning Report.</td>
</tr>
<tr>
<td></td>
<td>• Verify that training of building occupants regarding optimal operation of commissioned systems they interface with has been completed.</td>
</tr>
<tr>
<td></td>
<td>• Assure, through contractual arrangements, involvement by the CxA in reviewing building operation after one academic year of building use with O&amp;M staff and occupants. Include a plan for resolving outstanding commissioning-related issues.</td>
</tr>
<tr>
<td></td>
<td>• Conduct seasonal testing.</td>
</tr>
<tr>
<td></td>
<td>• Verify warranty documentation from equipment suppliers and sub-contractors; including extended warranty requirements, if any.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Point</th>
<th><strong>E4.1.3 Develop a Systems Manual</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Develop a Systems Manual to provide operations personnel with a tool that describes how the systems were developed, installed, and tested. The manual will be prepared in accordance with <strong>ASHRAE Standard 202 Appendix L</strong>. The intent of the manual is to allow operations personnel to maintain the peak performance of the commissioned system:</td>
</tr>
<tr>
<td></td>
<td>• The manual will be focused and arranged according to commissioned systems.</td>
</tr>
<tr>
<td></td>
<td>• The manual will contain the necessary calibration data and forms to allow operations personnel to verify and test the systems at peak performance.</td>
</tr>
</tbody>
</table>
Buildings, even simple structures, are complex systems of electrical, mechanical, and structural components. High performance buildings are healthy, efficient, environmentally sensitive structures whose performance can be significantly affected if the building has not been designed following the district’s intent or constructed according to the designer’s specifications. Commissioning is a rigorous quality assurance program administered by a knowledgeable third party that ensures the building performs as expected.

This credit ensures the design is developed in a way that meets the objectives of the building program including, in particular, its mechanical systems and energy requirements. However, it is important to coordinate the commissioning program with the overall environmental goals of the project. The WSSP highly recommends a facilitated integrated design workshop (See Planning, Education, Operations category) BEFORE the schematic design process has concluded. This credit assumes that the CxA either participates in the integrated design workshop or is familiar with the results of the workshop.

**Resources**

ASHRAE Standard 202, ([ashrae.org](http://ashrae.org))

Commissioning Report Templates are available for free, ([http://www.bcxa.org/resources/templates/index.htm](http://www.bcxa.org/resources/templates/index.htm))

Building Commissioning Association, ([www.bcxa.org](http://www.bcxa.org))

Management

Purpose: To optimize the building’s performance and comfort by monitoring and managing systems that deliver heating, cooling, ventilation, lighting, and other services. The credit requirements and points are based on Washington State Energy Code (WSEC) Commercial Provisions at the time of this document release.

E5.1: Energy Management Systems

<table>
<thead>
<tr>
<th>Required</th>
<th>Install an energy management system (EMS) to monitor each energy source and end-use per 2015 WSEC. Required per C409.1 for new buildings and additions with more than 50,000 sq. ft. gross conditioned floor area, for all energy sources (with exceptions), and sub-metered for HVAC and domestic hot water. Additionally, a data acquisition and display system is required. See 2015 WSEC for provisions that apply to existing building upgrades (modernizations and additions).</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 point</td>
<td>Install an EMS that meets the scope of C409 2015 WSEC on a project that does not meet the required square foot threshold.</td>
</tr>
<tr>
<td>Three additional points are available:</td>
<td>• The EMS also monitors the equipment energy use (plug loads), or lighting systems, throughout the school.</td>
</tr>
<tr>
<td>1 point</td>
<td>• An energy dashboard, integrated with the EMS, is in the school’s main entry lobby or other highly visible public location.</td>
</tr>
<tr>
<td>1 point</td>
<td>• The school prepares Measurement &amp; Verification Plan (M&amp;V) per IPMVP standards; see PEO category for execution of this Plan.</td>
</tr>
</tbody>
</table>

Energy management systems (EMS) are typically installed in new schools. However, care must be taken to specify and install an appropriate system for the district and maintenance staff. An appropriate EMS is the simplest system that adequately addresses the school’s needs.

Increased complexity does not always mean increased value for the district. EMS systems can potentially save significant energy, but only if the staff understands how to operate it. Proper training of district staff is critical, and high turnover rates challenge school districts to keep training up-to-date.

Control systems design will include:

1. Sensors should be provided as follows:
   a) Sensors to monitor and trend at the operator interface controlled variables. Control variables may include air and/or water flow, temperature, pressure, CO₂, and pump or fan speed.
   b) Sensors to trend outdoor air temperature.
   c) In marine and humid climates, sensors to trend humidity.
   d) Sensors to monitor and trend equipment status for all equipment with motors greater than 1/2 hp.
e) Indication and trending of damper and valve commanded position.
f) Sensors to monitor building electrical and natural gas demand and consumption.
g) Sensors to monitor indoor and outdoor CO₂.

Relevant multiplexed data from microprocessors located in chillers, boilers, humidifiers, VAV box controllers, variable speed drives, and other HVAC equipment with multiplexing capabilities may be used in lieu of specifying separate sensors.

Wells and other ports will be specified for the installation of calibration devices to facilitate calibration of sensors.

Exceptions:
- Unit heaters, cabinet heaters, radiation and convectors located in vestibules, storage rooms, janitor closets, and other unoccupied areas.
- Natural gas demand sensors not required on buildings less than 50,000 sf.

2. **Points Matrix**: A points matrix, including all hardwired input and output devices connected to the automation system, all set points, upper and lower control limits.

3. **Trend Capabilities**: Trend requirements including a trend point list and preprogrammed sample of point (performed by controls contractor), sample rate, storage interval, upload interval, custom trend abilities, alarms, and automated trend data review and notification (automated diagnostics).

4. **System Architecture**: A system architecture capable of allowing sampling of these points to facilitate building commissioning and diagnostics without significantly affecting system performance.

5. **Data Storage**: A data storage system with adequate capacity to record trend data for use by building operators. Data export requirements must facilitate user-friendly data access and manipulation.

6. **Operator Interface**: An operator interface designed for remote/web access, monitoring requirements, trend-log reporting and diagnosing building problems through a user-friendly interface. This includes providing a visual (non-text based) operations and reporting interface to facilitate rapid system assessment that utilizes color coding, diagrams of floor plans and graphing capabilities.

Monitoring capabilities should allow for comparison between various types of building loads throughout all spaces of the school (including portables). This information is valuable and can be used to manage and optimize energy use.

Energy savings can result by optimizing a building’s ventilation control through effective air quality monitoring. New systems are now available that integrate indoor air quality monitoring with your building management system.

Consider incorporating a dashboard for real-time energy monitoring. Incorporate the dashboard with educational opportunities in PEO2.1
# Indoor Environmental Quality

## Daylighting & Views

**Purpose:** Improve student performance and well-being through quality daylighting designs that minimize glare and direct sunlight penetration, and integrate views in day lit spaces. Provide a connection between indoor spaces and the outdoor environment through the introduction of daylight and views into the occupied areas of the building. Daylighting is fundamentally important to high performance design, from the standpoint of student and teacher preference, and should be the primary source of illumination in classrooms.

### IEQ1.1: Daylighting Classrooms

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>1 point</td>
</tr>
<tr>
<td>50%</td>
<td>2 points</td>
</tr>
<tr>
<td>75%</td>
<td>3 points</td>
</tr>
<tr>
<td>100%</td>
<td>4 points</td>
</tr>
</tbody>
</table>

#### IEQ1.1 Daylighting:

- **1 Point** 25% of classrooms are day lit
- **2 Points** 50% of classrooms are day lit
- **3 Points** 75% of classrooms are day lit
- **4 Points** 100% of classrooms are day lit

**Note:** Laboratories and computer rooms are excluded from the percentage calculations.

#### Option 1: Simulation – Single Point in Time Illuminance:

The following requirements must be satisfied in order for a classroom to qualify as day lit.

- Achieve an average horizontal daylight illumination in each qualifying classroom of not less than 25 foot-candles (250 lux) for a clear sunny day at 1:00 pm Daylight Savings Time on March 21. Illumination will be calculated at a work plane located 30 in. above the floor.

- Achieve contrast ratio (maximum to minimum) at the work plane (from daylighting) not greater than 8:1, determined at grid points spaced no greater than 2 ft. by 2 ft., for a clear sunny day at 1:00 pm on March 21.

- At a minimum, direct sun can be eliminated for day lit spaces with the use of operable shading devices (see IEQ 1.3 for additional shading opportunities).

Or
Option 2: Simulation – Spatial Daylight Autonomy:

- Demonstrate through annual computer simulations that spatial daylight autonomy (sDA) of at least 55% is achieved in each qualifying classroom. Use classroom occupied floor area.
- Demonstrate through annual simulations that annual sunlight exposure (ASE) of no more than 10% is achieved. Use the regularly occupied classroom area that is day lit per SDA simulations.
- The sDA and ASE calculation grids should be no more than 2 feet square and laid out across the regularly occupied area at a work plane height of 30 inches above finished floor. Use an hourly time-step analysis based on typical meteorological year data, or an equivalent, for the nearest available weather station. Include any permanent interior obstructions. Movable furniture and partitions may be excluded.

Design teams may select one of two simulation options:

Option 1: Single Point in Time Illuminance Calculations or Option 2: Spatial Daylight Autonomy Calculations for the requirements may be made with either a computer simulation tool or with a physical model.

Computer Simulation Tool

Computer simulation tools include Lumen Micro, AGI32, Radiance, Lightscape, SPOT, or Daysim. A minimum analysis grid of 2 ft. by 2 ft. will be used. The grid will be positioned so no analysis points are located closer than 3 ft. to a glazed wall. The average illumination and contract ratio calculations should then be performed for the equinox in accordance with both requirements.

Physical Model

If a physical model is used, the model should be constructed at a minimum scale of ½ in. equals one foot and care should be taken to use interior materials that have the same reflectance as the materials specified for the classroom. Glass or other material should be used in the openings that have the same light transmission as the fenestration proposed for the classroom. The model will be positioned outdoors on a sunny day such that the solar angles for noon on the equinox are achieved.

Daylighting in classrooms must be uniformly distributed, with no direct-beam sunlight penetration and minimal glare. Fixed or operable means of sun-glare control, such as roll down perforated shades for the view windows and horizontal louvered blinds for the upper daylight windows, must be specified for the period mid-September through mid-March. There are several daylighting labs in the region, including two in Washington (Seattle and Spokane) that provide daylighting analysis services.
Resources


Guide for Daylighting Schools,  
(http://www.lrc.rpi.edu/programs/daylighting/pdf/guidelines.pdf)

Illuminating Engineering Society (IES) LM -83-12,  
(http://www.techstreet.com/products/1853773)
IEQ1.2: Permanent Shading

| Required   | Comply with the minimum exterior sun control requirements in WAC 246-366-050 (9), if applicable. Eliminate direct sun from day lit spaces (other than instructional areas, assembly rooms and meeting rooms covered by the WAC) from March 21st until September 21st through the use of permanent shading devices. |

Install permanent shading devices such as various louvers, fins, or light shelves to eliminate direct sun for day lit spaces. The period for complete shading of direct sun is from March 21st until September 21st, from 9 a.m. to 3 p.m., adjusting for daylight savings time.

IEQ1.3: Outdoor View Windows

| Required   | Comply with the minimum outdoor view window requirements in WAC 246-366-050 (8). Provide a direct line of sight to vision glazing from 90% of critical task areas and office spaces, not including copy rooms, storage areas, mechanical, laundry and other low occupancy support areas. To qualify, a space will have view glazing equal to or greater than 7% of the floor area. View glazing will be transparent, but not translucent, and only include window area above 2.5 ft. or below 7.5 ft. from the floor. |

Resources

Lighting Design Lab in Seattle, (https://www.lightingdesignlab.com/)

Spokane Daylighting Lab, Operated by Washington State University, Interdisciplinary Design Institute


Electric Lighting Quality

**Purpose:** Provide an artificial lighting environment that promotes effective learning, teaching, and occupant health. K–12 classrooms must be adaptable to support a wide variety of educational media and learning activities.

<table>
<thead>
<tr>
<th>IQE2.1: Electric Lighting Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required</strong></td>
</tr>
<tr>
<td>School spaces will be designed so end of lamp life conditions meet the minimum average illumination levels as identified in WAC 246-366-120.</td>
</tr>
<tr>
<td>Contrast should be minimized with a focus on uniformity in classroom spaces.</td>
</tr>
<tr>
<td>Brightness and glare should be minimized to ensure a comfortable learning environment. Luminaires will be used with a luminance less than 2,500 cd/m² between 45° and 90° from nadir, excluding whiteboard wall wash luminaires.</td>
</tr>
<tr>
<td>Luminaires within 10 feet of the teaching wall will be separately switched from the other general luminaires for AV mode. Luminaires (with or without specific luminaires aimed at the whiteboards) will provide an average illumination of 15 footcandles on the whiteboards with an average: minimum uniformity less than 3:1.</td>
</tr>
<tr>
<td>Lamp sources will have a minimum CRI/ CQS of 80. The lighting systems should operate in general illumination mode and AV mode.</td>
</tr>
<tr>
<td>In <strong>general illumination</strong> mode, achieve an average illumination at the working plane complying with WAC 246-366-120 with a minimum of 20 footcandles (for general instructional spaces) and 35 footcandles (for special instructional spaces) at any point more than 3 feet from any wall.</td>
</tr>
<tr>
<td>In <strong>AV</strong> mode, achieve an average illumination at the working plane of 33% to 66% of the general illumination footcandle level for any point in the room greater than 3 feet from the side walls, 10 feet from the front wall, and 6 feet from the back wall. Limit vertical illumination on the projection screen to no more than 7 footcandles at any point on the screen.</td>
</tr>
<tr>
<td>The lighting system should be designed with flexibility in mind and allow the users to fully control the lighting level within the space.</td>
</tr>
<tr>
<td>After meeting all requirements above, dim all luminaires in the classrooms, excluding whiteboard luminaires. Provide switches that allow for manual dimming below the levels set by the photocells based on natural lighting entering the space.</td>
</tr>
<tr>
<td>After meeting all requirements above, provide a lighting system that is designed to change the color of the luminaires (approximately 3,000 K – 5,000 K) based on the respective color of the sunlight throughout the day. (Systems may be called tunable white, circadian rhythm, human-centric lighting, etc.) System may have the ability to have a temporary override (up to 60 minutes) for “calm” (3,000 K) and/ or “test” (5,000 K) settings.</td>
</tr>
</tbody>
</table>
The more that teachers teach and students learn by the glow of computers and video screens, the more critical the need for high-quality, adjustable-level lighting. The quality and quantity of light directly affect learning performance and the visual comfort of both student and instructor.

Care must be taken to integrate the daylight so that electric lighting is reduced or turned off when natural light levels are adequate. **IEQ6.2: User Controls** is highly recommended as a complementary action. **E2.0: Daylight Responsive Controls** is an automated option. Sensors must be placed correctly to read the available daylight in the space.

A lighting computer program will be used to determine the performance characteristics of the electric lighting system in typical classrooms. Minimum required calculations will include point-by-point analysis of horizontal illumination levels at desk height in both modes, vertical illumination levels of the teaching wall in general lighting mode, and vertical ambient illumination on the projection screen in AV mode. Calculations must be carefully set up to analyze only the specific tasks or zones as defined in the requirement. Use of a lighting analysis program employing radiosity and/or ray tracing is necessary. Some acceptable software packages include Lumen Micro 2000, Lumen Designer, AGI32, Radiance, Desktop Radiance, LightPro, Luxicon, and Visual.

Tunable white/circadian rhythm/human-centric lighting systems have shown an increase in reading speeds of approximately 35%. Testing errors can be reduced by approximately 45%. Classroom hyperactivity can be reduced by approximately 75%. Sick days by staff and students can be reduced. Student energy can be more balanced throughout the day.

**Resources**


Lighting and Human Performance II (free from EPRI), ([http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?Productld=000000000001006415](http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?Productld=000000000001006415))

### Indoor Air Quality

#### IEQ3.0: Minimum Requirements For Ventilation, Filtration, and Moisture Control

<table>
<thead>
<tr>
<th>Required</th>
<th>Permanent Ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comply with ventilation requirements for primary and secondary schools in WAC 246-366-080.</td>
</tr>
<tr>
<td></td>
<td>Meet the performance requirements for ventilation of the Washington State 2015 International Mechanical Code with Washington State Amendments. Section 402 Natural Ventilation and/or Section 403 Mechanical Ventilation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required</th>
<th>Construction Filtration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temporary filters: If permanent air handlers must be used during construction, install filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 at each return air grille as determined by ASHRAE 52.2. Replace all filtration media immediately prior to occupancy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required</th>
<th>Permanent and Construction Moisture Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All surface grades, drainage systems, and HVAC condensate must be designed to prevent the accumulation of water under, in, or near buildings, including portables. Irrigation systems must not spray on buildings.</td>
</tr>
<tr>
<td></td>
<td>In addition, during the Design Development stage of a project, particular emphasis should be made to detailing the building envelope to eliminate the possibility of future moisture infiltration.</td>
</tr>
<tr>
<td></td>
<td>Building materials, especially wood, porous insulation, paper, fabric, and other porous materials must be kept dry before, during, and after installation to prevent the growth of mold and bacteria. Before installation, store all materials in a manner that assures they stay dry. If stored outside, cover building materials with plastic to protect from the rain and other sources of moisture, and keep off of the ground. Immediately discard all water-damaged materials and replace with new, undamaged materials.</td>
</tr>
<tr>
<td></td>
<td>If building envelope components (foundation, framing and/or sheathing) are significantly impacted by moisture during the framing process, mitigation measures to reduce the moisture content to acceptable levels must be implemented prior to installation of insulation, wall cover, and other interior finishes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 point</th>
<th>IEQ 3.0.1 Evaluate Envelope</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employ the services of a professional consultant to evaluate the envelope details of the construction documents and make recommendations to eliminate the possibility of future moisture infiltration. Services will include special inspections during construction to ensure design details are followed.</td>
</tr>
</tbody>
</table>
Reliance on natural ventilation alone, with mechanical support, is not recommended for schools. Natural ventilation in areas with poor outside air quality is not recommended. Additionally, during allergy and pollen season, occupants may require protection from outside air contaminants.

2015 IMC with Washington Amendments Chapter 4 Ventilation addresses the ventilation requirement of a space that is intended to be occupied. Comply with code minimum requirement as the prerequisite requirement. An additional point is offered for having the envelope evaluated for moisture intrusion potential. Refer to the WSEC for ventilation control requirements.

Resources

ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality, (http://www.ashrae.org/)

EPA Creating Healthy Indoor Environments in Schools, access the IAQ Tools for Schools to design a program and find tools for implementation, (http://www.epa.gov/iaq/schools/index.html)


IEQ3.1: Low-Emitting Interior Finishes

1 to 6 points

Receive one point (up to a maximum of six points) for each product, of the following product types, that comply with the listed protocol:

- Interior adhesives and sealants - meet South Coast Air Quality Management District, SCAQMD, Rule 1168
- Concrete sealers – meet South Coast Air Quality Management District, SCAQMD, Rule 1113
- Interior carpet – meet Carpet and Rug Institute Green Label Plus
- Hard surface flooring (sheet vinyl, VCT, linoleum, rubber, cork, hardwood, bamboo, engineered wood, laminate, base and base products, and flooring adhesives) – meet FloorScore or GreenGuard.
- Interior paints and coatings – meet Green Seal GS-11 Standard
- Building insulation - meet Greenguard or contain no added urea-formaldehyde
- Acoustical ceilings and wall panels - meet Greenguard
- All interior composite wood products - contain no added urea-formaldehyde

Designers should request emissions test data from manufacturers to ensure the chemical emissions are within safe levels, or obtain products that have been certified by a third party, or otherwise indicate the applicable standards they meet.

Many manufacturers have developed sample material specifications to identify materials that meet the standards listed above.

Products/materials used to earn points under this credit may not be used to earn points for M2.5.

Resources


SCS Global Services listing FloorScore certified products, (http://www.scsglobalservices.com/floorscore)

Greenguard,  
(http://www.greenguard.org/en/manufacturers/manufacturer_indoorAirQuality.aspx)


SCS Indoor Advantage and Indoor Advantage Gold,  
(http://www.scsglobalservices.com/certified-indoor-air-quality?scscertified=1)
IEQ3.2: Low-Emitting Furniture

| 1 point | 75% or more of the new or newly refurbished/remanufactured student and administrative workstations (desk/table and chair or a desk/chair combination, and individual pieces) are low-VOC-emitting, either Greenguard™ certified or registered. Or 75% or more of the new or newly refurbished/remanufactured student and administrative work stations (desk/table and chair or a desk/chair combination, and individual pieces) emissions meet or are lower than the best practice air emissions standards as established by the US EPA’s Environmental Technology Verification (ETV) test method in a qualified testing laboratory. |

When using the US EPA’s Environmental Technology Verification (ETV) test method, the following emission levels must be reached within seven days of unpacking the product and installation in a building.

**Emission Limits for Furniture Systems:**
- TVOC’s (Total Volatile Organic Compounds) < 0.5 mg/m³
- Formaldehyde <0.05 ppm
- Total Aldehydes <0.1 ppm
- 4-PC (as an odorant) below the limits of detection

**Emission Limits for Office Seating:**
- TVOCs <0.25 mg/m³
- Formaldehyde <0.025 ppm
- Total Aldehydes <0.05 ppm
- 4-PC (as an odorant) below the limits of detection

**Resources**


Greenguard Product Directory, (http://www.greenguard.org)
### 2 points

Design to minimize and control sources of indoor air pollutants.

**At a minimum, meet requirements for protection of indoor air quality outlined in most current Environmental Health and Safety Standards for Primary and Secondary Schools, WAC 246-366.**

Control and trap soil, pollutants, and moisture at building entrances by providing an entry mat system, either permanent (grilled, grated, slotted, absorptive in any combination) or roll-out mats (if maintained under contract or by school staff). Entry mat systems should meet the EPA IAQ Design Tools for Schools specifications, or CA CHPS EQ2.1.2 at all entrances. Length of mats may vary due to entrance (vestibule) design;

**And** where chemical use occurs *(including housekeeping areas, chemical mixing areas)*, use structural deck-to-deck partitions with separate outside exhausting, no air recirculation, and negative pressure;

**And** install range hoods vented to the outside for all cooking appliances (such as stoves and ovens);

**And** install approved fume hoods in lab and preparation spaces for working with chemicals and for demonstrations. Demonstration hoods should be clear (see through) on all sides. All pottery kilns are to be vented to the outside;

**And** all plumbing in areas where hazardous chemicals are being used must be resistant to corrosion and degradation if they were to inadvertently come in contact with those materials;

**And** design to physically isolate activities associated with chemical contaminants from other areas (programs) in the building;

**And** provide dedicated systems (direct exhaust, no return air, room under negative pressure) to contain and remove chemical pollutants at their source;

**And** eliminate or isolate high hazard areas, and design all housekeeping chemical storage and mixing areas (central storage facilities and janitors’ closets) to allow for secure product storage;

**And** design copy/fax/printer/printing rooms, mechanical and electrical rooms, with structural deck-to-deck partitions and dedicated exhaust ventilation systems.

During design, schools may want to utilize the EPA’s IAQ Design Tools for Schools; Controlling Pollutants and Sources to identify sources of pollutants and design the facility to control source contaminants. Design considerations include walk-off mats, air-intake locations, material and furniture selection, hazardous, and dangerous material use and storage, housekeeping, food services, technical programs creating air and water pollutants, among others. If used, maintain
a copy of the EPA’s IAQ checklist for reference when developing the Indoor Air Quality Management Plan. Credit for the IAQ Plan can be taken in PEO3.3.

Other IEQ credits applicable to indoor air quality are IEQ3.0, IEQ 3.1, IEQ3.2, IEQ3.4, IEQ3.5, and IEQ3.6, and PEO3.3.

**Resources**


EPA Creating Healthy Indoor Environments, [http://www.epa.gov/iaq/schools/index.html](http://www.epa.gov/iaq/schools/index.html)


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### IEQ3.4: Ducted HVAC Returns

**1 point**

Install ducted HVAC returns.

The benefit of ducted returns is the ability to control the air flow out of the classroom as well as into the classroom with a ducted supply air system. This allows pressure gradient control: the ability to maintain a slightly positive pressure gradient to outdoors. Plenum returns are easily contaminated with dust and microbial growth.

---

### IEQ3.5: Particle Arrestance Filtration

**1 point**

Filtration media in dedicated ventilation air HVAC equipment, serving all occupied areas, will have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2 (Method for Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size).

**1 point**

Provide MERV13 Pleated Filters with minimum 2-inch pleat depth.

Outdoor air pollution, especially particulate matter can be harmful to children’s health. Particulate matter is especially high in areas by highways, roads and industrial manufacturing, and may be higher during certain seasons of the year.

Filters rated at MERV 13 will remove more pollutants from the air used to ventilate the school. Pleated filters, 2-4 inches in depth, rated at MERV 13 and higher will help ensure very good
quality ventilation air by blocking some fine particles and most allergens. Increasing the filter pleat depth reduces the airflow resistance. Cheaper pre-filters can be used to lengthen the life of the higher MERV filters.

MERV 13 filter has the ability to filter 90% of particles 1.0 to 3.0 microns particles in size, which includes lead dust, humidifier dust, mold spores, sand dust, fabric fibers, pollen, and dust mites, and filters some particles (less than 75%) that are 0.3 to 1.0 microns in size, etc. that includes viruses, carbon dust, and fine combustion smoke. Filters with a MERV 14 to 16 rating remove increasing amounts (about 80% up to more than 95%) of particles in the 0.3 to 1.0 micron size range, and thus help reduce exposure to truck and bus emissions from nearby roadways.

### IEQ3.6: Construction IAQ Management

<table>
<thead>
<tr>
<th>1 point</th>
<th>During construction, meet or exceed all of the following minimum requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temporary construction ventilation:</strong></td>
<td>Continuously ventilate with temporary equipment (not the permanent HVAC system) affected spaces during installation of materials that emit volatile organic compounds (VOC) and for at least 72 hours after installation. Ventilate longer than 72 hours if necessary to remove odors. Exhaust the air directly to the outside; do not re-circulate to other enclosed spaces.</td>
</tr>
<tr>
<td><strong>And</strong></td>
<td><strong>Duct protection:</strong> Turn the permanent mechanical system off and protect HVAC supply and return openings from debris generated during dust-producing activities such as drywall installation and finishing. Provide temporary ventilation as needed.</td>
</tr>
<tr>
<td><strong>And</strong></td>
<td><strong>Preconditioning:</strong> Allow products with odors and significant VOC content to off-gas, off-site in a dry, well-ventilated area for at least two weeks prior to delivery to the construction site. Remove products from their containers and packaging to maximize off-gassing of VOCs.</td>
</tr>
<tr>
<td><strong>And</strong></td>
<td><strong>Sequencing:</strong> Install any necessary odorous and/or VOC-emitting products and allow to off-gas prior to installation of porous and fibrous materials.</td>
</tr>
<tr>
<td><strong>And</strong></td>
<td><strong>HEPA vacuuming (carpets and upholstery):</strong> After installation, vacuum carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum as needed and just prior to occupancy.</td>
</tr>
<tr>
<td><strong>And</strong></td>
<td><strong>HEPA duct cleaning:</strong> Prior to installation, inspect ducts for dust and debris. Remove any dust, dirt, and residual oil. Prior to substantial completion and prior to using the permanent mechanical system, inspect the ducts again for dust and other debris that may have collected during construction. Immediately remove any dust using a HEPA vacuum. Bid specifications must require that new ducts be pre-cleaned and sealed prior to shipping to the job site.</td>
</tr>
</tbody>
</table>
After Construction select one of the following two options, to be implemented after construction ends and the building has been completely cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and furniture must be installed, and major VOC punch list items must be finished.

**Option 1 Building Flush-out Before Occupancy**

Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot (4267 140 liters of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.

**Option 2 Building Flush-out After Occupancy**

The school may alternatively conduct the flush-out while the building is occupied provided the specified testing occurs prior to building occupancy, followed by flush-out.

Step 1: The square root of the total number of classrooms must be tested for compliance with the following criteria. Any non-compliant rooms must be remedied and re-tested at the same sampling point until they are compliant. Two additional classrooms per non-compliant classroom must also be tested in all items below in the event of non-compliance. Conduct all testing before occupancy with the building ventilation system started at the normal daily start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the test. Conduct testing using protocols consistent with the methods listed in Table 4 below. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use. Demonstrate that contaminants do not exceed the concentration levels listed in Table 4.

Step 2: Once tested, classrooms have met compliance in step 1, and concurrent with initial occupancy, the building must be ventilated at a minimum rate of 0.30 cubic foot per minute (cfm) per square foot of outdoor air (1.5 liters per second per square meter of outdoor air) or the design minimum outdoor air rate, whichever is greater. During each day of the flush-out period, ventilation must begin at least three hours before occupancy and continue during occupancy. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outdoor air (4270 liters of outdoor air per square meter) has been delivered to the space.
Table 4: IAQ Testing After Construction Protocols and Contaminant Levels

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Maximum concentration</th>
<th>ASTM and U.S. EPA methods</th>
<th>ISO method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde</td>
<td>27 ppb</td>
<td>ASTM D5197; EPA TO-11 or EPA Compendium Method IP-6</td>
<td>ISO 16000-3</td>
</tr>
</tbody>
</table>
| Particulates (PM10 for all buildings; PM2.5 for buildings in EPA nonattainment areas, or local equivalent) | PM10: 50 micrograms per cubic meter  
PM2.5: 15 micrograms per cubic meter | EPA Compendium Method IP-10                                         | ISO 7708                          |
| Ozone (for buildings in EPA nonattainment areas)                            | 0.075 ppm             | ASTM D5149 - 02                                                     | ISO 13964                         |
| Total volatile organic compounds (TVOCs)                                    | 500 micrograms per cubic meter | EPA TO-1, TO-15, TO-17, or EPA Compendium Method IP-1  
|                                                                             |                       |                                                                    | ISO 16000-6                       |
| Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde | CDPH Standard Method v1.1–2010, Allowable Concentrations, Table 4-1 | ASTM D5197; EPA TO-1, TO-15, TO-17, or EPA Compendium Method IP-1  
|                                                                             |                       |                                                                    | ISO 16000-3, 16000-6              |
| Carbon monoxide (CO)                                                       | 9 ppm; no more than 2 ppm above outdoor levels | EPA Compendium Method IP-3                                         | ISO 4224                          |

Sample Testing Requirement

**Calculate the Square Root**

**Enter:**
- Number of Classrooms: 25

**Output:**
- Square root of the number: 5

Each of the listed construction practices will improve indoor air quality by minimizing the amount of indoor pollutants that are distributed and retained by the surface materials and ventilation systems during construction. Flushing out the building with tempered 100% outside air will help remove indoor pollutants prior to occupancy.

**Resources**

EPA Creating Healthy Indoor Environments in Schools, (http://www.epa.gov/iaq/schools/)

IEQ3.7: Natural Cooling

2 points Design 90% of permanent classroom spaces with natural cooling.

The T, H, or L-shaped floor plans, which allowed the maximum number of windows to provide natural light and ventilation, are still visible in most cities. Sunlight and solar gain are major influences on buildings in mid to late afternoon when students typically are not present. This scheduling circumstance allows designers to minimize solar gains to keep students comfortable in non-air conditioned buildings by properly orienting and shading windows. It is very important to confirm that code-required ventilation levels can be maintained and to verify the ventilation effectiveness in all natural cooled areas. Confirm that no outdoor pollutants (from traffic, industrial sources, or the possible air quality emergencies) eliminate its feasibility.

The selected design should either meet the applicable standards of the most current version of ASHRAE 62.1 Chapter 6 for at least 90% of occupied spaces, or, clearly meet the intent of recommendations set forth in CIBSE AM10.

Additional points for eliminating or reducing air conditioner use can be achieved under E1.1 Energy Performance.

Also see E2.1 HVAC and Operable Window controls, and IEQ6.1 User Control (operable windows).

Air conditioning systems prohibited by this credit include air- and water-source packaged air conditioners or heat pumps. Direct/indirect evaporative systems without compressed refrigerant can be used and still receive this credit.

For natural ventilation, an eight-step process is described by the Carbon Trust in their Good Practice Guide 237: “Natural Ventilation in Non-Domestic Buildings”.

The basic steps set forth in CIBSE AM10 are to:

1) Develop the design brief, with attention to heat loads, future use and cultural factors like dress code.
2) Identify airflow paths, paying attention to season, time of day, and pollutant source control.
3) Identify issues to mitigate (e.g. heat gain, pollutants).
4) Determine ventilation and thermal comfort requirements.
5) Estimate wind pressures.
6) Choose ventilation devices.
7) Size openings, (Chapter 5 of CIBSE, AM10).
8) Check the design. You may use public domain software such as NIST’s CONTAM, Multi-zone Modeling Software, along with LOOPDA, Natural Ventilation Sizing Tool.
Resources


NIST Multizone Modeling Website, (http://www.bfrl.nist.gov/IAQanalysis/applications/iaq.htm)

Acoustics

**Purpose:** Provide the acoustical qualities necessary for good speech communication between students and teachers in classrooms and other learning spaces.

---

**IEQ4.0: Minimum Acoustic Performance**

<table>
<thead>
<tr>
<th>Required</th>
<th>ComPLY with sound control requirements in WAC 246-366-110.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This requirement may not be achieved through design; field testing/inspection is required.</td>
</tr>
<tr>
<td></td>
<td>Maximum unoccupied background noise levels generated from HVAC system noise only in classrooms not to exceed an NC-35, and overall noise levels from all sources of environmental, interior, and ventilation equipment noise not to exceed 45 dB(A) at any student location within the unoccupied classroom (measured as a noise average Leq, where x is thirty seconds or more).</td>
</tr>
<tr>
<td></td>
<td>Maximum (unoccupied) reverberation times at mid-frequencies (500, 1000, and 2000 Hertz) of:</td>
</tr>
<tr>
<td></td>
<td><strong>0.6-seconds</strong> for general classroom spaces 10,000 cubic feet or fewer.</td>
</tr>
<tr>
<td></td>
<td><strong>0.7-seconds</strong> for general classroom spaces greater than 10,000 but fewer than 20,000 cubic feet.</td>
</tr>
<tr>
<td></td>
<td>The maximum noise exposure for students in vocational education and music areas will not exceed the levels specified in WAC 246-366-110, Table 1. These permissible exposure limits protect state employees and students against the health effects of noise exposure. When exposed to sound exceeding those listed in Table 1, feasible administrative or engineering controls will be utilized to limit or reduce exposure to within acceptable limits.</td>
</tr>
</tbody>
</table>

Good acoustical qualities are essential in general classrooms where speech communication is an important part of the learning process. Excessive background noise or reverberation in such spaces interferes with speech communication and thus presents an acoustical barrier to learning. With good classroom acoustics, learning is easier, deeper, more sustained, and less fatiguing. Teaching is more effective and less stressful with good acoustical characteristics in a classroom. There can be more verbal interaction and less repetition between teacher and students when spoken words are clearly understood.

Everyone in a classroom, including teachers, will benefit. Special beneficiaries are young children in early stages of language acquisition and persons with hearing difficulty, second language challenges, speech problems, attention deficit, or other learning disabilities. Conformance with the provisions of this prerequisite will improve the quality of education by removing or significantly reducing any residual acoustical barriers for all students and teachers, including those with communication challenges. Good architectural design practice and
attention to detail throughout the construction or renovation process can ensure conformance to the requirements of this credit.

Compliance with this prerequisite must be determined with the classroom ventilation system and noise generating components, such as compressors and fans, in normal operation during conditions representing reasonable worst-case equipment loads. Specifications for noise measurement equipment and measurement procedures are defined in the American National Standard – “Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools” (ANSI S12.60-2010).

The prerequisite 45 dB(A) average background noise level is considered not conducive to effective instruction, and represents minimal compliance with the noise levels required by the State of Washington (WAC 246-366-110, Sound Control). School districts and designers are strongly encouraged to move beyond these prerequisites and achieve background noise levels of NC 30 (HVAC noise) and 40 dB(A) (all noise sources) for all classrooms (see IEQ4.1). (ANSI S 12.60-2010).

**Resources**


National Clearinghouse for Educational Facilities, (http://www.ncef.org/)


**IEQ4.1: Improved Acoustic Performance**

<table>
<thead>
<tr>
<th>1 - 4 possible points</th>
<th>This credit may not be achieved through design; field testing/inspection is required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Unoccupied Classroom Noise = 1 point</td>
<td><strong>All Classrooms</strong>&lt;br&gt;Maximum unoccupied background noise levels generated from ventilation equipment noise sources in classrooms not to exceed an NC-30 and overall noise levels from all sources of environmental, interior, and ventilation equipment noise not to exceed 40dB(A) at any student location within the classroom (measured as a noise average $Leq_x$ where $x$ is thirty seconds or more).</td>
</tr>
<tr>
<td>STC 50 (classrooms) = 1 point</td>
<td>All Classrooms</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Provided the preceding point regarding reduced classroom noise level is achieved. Minimum Sound Transmission Class (STC) ratings of <strong>STC 50</strong> for classroom single or composite partition wall and floor–to underside of deck or solid structure above that separate an enclosed instructional space from an adjacent instructional space.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gymnasium Reverberation Times = 1 point</th>
<th>Gymnasium Reverberation Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum (unoccupied) reverberation times at all mid-frequency (500, 1000, 2000 Hertz) of:</td>
<td></td>
</tr>
<tr>
<td>• Not greater than <strong>1.3 seconds</strong> for gymnasiums of 150,000 cubic feet or less.</td>
<td></td>
</tr>
<tr>
<td>Or</td>
<td></td>
</tr>
<tr>
<td>• Not greater than <strong>1.5 seconds</strong> for gymnasiums greater than 150,000 cubic feet.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multi-Purpose, Commons, or Cafeterias Reverberation Times = 1 point</th>
<th>Multi-Purpose, Commons, or Cafeterias Reverberation Times:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum (unoccupied) reverberation times at all mid-frequency (500, 1000, 2000 Hertz) of:</td>
<td></td>
</tr>
<tr>
<td>Not greater than <strong>1.2 seconds</strong> for Multi-Purpose, Commons, or Cafeterias of 100,000 cubic feet or less.</td>
<td></td>
</tr>
<tr>
<td>Or</td>
<td></td>
</tr>
<tr>
<td>Not greater than <strong>1.4 seconds</strong> for Multi-Purpose, Commons, or Cafeterias greater than 100,000 cubic feet.</td>
<td></td>
</tr>
</tbody>
</table>

Students with language, speech, hearing or learning challenges are particularly vulnerable to poor acoustic classroom conditions, as are those for whom English is a second language. Consideration should be given to improving acoustical performance in all classrooms, with priority consideration given to all learning spaces for these student populations.

Background noise levels in the classroom are typically of two types: noise from outside and noise from within the classroom. Noise that intrudes into the classroom from sources outside of the school building envelope includes vehicular traffic, aircraft, industrial plants, and activity in schoolyards or from grounds maintenance. Control of noise in classrooms from such sources is accomplished through proper selection of materials and acoustical design for the exterior envelope of the school building. Each situation is unique with regard to distance to, and the extent and characteristics of, industrial sources, local traffic, or other transportation noise sources.

The most effective approach to outdoor-to-indoor noise control is to measure the current, or predict the future, noise levels of external sources at the proposed locations for each of the school building facades. The next step is to determine the necessary outdoor-to-indoor noise control.
level reduction to achieve the required interior background noise level. Guidelines and methodologies for designing effective exterior source noise control are available in resources.

The second type of noise originates within the school building and intrudes into the classroom through classroom walls and partitions, floor-ceiling assemblies, and ventilation systems. Interior noise sources can be isolated through the proper design and construction of school building elements and by effective noise control design measures applied to the building services and utilities. Compliance with the background noise level and the STC 50 sound rating for partitions and floor/ceiling assemblies can be demonstrated through testing as specified in ANSI Standard S12.60. A measured Noise Isolation Class (NIC) rating of 45 or higher is considered to be in compliance with the STC requirement.

Resources


National Clearinghouse for Educational Facilities, (http://www.ncef.org/)


A part of AMCA’s Fan Application Manual, aimed primarily at the designer of air moving systems, showing methods to improve fan inlet and outlet connections, resulting in reduced noise and energy consumption at optimum fan performance. (http://www.amca.org/)
**IEQ4.2: Audio Enhancement**

<table>
<thead>
<tr>
<th>1 point</th>
<th>Provide accommodations for a sound amplification system and an assistive listening system in all classroom spaces.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• A sound amplification system to amplify the teacher’s voice, via wired or wireless microphones, and to amplify audio visual presentations.</td>
</tr>
<tr>
<td></td>
<td>• A dedicated or portable assistive listening device (system) to amplify the teacher’s voice, via wired or wireless microphones, and to amplify audio visual presentations.</td>
</tr>
</tbody>
</table>

A properly designed sound system is an effective method for increasing the speech level in a classroom, thereby increasing the signal-to-noise ratio (SNR), signal being the voice you want to hear above all the other background noise. In addition to improved speech intelligibility, the use of a sound system can significantly reduce voice fatigue for the teacher or presenter, and improve speech perception. It is important to note that amplified speech does not reduce the requirement for background noise control, because communication between students, and between student and teacher, must continue to be facilitated by a low background noise level.

**For compliance with this credit, the sound system must:**

- Provide uniform sound distribution at all student seating areas within a classroom. Uniformity is confirmed if measurements across all student seating areas are within +/- 2 dB in the 1/1-octave band centered on 2000 Hertz.

- Provide distribution to all student seating areas within a classroom utilizing either dedicated or portable assistive listening systems.

- Provide a minimum signal-to-noise ratio of 15 dB across all student seating areas. Uniformity is confirmed if A-weighted amplified speech sound level measurements are 15 dB above background sound levels across all student seating areas.

- In addition, designers are encouraged to meet the maximum unoccupied background noise levels of 40 dBA, as set in IEQ4.1. Relying solely on amplification is not considered best practice.

**Resources**


Thermal Comfort

**Purpose:** Provide consistent thermal comfort to support optimum health, productivity, and comfort.

### IEQ5.0: Thermal Code Compliance

| Required | Comply with ASHRAE Standard 55 - Thermal Comfort Conditions for Human Occupancy, for thermal comfort standards within established ranges per climate zone. |

Satisfaction with the thermal environment is important because it influences productivity and health of building occupants. There are large variations from person to person in terms of thermal comfort. Center for the Built Environment (CBE) Thermal Comfort Tool for ASHRAE 55 can be used to do thermal comfort calculations.

Indoor design temperature conditions for general comfort applications will be determined in accordance with ANSI/ASHRAE 55 or the chapter titled “Thermal Comfort” in the ASHRAE Handbook Fundamentals.

### Resources


ASHRAE CBE Thermal Comfort Tool, [http://smap.cbe.berkeley.edu/comforttool](http://smap.cbe.berkeley.edu/comforttool)
User Control

**Purpose:** A significant factor in human comfort is the ability to make adjustments based on individual preference or immediate perception of conditions. Allowing teachers and staff to manually control the windows, lights and thermostat give occupants an immediate way to affect their environment, reducing distraction and discomfort.

### IEQ6.1: User Control – Windows

1 point

Provide a minimum of one operable window in each classroom.

Operable windows are important for personal comfort and can contribute to improved student performance. In addition to providing fresh air, they provide a connection to the outdoors.

Provide at least one operable window in each classroom. It is recommended to **interlock controls with the HVAC system** to optimize energy efficiency. During building orientation teachers and staff must be taught how to properly use the HVAC controls in their rooms and how opening doors and windows affect ventilation and comfort.

Also see Credit E2.1 that provides a point for providing controls/devices or HVAC systems that can respond when windows or doors are opened. This strategy is important as it allows operable windows, yet mitigates energy penalties that might result. And see Credit IEQ3.7 that rewards natural ventilation (no air conditioning).

### IEQ6.2: User Control – Temperature

1 point

Provide a temperature control in each classroom that is adjustable by the occupants.

Individual classrooms will vary in temperature depending on their orientation and other building conditions. Provide individual or integrated controls systems to allow teachers and staff to regulate the temperature of each individual classroom.

Also see Credit E2.1, HVAC and Operable Windows, and Credit IEQ3.7 Natural Cooling (natural ventilation). Additional points for occupant controlled classroom lighting are available in credit IEQ2.1 Electric Lighting Quality.

Temperature control systems should not give teachers and staff free range to adjust the temperature to whatever they desire. Install systems that allow temperature adjustments in a room to within 1-2 degrees of the standard setting for the season (e.g. 70° in winter). This will improve their comfort while not having a significant adverse impact on the building’s energy efficiency. Establishing a standard temperature setting for the entire building is an important corollary action.
Planning, Education, & Operational Activities

The purpose of this section is to capture and acknowledge activities before and after construction of a high-performance school that lead to its on-going success. Planning, through integrated design, brings together various disciplines involved in designing, building, and occupying a school facility. The school can also become a hands-on teaching tool for students to learn about the benefits of high-performance design. There are also post-construction activities that districts can do to assure the goals of the high-performance design are achieved once the building is in operation.

Planning

**Purpose:** To have the entire project team incorporate sustainable building strategies in early programming and ongoing design decision-making. This approach helps maximize systems integration and associated efficiencies and cost-benefits, as well as identify other sustainable opportunities.

**PEO1.1: Integrated Design Workshop**

| 1 point | **Integrated Design Workshop.** Conduct a workshop no later than mid-schematic design phase. Include project stakeholders to collaboratively develop a range of sustainable building strategies for all five categories of the WSSP, document the project’s sustainable building goals, and incorporate them as an ongoing part of programming and design decision-making. A second workshop held prior to the construction drawings phase is highly recommended. |

Sustainable building design requires new and often innovative design approaches that cross boundaries of professional expertise and need to be considered comprehensively to be successfully incorporated. Experience with project teams in Washington and across the country has shown that projects that successfully incorporate a wide range of sustainable building strategies are those that involve project stakeholders in early design programming, analysis, and design decisions. For best results, this process should begin with a collaborative workshop held no later than mid-schematic design phase, with another workshop prior to construction drawings phase.

An Integrated Design Workshop is an important first step in achieving the benefits of integrated design. A collaborative team process can carry out the ideals expressed in the workshop by continuing an interdisciplinary dialogue through the design process, by documenting design decisions related to this effort, and by ensuring sustainable building strategies are incorporated in construction documents and the construction process itself.
To earn this credit, it is suggested the workshop be a minimum of 3 hours; however, more time is suggested. Software programs are available that can be used during the workshop to provide immediate feedback on the feasibility of strategies being considered.

Stakeholders should include district representatives, design consultants, construction representatives (if available), and school occupants. Examples of attendees in these categories include:

- District Representatives – Capital projects staff, facilities staff, and representative administrators and school board member.
- Design Consultants – Architect and sub consultants (civil, structural, electrical, mechanical, acoustic, landscape, etc.), value engineer. Energy providers and local building and planning officials also can be valuable contributors.
- Construction Representative, if available – General contractor, commissioning agent.
- School Occupants – Teachers, principal, maintenance, custodial, and operations staff, students, and representative parents.

In Integrated Design Workshops, open dialogue is encouraged and expected. Operate with a few fundamental ground rules:

- A neutral, non-confrontational environment.
- Life cycle value needs to be considered along with imperatives of first cost.
- Reservations are noted with the expectation that strategy proponents will provide additional investigation to further refine and justify that particular strategy.

Deliverables from the Integrated Design Workshop will guide the collaborative process for the remainder of the project, and include:

- Sustainable building mission statement.
- Set of high-level sustainable building goals that relates to the specific project’s priorities.
- Summary of sustainable strategies to be incorporated or investigated further.
- Identification of project team member(s) responsible for specific sustainable strategy development, including a timeline for reporting back to the team.
- Preliminary WSSP Scorecard indicating credits easy to achieve, credits of moderate difficulty that require further investigation, and credits unlikely to be achieved (easy, moderate, difficult OR yes, maybe, no).
- Use the meeting notes or sustainable narrative that results from this workshop as the Sustainable Narrative due to OSPI with the D9 High-Performance Building submittal.
Resources

Energy Scheming software - Overview and ordering info at Oikos, (http://oikos.com/esb/37/scheming.html)


National Institute of Building Sciences, Whole Building Design, (http://www.wbdg.org/)

Purpose: To select materials and systems that contribute to making the building last longer including selecting those that are durable, efficient, and easy to maintain.

<table>
<thead>
<tr>
<th>1 point</th>
<th>Implementation of Durability, Efficiency and Maintainability Features</th>
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<tbody>
<tr>
<td></td>
<td>Provide Architect’s certification that project cost exceeds the state of Washington’s Construction Cost Allowance by at least 5%, and that this excess cost is directly attributable to enhanced systems that will improve durability, increase useable building life, improve operation efficiency, and/or reduce maintenance costs. Ideally, these items would arise from the Integrated Design Workshop.</td>
</tr>
<tr>
<td>Or</td>
<td>Implementation of Durability, Efficiency and Maintainability Features – Provide Architect’s certification that major components of the facility are designed to exceed the 30 year useful service life envisioned by the state of Washington. A criterion for this certification is that specific features of the design are likely to give the facility a state Building Condition Evaluation (BCE) score of greater than 60 after 30 years (or a Building Condition Assessment (BCA) score of greater than 62 after 30 years). This aligns with both the state priority system and the sustainability goal of re-using existing buildings. The architect’s certification should outline the specific features and indicate how they will improve service life, given reasonable use and maintenance.</td>
</tr>
</tbody>
</table>

NOTE: The implementation of this point refers specifically to programs and policies in the state of Washington.

A commonly held and common sense definition of sustainable buildings is: they should be durable, efficient to operate, and easy to maintain. Promoting durability, efficiency of operation and ease of maintenance should be one focus of the integrated design workshop.

This point gives credit for increasing expenditures to implement goals and strategies developed in the Integrated Design Workshop.
Often it is difficult to track the precise costs of items that serve these ends. Such items may involve more than one design discipline and serve more than one purpose. For example, a vertical shaft connecting a classroom to the roof may be a component of both the natural ventilation and daylighting systems, and provide efficiency and maintainability benefits from reduced energy and maintenance costs. Increasing the R-value and extent of insulation may reduce energy costs and improve classroom acoustics. Upgrading the type and extent of masonry cladding may increase building life and decrease maintenance.

The following are some other examples to consider. This list is neither exhaustive nor complete.

- Type and extent of durable envelope materials (masonry, siding, roofing, windows, etc.)
- Efficiency, maintainability and useable life of major heating, ventilation, lighting, communications, and data systems.
- Generous floor-to-floor heights and oversized service cores, chases, tracks, raceways, etc.

A basic sustainability principal is that, where feasible, functional, and prudent, it is preferable to reuse an existing building rather than replace it. The Washington State School Construction Assistance Program requires that facilities built with state-assistance funds be used for at least 30 years before they are eligible for additional funding. The priority system for ranking projects for funding has an explicit standing linking building condition to a Schools District’s decision to modernize or replace an existing building.

From OSPI School Facility Manual – Section 215:

Cost/Benefit Factor: A cost/benefit factor is used to modify the condition score if the proposed project does not correct the problem in the most cost-effective way. If the Building Condition Evaluation (BCE) score is less than 40, up to 10 points are deducted from the score if a modernization is proposed on the basis that new construction replacing the old facility would be the most appropriate approach. Similarly, up to 10 points are deducted if the condition score is greater than 60 and new construction is proposed rather than modernization.

WAC 392-343-515 Modernization or new-in-lieu of modernization priority elements is the basis for this priority system feature.

“(3) Cost/benefit factor - Ten minus points possible. If the proposed project is a modernization and the BCEF score is less than 40, one point is deducted for each point the BCEF score is less than 40 up to a total possible deduction of 10 points.

If the proposed project is a new-in-lieu of modernization and the BCEF score is greater than 60, one point is deducted for each point the BCEF score is higher than 60 to a total possible deduction of 10 points.

The scores will be determined at the time of project approval per WAC 392-341-045. These scores will be carried until the district requests a redetermination.”
Resources

Superintendent of Public Instruction, School Facility Manual – Section 215,
(http://www.k12.wa.us/SchFacilities/Publications/default.aspx)

School Construction Assistance Program,
(http://www.k12.wa.us/SchFacilities/Programs/SchoolConstructionProjects.aspx)

WAC 392-343-515 - Modernization or new-in-lieu of modernization priority elements,
**Purpose**: To implement and test innovative approaches to improving the health of school occupants and the performance of school facilities.

This credit allows project teams to be creative and test new technologies or strategies.

### PEO1.3 Innovation

<table>
<thead>
<tr>
<th>2 points maximum</th>
<th>Implement a new technology, strategy, or technique that produces actual and measureable results, is not used to comply with a point in another WSSP credit, and that strives for at least one of the following goals:</th>
</tr>
</thead>
</table>
| 1 point per innovation |  • Improves the health and performance of students and staff.  
  • Improves the performance and efficiency of the school facility, or operation of the facility.  
  • Improves the natural environment.  
  • Achieves Living Building status as defined by the Living Future Institute. |

The following may be considered for innovation points, in addition to others that meet the goals stated above:

- Performance beyond what is awarded in a WSSP credit.
- Strategies or technologies not tried in school buildings.
- Master plans that incorporate high-performance elements.
- Build and operate to achieve “Living Building” status.
- Provide 1 or more electric car charging station in addition to the preferred parking in S2.3 Minimize Parking.

### Resources

Living Building Institute, ([http://living-future.org/lbc](http://living-future.org/lbc))
Education

**Purpose:** To engage students and teachers in learning about the benefits of green building, using their own building as a learning tool.

### PEO2.1: Green Building Learning

<table>
<thead>
<tr>
<th>1 point</th>
<th>Develop student-learning opportunities by using the building structure and site, through demonstration areas, exposed systems, lesson plans, teaching aids, interpretive graphics and signage.</th>
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</thead>
<tbody>
<tr>
<td>1 point</td>
<td>Provide operations and maintenance training for facilities and maintenance staff.</td>
</tr>
<tr>
<td>And</td>
<td>Provide students, teachers, and staff with knowledge of each aspect of the high-performance design and their responsibility for use and preservation.</td>
</tr>
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</table>

**Student Learning**

Students can be involved in analyzing energy use as well as planning, implementing, and monitoring outdoor classroom resources (gardens, native plants). Consider a dashboard for real time energy use data analysis. Outdoor classrooms and learning environments should be **planned into the site design** for use or further development by students.

Students can create signs, displays, newsletter articles, or brochures to educate each other and visitors about the environmental design features that are included. Exposed building systems can be utilized as learning opportunities. When advanced technology and design in new schools are made visible, buildings can become teaching tools and important features of science, math, and environmental curriculum. To earn this point the learning objectives must be part of a “credit bearing class” for individual or groups of students.

Building systems work best when users understand them. A great example of newer technology being widely used is occupancy sensors on classroom lighting. Building occupants do not need to turn lights on and off in sensor-controlled spaces. That function is controlled automatically by the occupancy sensors. When switches are operated manually it defeats the purpose of automatic controls and allows for lights to be left on when rooms are not occupied. Studying occupancy sensor effectiveness can be the means for student learning in math and science, even human behavior.

**Operations, Maintenance, and Use Training**

Training is the foundation of effective maintenance programs and is an essential tool to maintaining buildings in optimum condition. Effective maintenance protects indoor air quality, thermal and visual comfort, and superior energy performance. Students, teachers, and staff rely on the buildings systems to provide a comfortable environment to learn and teach. To keep the
building systems and materials in optimum working order these occupants must understand the design intent, and know how to use and treat the systems and materials.

Facilities and maintenance staff will receive operations and maintenance training on all systems included in the commissioning scope of work as well as systems related to high-performance – lighting, shading controls, all floor and wall finishes, audio systems, etc. depending on the scope of the project. Training will be a combination of O & M document review and field observations.

Teachers and staff will attend a new building orientation where they will learn about the building systems and the design intent. The building materials and systems will be reviewed along with the expectations for care and use. If available, a “user manual” should be provided. The user manual will provide descriptions of the high-performance features, explain how those features operate individually and together, explain the care and maintenance of the features and explain the users’ responsibility for care. The same user manual will be available for parents and community users.

First year training and building orientation will be provided by the design engineer/architect, or their designee, who is an expert on this building. In subsequent years, annual training and building orientation can be facilitated by the school facility manager or their designee.

Resources

Washington Green Schools, (http://www.wagreenschools.org/)

Healthy Schools Coalition, (http://www.healthyschools.org/coalition.html)

Alliance to Save Energy, Washington, DC, (http://www.ase.org/initiatives/education)

Green Schools Energy Project: Step by Step Manual (HS), Youth for Environmental Sanity, (www.yesworld.org)

SolarQuest, Solar on Schools Program Management, EcoSage, Inc., Chelsea, VT (www.solarschools.com)
## Operational Activities

**Purpose:** To encourage pre-construction and post-construction activities that contribute to the understanding of high-performance schools, as well as implementing operational plans and systems that assure the goals of the high-performance design are achieved once the building is in operation.

### PEO3.0: Operational Performance Monitoring

<table>
<thead>
<tr>
<th>Required</th>
<th>Operational Performance Monitoring</th>
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<tr>
<td></td>
<td>For five years after board acceptance of the building project, districts are required by RCW39.35D to provide an annual report to OSPI. Districts may begin the five-year reporting at building occupancy, as opposed to Board of Directors final acceptance. The WSSP Annual Reporting Workbook, found on the <a href="http://www.k12.wa.us/SchFacilities/Programs/HighPerformanceSchoolBuildings.aspx">High-Performance School website</a>, is the preferred reporting format. The annual report includes:</td>
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<td></td>
<td>• Basic building profile information.</td>
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<td></td>
<td>• Monthly energy use, by fuel type.</td>
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<td></td>
<td>• Water use recorded separately for indoor and outdoor use.</td>
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<tr>
<td></td>
<td>• Observation and operating information on function, repair, maintenance, and custodial experience related to the high-performance building features.</td>
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</tbody>
</table>

**Optional:** Energy and water use may be reported and tracked in Energy Star Portfolio Manager as opposed to on the WSSP Annual Report. Districts that choose that option must then “share” their building account with OSPI. The Building Profile and Observation sections of the report must still be completed and emailed to OSPI.

## Resources

OSPI High-Performance School Building Program,  
([http://www.k12.wa.us/SchFacilities/Programs/HighPerformanceSchoolBuildings.aspx](http://www.k12.wa.us/SchFacilities/Programs/HighPerformanceSchoolBuildings.aspx))

EPA’s Energy Star Portfolio Manager,  
## PEO3.1: Post Occupancy Evaluation

| 1 point | Conduct a Post-Occupancy Evaluation (POE) at least one year after the building is occupied, but no longer than two years after. A written plan and/or contract for a POE must be in place at the time of the final (D11) WSSP submittal. The evaluation will include at a minimum:
|           | • An analysis of the actual resource use (energy and water).
| 1 point   | • Surveys of occupants regarding comfort, including thermal comfort, air quality, and acoustical comfort.
|           | For an additional point, the POE should investigate connections between the facility and health, user satisfaction, academic achievement, and other fundamental goals of facility construction. Coordinate with the building commissioning report.

A POE is a formal process that measures building performance. It is an important means of building a body of knowledge about the impact of building strategies employed in a particular building. This knowledge will be useful for school districts in planning future capital projects and in implementing green building requirements. The POE should endeavor to include all building users in the survey and response.

At a minimum, the POE required for earning this credit includes occupant surveys regarding comfort, including thermal comfort, air quality, and acoustical comfort, as well as an analysis of energy and water use. Additional evaluation activities could include air quality monitoring and thermal and light level testing.

The WSU Energy Program evaluates energy efficiency initiatives to provide funders with performance data and managers with feedback to improve their programs. One specific type of evaluation offered is Post Occupancy Evaluation.

The CHPS Operations Report Card™ (ORC) is an available resource to Washington schools. With the ORC, you can benchmark the performance of your schools against the expected results, and develop data-driven improvement plans if necessary. The ORC evaluates seven metrics: indoor air quality, energy efficiency, visual quality, acoustics, thermal comfort, water conservation, and waste reduction.

### Resources

Center for the Built Environment, University of California, Berkeley, ([http://www.cbe.berkeley.edu/](http://www.cbe.berkeley.edu/))

ELCCA Require

For all major facilities (1) new buildings having twenty-five thousand gross square feet or more of usable floor space, (2) renovation, modernization, addition, alteration or repair of a facility having greater than twenty-five thousand square feet, work completed within a 12-month period, the project cost is more than 50 percent of the assessed value of the facility and the project affects energy-using systems. As part of the early design process, perform an Energy Life Cycle Cost Analysis (ELCCA) to meet RCW Chapter 39.35 RCW – Energy Conservation in Design of Public Facilities requirements.

ELCCA 1 point

For all other facilities (1) new building projects larger than five thousand gross square feet, but less than twenty-five thousand gross square feet of usable floor space, (2) renovation, modernization, addition, alteration, or repair of a facility where the cost is less than 50 percent of the assessed value.

LCCA 1 point

Perform a Life Cycle Cost Analysis (LCCA) showing 30-year net present value.

The ELCCA is required for public buildings in Washington. The State ELCCA program is administered by the Department of Enterprise Services (DES). Guidance and spreadsheets are available on their web page:
(http://des.wa.gov/services/facilities/Energy/ELCCA/Pages/default.aspx)

Typically, first cost is the primary economic factor when analyzing whether to proceed with a specific strategy, sustainable or not. However, it is in the long period of operation when the employed strategy will prove economically advantageous or not.

A Life Cycle Cost Analysis (LCCA) is a method for assessing the total cost of ownership for a new facility or a building system. The analysis is done to estimate the total costs of project alternatives that take into consideration costs of acquisition, initial capital investment, ongoing operating and maintenance costs, and other costs beneficial for the analysis. The results of the analysis allow school districts to select the design that ensures the new facility or building...
system provides the lowest total cost of ownership consistent with the project’s intended quality, function, and lifespan.

There are a variety of methods to use to conduct an LCCA, varying in complexity. The National Institute of Building Sciences describes LCCA in its Whole Building Design Guide. The discussion includes a description of “Present Value” Analysis required to earn this credit. This method converts cash flows to present values by discounting them to a common point in time. Washington State Office of Financial Management has developed an LCCA tool to be used on state-funded projects required to conduct LCCA. The tool, LCCT, is available at the link below.

The spreadsheet available through the Washington State ELCCA program is available electronically and can be modified to address alternatives other than energy.

Resources

Washington State Department of Enterprise Services ELCCA guidelines, (http://des.wa.gov/services/facilities/Energy/ELCCA/Pages/default.aspx)


FEDS Software, Pacific Northwest National Laboratory, (www.pnl.gov/FEDs)


Energy-10, National Renewable Energy Lab, (http://www.nrel.gov/)
PEO3.3: Project or District Level Operational Activities

Many operational activities can take place either at the particular high-performance school building or at the district level. Many of these operational plans and programs may already be implemented in the district, and occur during the operation. To be able to claim these particular points, the district plan or program must include all new building projects, or a new plan or program must be implemented specifically to cover this building project.

The district, or facility, will have to commit to implementation and annual reporting for five years for most of these credits. Operational activity reporting will be submitted in March, for five years, with the WSSP Annual Report.

| Required | Asset Preservation Program (APP) reporting |

**Required: Asset Preservation Program (APP) and Asset Preservation System (Maintenance Plan)**

Newly constructed state-assisted school buildings, board accepted after December 31, 1993, must participate in the Asset Preservation Program (APP) in order to be eligible for future state assistance. A district Asset Preservation System (maintenance plan) is required as part of the APP. The building maintenance plan must include maintenance and operational issues related to high-performance features.

**Resources**

OSPI School Facilities, Asset Preservation Program, [http://www.k12.wa.us/SchFacilities/Programs/AssetPreservation.aspx](http://www.k12.wa.us/SchFacilities/Programs/AssetPreservation.aspx)

| 1 to 4 possible points | Choose up to 4 of the 10 possible. Receive one point for each; no more than 4 points. *Schools are required to annually report on most of these credits for five years, with the exception of the Asset Preservation System on Modernizations* |
1 point: Asset Preservation System (Maintenance Plan) on Modernizations

A state-assisted school building modernization project is not required to participate in the Asset Preservation Program (APP), therefore no asset preservation system (maintenance plan) for OSPI purposes is required. To earn the point, the district will provide a building maintenance plan that meets the requirements in the APP program, and include maintenance and operational issues related to high-performance features.

Requires certification letter to OSPI.

1 point: Resource Conservation Plan and GHG Reduction Plan

Develop and implement a Resource Conservation Plan including energy, water, and materials conservation.

And

Develop a Greenhouse Gas Reduction plan. Include plans for reduction of water, energy, and vehicle miles traveled. Include goals with target dates.

A district-wide Resource Conservation Plan and Greenhouse Gas Reduction Plan can meet the credit requirements.

Requires annual reporting to OSPI for five years.

Resources


1 point: IAQ Management Plan

Use EPA’s Design Tools for Schools as a design reference and resource. Implement the EPA’s Tools for Schools Program or an alternative, equivalent in scope and effectiveness. A school-specific IAQ management plan must be implemented. Proof of use must be provided annually.

Requires annual reporting to OSPI for five years.

Resources

EPA’s Design Tools for Schools, (http://www.epa.gov/iaq/schooldesign/)
1 point: Integrated Pest Management (IPM) Program

Develop and implement a formal IPM Program that follows the model IPM program for schools in Washington State developed by Urban Pesticide Education Strategy Team (UPEST). To get this point, an IPM plan must be developed and implemented at the school. A district-wide IPM that includes all new schools can be used to satisfy this credit.

An IPM policy, if consistently used as a reference by school employees, can be a valuable tool for launching a sustainable IPM program in your district. For more information, check out "Model Pesticide Safety and IPM Guidance Policy for School Districts" [http://www.epa.gov/pestwise/publications/ipm/Model-School-IPM-Policy.pdf]

Requires annual reporting to OSPI for five years.

Resources

Safer Choice products have been reviewed and labeled by the EPA against strict human health and environmental criteria. WA Department of Ecology [http://www.ecy.wa.gov/GreenChemistry/SaferChoice.html]

IPM Information, WSU Cooperative Extension service, [http://ipm.wsu.edu/]

Oregon School District IPM (sample of a completed plan), [http://www.hsd.k12.or.us/Portals/0/district/IPM/HSD%20IPM%20Plan.pdf]

EPA’s Regional and Center of Expertise for School IPM Contacts, [http://www.epa.gov/pesticides/ipm/ipmcontacts.htm]

The University of Florida Institute for Food and Agricultural Sciences. "National School IPM Information Source." [http://schoolipm.ifas.ufl.edu]

"Is Your Child's School Stuck on a Pest Control Treadmill?" Jim Jones. [http://blog.epa.gov/epaconnect/2014/03/is-your-childs-school-stuck-on-a-pest-control-treadmill/]


1 point: Transportation Options Program

Develop and implement a Transportation Options Program, with input from the local community and other stakeholders. The goal of the plan is to improve the school’s connection to the community by offering students and staff more transportation choices such as public buses, rail, biking, and walking. Implement the education and enforcement components of the Safe Routes to School program.

Requires annual reporting to OSPI for five years.

Resources


1 point: Fuel Efficient Buses and Maintenance Vehicles

At least 20% of the district-owned buses and 20% of the district-owned maintenance vehicles (only those that travel on the roads and highways) serving this school are built in or after 1994 when the first emission standards were adopted. If district bus service is provided under contract from a third party, then 20% of the buses used to service THIS school must meet the requirement. The same is true if the school is served by public bus service.

Requires annual reporting to OSPI for five years.

Resources


1 point: Food Related Waste Prevention and Management

Develop and implement a plan for food waste management at this school. Design the school to address special handling options for food preparation and food wastes. The plan may include handling food waste on-site or off-site. Some options include composting, worm bins, municipal collection, vegetable/herb gardens, etc.

Requires annual reporting to OSPI for five years.

Resources

1 Point: Environmentally Preferable Purchasing Policy

Develop and implement an environmentally preferable purchasing policy at the school or district level. The plan must include the environmental performance indicators that are to be used to judge purchasing decisions. The plan should include typical products and materials and weighting of the indicators. Typical products and materials generally include office supplies and classroom supplies. The plan should ensure the protection of the students, staff, and workers.

Requires annual reporting to OSPI for five years.

Resources


Safer Choice products have been reviewed and labeled by the EPA against strict human health and environmental criteria. WA Department of Ecology (http://www.ecy.wa.gov/GreenChemistry/SaferChoice.html)


1 Point: Green Cleaning Policy and Program

Develop and implement a Green Cleaning Policy and Program at the school or district level. The policy will include:

- Defining the key terms, such as "green" and "green cleaning".
- Explaining the green team's role and responsibilities, if applicable.
- Key expectations such as reporting spills, keeping personal space free of clutter, etc.
- Inappropriate activities such as bringing cleaning supplies from home.
- Purchase decision guidelines and approved products and vendors.
• Education and communication to key audiences.
• Methods to track progress.

Requires annual reporting to OSPI for five years.

Resources

Cleaning for Healthy Schools, (http://www.cleaningforhealthyschools.org)

Green Clean Schools; Healthy Schools Campaign, (http://healthyschoolscampaign.org/programs/gcs/guide.php)

Safer Choice products have been reviewed and labeled by the EPA against strict human health and environmental criteria. WA Department of Ecology http://www.ecy.wa.gov/GreenChemistry/SaferChoice.html

Greening Your Purchase of Cleaning Products; EPA, (http://www.epa.gov/epp/pubs/cleaning.htm)

1 Point: Register to Participate in 1 or more Green School Programs

Programs that meet the requirements listed above include Washington Green Schools, King County Green Schools, EPA’s Cool Schools Challenges, plus others.

To earn the point this school must participate in a green schools program that engages staff, students, and the school community in sustainable school management techniques that provide for student learning, resource conservation, health, and safety.

Requires annual reporting to OSPI for five years.
Documentation and Reporting

The D-Form Process

D-3 Application for Project Approval

In the Additional Project Information section, indicate which high-performance standard will be pursued or exemption:

___ Washington Sustainable Schools Protocol
___ LEED (Silver)
___ LEED for Schools (Silver)
___ Exempt by Law____ Exempt-Not Practicable*

*The district must include a letter of request that explains the exemption. OSPI will respond with a determination. A sample letter is included in the Forms and Examples section of this guideline.

D-5 Application for Preliminary Funding Status

Submit a preliminary design WSSP or LEED scorecard only. Districts may use the scorecard only or the WSSP Workplan scorecard tab. The Workplan can be used to capture these preliminary credits (Yes, No, Maybe) and updated as the project moves through the design and construction process. See the OSPI School Facilities Website for digital copies of these and other high-performance related documents.

D-7 Application to Proceed with Bid Opening or Negotiate MACC

An Energy Life Cycle Cost Analysis (ELCCA) is required by 39.35 RCW for all projects more than 25,000 square feet or modernizations of greater than 50 percent of the assessed value. The ELCCA is referred to as the Energy Conservation Report. Indicate cost of the report on the D-7 and include the DES review letter with D-7 package. No separate submittal is required.

D-9 Application for Authorization to Sign Contracts or MACC Agreement

Submit the four documents listed below with the D-9. Use the WSSP Workplan for WSSP projects. Use the LEED scorecard and a similar format for the cost analysis for all LEED projects.

- **Final design-phase WSSP or LEED scorecard**
  For WSSP use the scorecard tab in the Workplan to indicate credits (Yes, No, Maybe).

- **Final design phase WSSP or LEED cost analysis**
  The cost analysis follows the same format as the scorecard. Incremental costs related to achieving individual credits and requirements include district administration and reporting costs, professional design and consultant fees, construction costs, and
permitting and approval fees. Use the Cost Analysis tab in the WSSP Workplan. If using LEED follow the same format.

- **Sustainable Building Strategy**
  Provide a two to four page narrative of the selected sustainable features. (Often generated during the eco-Charette or Integrated Design planning meetings.)

- **Energy Life Cycle Cost Analysis executive summary, if applicable.**
  The executive summary typically includes the narrative of alternate systems studied and the energy cost and energy use data for the selected system. Do not submit the third-party review of the analysis.

**D-11 Application to Release Retainage**

Submit the following three documents prior to, or as part of, the D-11 process:

- Final WSSP or LEED scorecard. Use the WSSP Workplan (submitted at D-9), and update the scorecard to reflect the final credits earned or update the LEED scorecard.

- Final WSSP or LEED cost analysis. Capture all final incremental costs of credits earned. For WSSP projects use the Workplan submitted at D9 and update the cost analysis tab, or update the D9 LEED cost analysis.

- Certification Letter. State that the district has provided the high-performance submittals listed above in D-5, D-9, and the finals in D-11 and annual monitoring and reporting to OSPI will take place for five years. Address and submit this letter to the Disbursement Officer. A sample letter is included in the Forms and Examples section of this guideline.

The process above has been captured in an at-a-glance flowchart that districts can use to determine whether or not they must comply, and if so, what documents are required throughout the D-form process. The at-a-glance flowchart is included on page 130.
Annual Reporting

Annual reporting is required by law for five consecutive years following the local board acceptance date of the project. Districts that prefer to begin reporting following occupancy may do so. A copy of the final WSSP or LEED scorecard must be available to staff in order to complete the annual report. All projects should use the WSSP Annual Reporting Workbook. Instructions for completing the various tabs of the workbook are included in tab one. A digital copy can be found on the OSPI School Facilities High-Performance School Buildings website. Districts using LEED will need to format either tab four or five to fit the LEED scorecard credits.

Reporting requirements

- The annual report includes monthly energy and water use. Reporting is by meter, by energy source, and by use (i.e. exterior and interior water use). If you are reporting energy and water use from a meter that serves multiple buildings (the high performance building and another building), please be certain to indicate that on the reporting spreadsheet. If you use Portfolio Manager, you do not need to complete tabs two and three in the Workbook. You may share your Portfolio Manager account with OSPI and send in the report with the Building Profile and Operations tabs completed.

- The annual report includes Operations and Maintenance Performance Observations. For each credit achieved, please record observations about performance, durability, health and safety benefits, maintenance costs, and other observations, or lessons-learned. This information will be helpful in the design and construction of future facilities and helpful in determining the value of a high-performance measure.

- Starting with the 2013–2014 fiscal year reporting cycle, the annual reports are due to OSPI in March of each year. Districts should consider completing this annual report concurrent with the Asset Preservation Program (APP) annual assessment that is due prior to April 1 each year. The first reporting year may be a partial year (less than 12 months). Thereafter, annual reports should be for a 12-month period.
At-A-Glance Flowchart: Determining and Documenting High-Performance Compliance

Determining High-performance Applicability

Q1. Is the project receiving state funding assistance?
   - No: Not required to comply with high-performance requirements but strongly encouraged.
   - Yes: Q2.

Q2. Is the project new construction > 5,000 gsf? Or a modernization > 5,000 gsf and the cost of the modernization is greater than 50% of current assessed value?
   - Yes: Q3.

Q3. Is the type of building listed as exempt in the RCW?
   - No: Q4.

Q4. Are there circumstances that would make it difficult to achieve LEED silver or WSSP compliance?
   - No: Q5.

Q5. Which green building standard will be followed, WSSP or LEED? Indicate that on the D3.

Documenting High-performance Compliance

START by documenting the sustainable “green building” goals. This is often done as an eco-charette.

Submit sustainable design narrative with D9.
Submit preliminary design WSSP Workplan scorecard (Tab 1) with D5.
Submit executive summary of ELCCA (if applicable) and a sustainable design narrative with D9.
First year annual report due in March of the year following board acceptance. Districts may begin reporting following building occupancy.

Using the WSSP Workplan, or other similar document, indicate credit goals and assign work tasks to project team members.

Submit project final WSSP Workplan scorecard and cost analysis update following construction completion (at occupancy or at board acceptance). Submit Certification Letter. Must be submitted prior to/with D11.

Submit final design WSSP Workplan scorecard indicating credits achieved through design and planned to be achieved through construction and the credit cost analysis with D9.

Estimate costs of sustainable goals to fully-integrate in project budget.

Year Two Annual Report in March.
Year Three Annual Report in March.
Year Four Annual Report in March.
Year Five FINAL Annual Report.
**Glossary**

**ASHRAE** – American Society of Heating, Refrigeration, and Air Conditioning Engineers.

**ASTM** – American Society for Testing and Materials.

**B-20** – The term for a blend of 20% renewable bio-derived diesel fuel with 80% petroleum-based diesel fuel.

**Basis of design (BOD)** – The information necessary to accomplish the owner’s project requirements, including system descriptions, indoor environmental quality criteria, design assumptions, and references to applicable codes, standards, regulations, and guidelines.

**Biodiesel** – A domestic, renewable fuel for diesel engines, derived from natural oils like soybean oil, that meets the specifications of American Society for Testing and Materials D 6751. Biodiesel is not the same thing as raw vegetable oil. It is produced by a chemical process that removes the glycerin from the oil.

**Biomass** – Any biological material that can be used as fuel. Biomass fuel is burned or converted in systems that produce heat, electricity, or both. In this document, biomass-fired systems refer to systems that are fueled by clean wood chips from forestry or saw mill operations.

**Brownfields** – Real property that is abandoned or underused where the expansion, redevelopment, or reuse of the property may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

**Building exterior** – A structure’s primary and secondary weatherproofing system, including waterproofing membranes and air- and water-resistant barrier materials, and all building elements outside that system.

**Building interior** – Everything inside a structure’s weatherproofing membrane.

**CSI** – Construction Specifications Institute.

**CHPS** – Collaborative for High Performance Schools.

**Chain of custody (CoC)** – A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stages of processing, transformation, manufacturing, and distribution.

**Charrette** – An intensive, multiparty workshop that brings people from different disciplines and backgrounds together to explore, generate, and collaboratively produce design targets, goals and options.
**CFC - Chlorofluorocarbon-based refrigerant** – A fluid containing hydrocarbons that absorbs heat from a reservoir at low temperatures and rejects heat at higher temperatures. When emitted into the atmosphere, CFCs cause depletion of the stratospheric ozone layer.

**Commissioning (Cx)** – A systematic process of ensuring that building systems perform separately and interactively according to the manufacturers specifications, the contract documents, the design intent, and the schools operational needs. Commissioning involves three phases: pre-design, construction, and warranty.

**Commissioning authority (CxA)** – Individual or company designated to organize, lead, and review the completion of commissioning activities. The CxA coordinates and facilitates the work between the owner, designer, and contractor to ensure that complex systems are installed and function in accordance with the design and owners requirements.

**Commissioning plan** – A plan that includes a list of all equipment to be commissioned, delineation of roles for each of the primary commissioning participants, and details on the scope, timeline, and deliverables throughout the commissioning process.

**Cool roof** – A roof that reflects more of the sun’s energy instead of absorbing it into the interior spaces below. Cool roofs can be made of highly reflective paint, sheet covering, or highly reflective tiles or shingles.

**Daylighting** – The practice of placing windows and reflective surfaces so the natural light of day provides effective internal illumination. Optimize the daylighting design to minimize glare and eliminate direct-beam light in the classroom and use daylighting controls designed to dim or turn off electric lights when sufficient daylight is available.

**dBA** – A measure of the level of sound expressed in units of “decibels”. The application of the “A-weighted filter” de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing.

**Design-build** – A construction-project delivery process with a single entity that assumes the obligation of furnishing the design, supervision, and construction services required to complete a project.

**Development footprint** – The total land area of a project site covered by buildings, streets, parking areas, and other typically impermeable surfaces constructed as part of the project.

**Direct sunlight** – An interior horizontal measurement of 1,000 lux or more of direct beam sunlight that accounts for window transmittance and angular effects, and excludes the effect of any operable blinds, with no contribution from reflected light (i.e., a zero bounce analysis) and no contribution from the diffuse sky component (Adapted from IES).
**Energy Use Intensity (EUI)** – EUI expresses a building’s energy use as a function of its size or other characteristics. The site EUI is calculated by dividing the total energy consumed by the building in one year (measured in kBtu or GJ) by the total gross floor area of the building. EUI is calculated and expressed as either site EUI or source EUI. Source EUI considers the energy required to deliver the consumed energy on site.

**Enhanced Commissioning (E-Cx)** – Additional activities by the commissioning authority to ensure building systems are designed, constructed, and operating in accordance with the owners’ project requirements (OPR) and basis for design (BOD). Activities include reviewing building system design, contractor submittals, delivery of systems manuals, operator and occupant training, seasonal testing.

**Environmental Product Declaration (EPD)** – A statement that the item meets the environmental requirements of ISO 14021–1999, ISO 14025–2006 and EN 15804, or ISO 21930–200. An Environmentally Preferable Product (EPP) that is declared, is defined in accordance with ASTM as a material, component, system, or service that has measurable and statistically significant, positive, or reduced negative environmental impacts when compared with other material(s), component(s), and system or service(s) that serve similar purpose(s).

**Environmentally sensitive area** – A designation of a piece of land that needs special protection because of its landscape, wildlife, or historic value.

**Furniture, fixtures, and equipment (FF&E)** – The stand-alone items purchased for the project, including individual and group seating; open-plan and private-office workstations; desks and tables; storage units, credenzas, bookshelves, filing cabinets, and other case goods; computers, printers, network servers and initial software purchases; gymnasium instructional equipment, communications and security equipment, window coverings, commercial kitchen equipment, library books, wall-mounted visual-display products (e.g., marker boards and tack boards, excluding electronic displays); and miscellaneous items, such as easels, mobile carts, freestanding screens, installed fabrics, and movable partitions, desks, and moveable task lighting. Office accessories, such as desktop blotters, trays, tape dispensers, waste baskets are excluded.

**Gray water system** – Untreated wastewater that has not come into contact with toilet waste. Gray water may include used water from bathtubs, showers, bathroom washbasins, and water from clothes-washers and laundry tubs. It may include wastewater from kitchen sinks or dishwashers. Project teams should comply with the gray water definition established by the authority having jurisdiction in the project area.

**Greenfields** – Parcels of land not previously developed, graded, or disturbed and could support open space, habitat or natural hydrology.

**Hardscape** – The inanimate elements of the building landscaping. It includes pavement, roadways, stonewalls, wood and synthetic decking, concrete paths and sidewalks, and concrete, brick, and tile patios.
**Heat island** – An effect caused when exterior hardscape surfaces, such as dark, non-reflective pavement and buildings, absorb the sun’s energy and heat the air near the ground. Other contributing factors may include vehicle exhaust, air conditioners, and street equipment.

**HEPA filters** – High Efficiency Particulate Air filters

**Impervious surface** – An area of ground that development and building have modified in such a way that precipitation cannot infiltrate downward through the soil. Examples of impervious surfaces include roofs, paved roads and parking areas, sidewalks.

**Integrated pest management (IPM)** – A sustainable approach to managing pests that minimizes economic, health, and environmental risks.

**Integrated design** – The consideration and design of all building systems and components. It brings together the various disciplines involved in designing a building and reviews their recommendations as a whole. It also recognizes that each discipline’s recommendation has an impact on other aspects of the building project.

**Land-clearing debris and soil** – Materials that are natural (e.g., rock, soil, stone, vegetation) that have naturally occurred on the site or have been placed or planted. Materials that are man-made (e.g., concrete, brick, cement) are considered construction waste if they were on site and needed to be removed for the project to proceed.

**Life cycle cost analysis (LCCA)** – A tool to determine the most cost-effective option among different competing alternatives to purchase, own, operate, maintain and dispose of a building or building system when each is equally appropriate to be implemented on quality, function, lifespan, and technical grounds.

**Light pollution** – Waste light from building sites that produces glare, is directed upward to the sky, or is directed off the site. Waste light does not increase nighttime safety, utility, or security and needlessly consumes energy.

**Light trespass** – Obtrusive illumination that is unwanted because of quantitative, directional, or spectral attributes. Light trespass can cause annoyance, discomfort, distraction, or loss of visibility.

**Low-impact development (LID)** – An approach to managing rainwater runoff that emphasizes on-site natural features to protect water quality, by replicating the natural land cover hydrologic regime of watersheds, and addressing runoff close to its source. Examples include better site design principles (e.g., minimizing land disturbance, preserving vegetation, minimizing impervious cover), and design practices (e.g., rain gardens, vegetated swales and buffers, permeable pavement, rainwater harvesting, soil amendments). These are engineered practices that may require specialized design assistance.

**Minimum Efficiency Reporting Value (MERV)** – MERV is a rating system for HVAC system air filters. ASHRAE standards use the MERV. The higher the rating (higher the number) indicates the smaller the particles can be captured.
**Native vegetation** – An indigenous species that occurs in a particular region, ecosystem, and habitat without direct or indirect human actions. Native species have evolved to the geography, hydrology, and climate of that region. They also occur in communities; that is, they have evolved together with other species. As a result, these communities provide habitat for a variety of other native wildlife species. Species native to North America are generally recognized as those occurring on the continent prior to European settlement. Also known as native plants.

**Nonpotable** – Water that does not meet drinking water standards.

**Occupant control** – A system or switch that a person in the space can directly access and use. Examples include a task light, an open switch, and blinds. A temperature sensor, photo sensor, or centrally controlled system is not occupant controlled.

**Operations and maintenance (O&M) plan** – A plan that specifies major system operating parameters and limits, maintenance procedures and schedules, and documentation methods necessary to demonstrate proper operation and maintenance of an approved emissions control device or system.

**Operations and maintenance manual** – Provides detailed operations and maintenance information for all equipment and products used in the school.

**Operations and maintenance training** – Provides a short introduction on operations and maintenance of equipment and products for all school staff and then features hands-on workshops for facility personnel.

**Owner’s project requirements (OPR)** – A written document that details the ideas, concepts, and criteria determined by the owner to be important to the success of the project.

**Permeable pavement** – A paved surface that allows water runoff to infiltrate into the ground.

**Post-consumer** – Waste generated by households or commercial, industrial, and institutional facilities in their role as end users of a product that can no longer be used for its intended purpose. Examples include a soda-pop can or a cardboard box that are discarded after use.

**Potable water** – Water that meets or exceeds U.S. Environmental Protection Agency drinking water quality standards (or a local equivalent outside the U.S.) and is approved for human consumption by the state or local authorities having jurisdiction; it may be supplied from wells or municipal water systems.

**Pre-consumer** – Waste generated by industrial or manufacturing. Examples include planer shavings, sawdust, walnut shells, culls, trimmed materials. The designation excludes rework, regrind, or scrap materials capable of being reclaimed within the same process that generated them (ISO 14021). Formerly known as post-industrial.
Rainwater harvesting – The capture, diversion, and storage of rain for future beneficial use. Typically, a rain barrel or cistern stores the water; other components include the catchment surface and conveyance system. The harvested rainwater can be used for irrigation.

Rapidly renewable materials – Materials that substantially replenish themselves faster than traditional extraction demand (e.g., planted and harvested in less than a 10-year cycle), do not result in significant biodiversity loss or increased erosion, positively impact air quality, and can be sustainably managed. Products in this category include, but are not limited to, bamboo products, wheat grass cabinetry, oriented strand board, and other wood products made from fast-growing pine trees.

Recycled content – Materials that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer) or after consumer use (post-consumer). Defined in accordance with the International Organization of Standards document ISO 14021.

Refurbished material – An item that has completed its life cycle and is prepared for reuse without substantial alteration of its form and use. Refurbishing involves renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality, or value of a product.

Renewable energy – Energy sources that are not depleted by use. Examples include energy from the sun, wind, and small (low-impact) hydropower, plus geothermal energy and wave and tidal systems.

Renewable energy credit (REC) – A tradable commodity representing proof that a unit of electricity was generated from a renewable resource. RECs are sold separately from electricity itself and thus allow the purchase of green power by a user of conventionally generated electricity.

Reuse – The reemployment of materials in the same or a related capacity as their original application, thus extending the lifetime of materials that would otherwise be discarded. Reuse includes the recovery and reemployment of materials recovered from existing building or construction sites. Also known as salvage.

Responsibly produced – Materials that are extracted, harvested, or manufactured in an environmentally friendly manner (includes certified wood products).

Reverberation time – The time in seconds it takes for the sound level to decrease by 60 decibels after the source of the sound has been abruptly interrupted.

Salvaged material – Materials that are recovered and reused for a similar purpose rather than processed or remanufactured for different use. Common salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick, and decorative items.

Solar reflectance index (SRI) – A measure of the constructed surface’s ability to stay cool in the sun by reflecting solar radiation and emitting thermal radiation. It is defined such that a
standard black surface (initial solar reflectance 0.05, initial thermal emittance 0.90) has an
initial SRI of 0, and a standard white surface (initial solar reflectance 0.80, initial thermal
emittance 0.90) has an initial SRI of 100. To calculate the SRI for a given material, obtain its
solar reflectance and thermal emittance via the Cool Roof Rating Council Standard (CRRC-1). SRI
is calculated according to ASTM E 1980. Calculation of the aged SRI is based on the aged tested
values of solar reflectance and thermal emittance.

**Source reduction** – A decrease in the amount of unnecessary material brought into a building in
order to produce less waste. For example, purchasing products with less packaging is a source
reduction strategy.

**Thermal comfort** – A condition of mind that expresses satisfaction with the surrounding
environment. It is determined by taking into account environmental factors (such as humidity,
A/C, heat) and personal factors (what an occupant is wearing).

**Total Cost of Construction** – The total cost of construction is the contractors’ price to the owner
of all materials, excluding mechanical and electrical materials, excluding all contractor labor
costs and all contractor fees (overhead, profit, insurance, bonds) when applying the 35%
default value as opposed to actual value for determining MR credits.

**VOC** – Volatile Organic Compounds are organic chemicals that are emitted as gases from
certain solids or liquids. VOC’s are emitted from paints, glue, cleaning supplies, pesticides,
furnishings, copiers and printers, craft and graphic materials, and adhesives to name a few.
Many scents and odors found in a building are from VOC’s. VOC’s are regulated by law,
especially for indoor materials that are dangerous to human health and cause harm to the
environment.

**Waste diversion** – A management activity that disposes of waste through methods other than
incineration or landfilling. Examples include reuse and recycling.

**Wetlands** – Areas that are inundated or saturated by surface or ground water at a frequency
and duration sufficient to support vegetation adapted for life in saturated soil. Wetlands
generally include swamps, marshes, bogs, and other similar areas.

**Xeriscaping** – Landscaping that does not require routine irrigation.

**Zero Net Energy (ZNE)** – A building that uses no more energy in the course of the year than
they produce from on-site renewable sources.