Integration

II.P1 Integrated Design — Prerequisite

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

Intent: Integrate high performance goals into district planning in early programming and in on-going decision-making to maximize system integration, and the associated efficiencies and benefits of high performance schools.

Integrated design is the consideration and design of all building systems and components together. It brings together the various disciplines involved in designing a building to develop and review their recommendations as a whole. It recognizes that each discipline's recommendations have an impact on other aspects of the building. For example, the HVAC system selection and design should take into consideration the building envelope and other building systems such as lighting and daylighting. A lack of teamwork can result in oversized systems or systems that are optimized for non-typical conditions. Integrated design allows professionals working in various disciplines to take advantage of efficiencies that are not apparent when they work in isolation. The earlier the integration is introduced into the design process the greater the benefit for both new construction and major renovation projects.

Requirement

Prerequisite	II.P1.1 Conduct a series of four integrated design team workshops that identify the project's high performance goals, ensure the incorporation of all HI-CHPS prerequisites, and target the appropriate HI-CHPS best practices and credits as an ongoing part of programming and design decision making. The workshops should not be standalone high performance school workshops, but integrated with the required Charette Process under the Department of Education EDSPECS, Chapter 2-Charette Process Guide. The first workshop must take place during the programming phase. The second, during schematic design. The third, in the late construction document phase to "quality check" the documents with particular emphasis on maintenance and operational aspects. School staff in charge of mechanical and electrical system operation, cleaning, landscaping, recycling, trash collection, and purchasing are required to attend. The final, and fourth workshop shall be held during the early part of construction, and must include the general contractor and major subcontractors to convey the integrated design intent and discuss implementation issues. For all workshops, attendees should include all individuals under contract that have influence on a HI-CHPS credit or prerequisite such as: • Owner Representatives – DOE Project Coordinator (or Owners Project Manager), Facilities Maintenance Representative, District or School Capital Project Staff, Utility Representative (to ensure project is enrolled in appropriate incentive programs) and Commissioning Agent. • All Design Consultants – Architect, Interior Designers, Engineers (Mechanical, Electrical, Plumbing and Civil), Food Service, Acoustic and Energy Consultants, Lighting Designer, and Landscape Architect.

		• Construction Representatives – General Contractor and Major Subcontractors. • School Occupants Representatives - Principal, Students, Teacher Representative(s), Parent Representative(s), Operations Staff, and Community Members. The outcome shall be a plan of how each prerequisite and credit will be implemented, the person responsible, and a timeline of key deliverables or implementation procedures.
Prerequisite	II.P1.2	Incorporate the projects HI-CHPS Scorecard as a plan sheet in the approved construction drawings. For CHPS Verified projects, a model plan sheet is provided through the CHPS Verified Program.

Implementation

Assign a facilitator to oversee the integrated design team workshops. The most likely candidates are the project architect or school project manager.

The CHPS Verified Program and/or HI-CHPS Scorecard are efficient tools to record the results. In addition, if time and resources allow, software programs are becoming available that can be used during the workshops to provide immediate feedback on the feasibility of the strategies being considered.

Keep in mind that although integrated design team workshops are an important first step in achieving the benefits of high performance schools, a collaborative team process should be carried out through continual interdisciplinary dialogue all the way through the completion of construction and into post-occupancy to discuss lessons learned for future projects, and to highlight any pertinent maintenance and operations issues.

In addition, although only four integrated design workshops are required, depending on the district's and team's level of high performance schools knowledge and experience, and/or the complexity of the project, more workshops may be required to ensure optimum results.

Verification

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

Design Review Requirements	
II.P1.2	Construction drawings must incorporate the HI-CHPS Scorecard provided through the CHPS Verified Program.
Construction Review Requirements	
II.P1.1	Submit meeting agendas and attendee lists with identifying roles for all four required workshops.
II.P1.1	Submit meeting minutes that outline high performance goals, implementation procedures, topics needing further investigation or research, and team members responsible for each prerequisite and targeted credit.

Resources

CHPS Best Practices Manual, Volume II: Integrated Design.

HI Department of Education EDSPECS Chapter 2, Section 203 –The Charette Process Guide - http://fssb.k12.hi.us/educational_specifications.htm

U.S. Department of Energy Office of Renewable Energy and Energy Efficiency. Integrated Building Design: http://www.eere.energy.gov/buildings/info/design/integratedbuilding/

ANSI/MTS 1.0 Whole Systems Integrated Process Guide (WSIP)-2007 for Sustainable Buildings & Communities ©

Integration

II.P2 Microclimate Based Design — Prerequisite

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

Intent: Optimize the site design and building impacts by studying local climate considerations in the layout of buildings and exterior spaces early in the planning process.

The climate amongst Hawaii's islands is dynamic, ranging from dry and arid, to steeply sloped rainforests, and humid coasts. It is likely that each school project will have a different solution to optimize resource efficiency and occupant comfort. The projects microclimate, including temperature, humidity, solar access and wind should be considered in energy and occupant comfort conscious site planning to reduce climate impacts on the building and the need for artificial light, ventilation and air conditioning.

Requirement

Prerequisite	II.P2.1 Site Analysis - Study the project sites local microclimate, including collection of 24 hour, annual data on temperature, humidity, solar access, landscape elements (including soil analysis), neighboring buildings, historic weather events, and prevailing trade winds. The data must be made available prior to the required workshops in prerequisite II.P1 Integrated Design. II.P2.2 Findings - Prepare recommendations and findings on each design consideration below. Hawaii school design teams will particularly need to provide discussion on how a solution for efficiency or occupant comfort might impact other relationships, particularly those between optimal acoustics, thermal comfort, ventilation, daylighting and school security. • Building Orientation • Alternative Energy Options • Ventilation and Conditioning Methods – Consider natural, mechanical and mixed mode. • Landscaping – Consider options to reduce heat gain, provide shelter from extreme weather events and wind, capture rainwater, or deflect unwanted noise. • Materials - Consider options, particularly for schools on the coast with high humidity that perform well against an abundance of moisture and extreme weather events. • Daylighting - Include discussion on optimal fenestration placement (windows, light shelves and skylights), devices for shading, and how best to manipulate daylight indoors such as with overhangs, awning windows, eaves and porches/lanai. • Disaster Management

Implementation

II.P2.1 Site Analysis

Provide analysis of the sites microclimate prior to the integrated design workshops noted in prerequisite II.P1. Since the microclimates in Hawaii can change even within a few miles, it is unacceptable to use regional or statewide data. Performing a thorough site analysis is critical to understanding all the opportunities and complexities of a building site, and ensuring informed decisions are made.

II.P2.2 Findings

Provide a list of recommendations on all items covered in the prerequisite based on the analysis under II.P2.1. While it is not explicitly stated in the prerequisite, it is likely that the design team will want to look at the physical connections between neighboring properties and transportation paths. Examples of recommendations anticipated based on wind data may include how the shape of a building itself can create wind-sheltered spaces, or how prevailing winds when designing parking lots and driveways can help blow exhaust fumes away from the school. In open, windy areas (areas that are at Wind Zone II and above as delineated by FEMA), the team could consider providing natural or man-made windbreaks and/or topography to reduce wind velocity through site, or maximize it through capturing the renewable energy resource.

Verification

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

Design Review Requirements	
II.P2.1 and II.P2.2	Submit the detailed site analysis and findings. For credit to be awarded, all of the measures listed under the site analysis and findings requirements must be included. For major modernization projects, if a requirement seems unreasonable based on the scope, provide justification through the verification process.

Resources

Hawaii State Climate Office: http://www.soest.hawaii.edu/MET/Hsco/

Fuller Moors, "Environmental Control Systems: Heating, Cooling, Lighting (Paperback)" Chapter 4 on Microclimates has detailed guidelines on designing for microclimates.

FEMA Wind Zones in the United States: http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm

CSU Extension Bulletin #7.225 "Landscaping for Energy Conservation"

Olgyay, V. (1963). Design with Climate: Bioclimatic approach to architectural regionalism. Princeton: Princeton University Press

National Climatic Data Center: http://www.ncdc.noaa.gov/

Western Regional Climatic Center: http://www.wrcc.dri.edu/

Integration

II.P3 Educational Display — Prerequisite

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

Intent: Increase the school community's knowledge about the basics of high performance design using an educational display.

Recognizing that the school itself can serve as a learning tool, students and staff can benefit by having an educational display to illustrate the environmentally sustainable, efficient, healthy design of the school.

Requirement

Prerequisite	II.P3.1	Provide a permanent display on the school site that describes the high performance features that are part of the school's design.

Implementation

A permanent educational display must be located in a prominent location at the school. The display shall include a list of all HI-CHPS features with a statement of the intent, and an explanation of each high performance feature. Visual aids or drawings can be used to illustrate features as needed. Include a map of the school and grounds pointing to location(s) where demonstration areas of the sustainable features can be seen.

The display may be electronic and interactive, but must be physically present at the school site and dedicated for this purpose. It may not be a virtual display only accessible via computer, unless that computer is permanently located as described above. It is recommended that it is designed so that it can be updated periodically.

Schools are encouraged, but not required to develop curriculum and dedicate instructional hours for high performance school education. Schools that do this may consider applying for innovation credit.

Verification

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

Design Review Requirements	
II.P3.1	Construction drawings must include the location and details of display.
Construction Review Requirements	
II.P3.1	Submit a picture of the installed educational display.

Resources

The Education and the Environment Initiative: http://www.calepa.ca.gov/education/eei

Integration

II.C1 Enhanced Integrated Design — 2 Points

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

Intent: Engage the entire project team in incorporating sustainable building strategies in early programming and on-going design decision-making in order to maximize systems integration and associated efficiencies and cost-benefits as well as identify other sustainable opportunities beyond the prerequisite.

Integrated design is the consideration and design of all building systems and components together.

Requirement

1 point	II.C1.1 Engage the projects General Contractor during the design phase, prior to completion of construction documents. The Contractor shall provide sustainability, constructability, and document coordination reviews. The Contractor may present value engineering options, and schedule and cost data as needed for the Owner and the design team to make fully informed decisions in the best interest of the project. Include the General Contractor with key mechanical and electrical subcontractors to assist the design team with specific information on the buildings systems.
1 point	II.C1.2 Utilize Building Information Modeling (BIM) to create a model of the entire project including architectural, structural, mechanical and electrical systems.

Implementation

II.C1.1

The General Contractor can be engaged in the project by the Owner through design-build, design-assist, construction management, or any other method that is acceptable to the Owner. The General Contractor, and if available, key mechanical and electrical subcontractors, should be integral members of the design team, participating in design coordination meetings and workshops.

II.C1.2

Building Information Modeling (BIM) is the process of using three-dimensional modeling software to generate and mange building design, construction and operations management. The process produces a model that encompasses building geometry, spatial relationships, systems analysis, orientation, geographic information, and quantities and properties of building components. BIM can be used to demonstrate the entire building life cycle, including the processes of construction and facility operation. It is also useful for records retention of the building systems and plans.

It is recommended, but not required, that the contractor input as built conditions into the model for facilities operation management. Consider using clash-detection to help reduce the risk of human error in modeling systems that collide with one another.

The following software programs are acceptable to meet this credit or an equivalent: Revit, Bentley BIM, and Tekla.

Cross Category and Other Considerations

The goals in this credit build on prerequisites II.P1 and II.P2, which require microclimate based design and integrated design team workshops during the school planning phases.

Verification

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

Design Review Requirements	
II.C1.1	Provide proof of the General Contractors involvement through contract or letter, including commitment and work completed.
II.C1.2	Construction drawings submittal must include BIM model with required features.

Resources

See resources under Prerequisite II.P1 Integrated Design.

Integration

II.C2 Demonstration Areas, Staff Training and Community Outreach — 2 Points

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

Intent: Provide students, teachers and staff with more in-depth knowledge for each aspect of high performance design on their school site, including sustainable sites, water conservation, energy and material efficiency, and indoor environmental quality.

High performance features offer excellent opportunities to teach students about the specific ideas and technologies incorporated into the school. Demonstrating these features in the architecture of the school provides a hands-on experience for students, teachers and staff.

Requirement

1 point	II.C2.1	Create demonstration areas for three out of the five major high performance categories of the HI-CHPS Criteria: Site, Water, Energy, Materials and Waste Management, and Indoor Environmental Quality. Within these demonstration sites at least one feature of a high performance category must be showcased. Each demonstration area must explain how the high performance feature(s) work, its environmental and economic benefits, and how it exemplifies a holistic and integrated approach to sustainable design.
1 point	II.C2.2	When the school opens, or the modernization is completed, provide training and a manual for school occupants on the high performance aspects of the school. The intent is to allow the occupants to learn how they can assist in assuring the operation of the school enhances the high performance school goals.
	II.C2.3	When school construction is complete, provide an open house for the community to tour and visually experience the benefits of the high performance school. Provide a copy of the invitation, tour features, and guest book of attendees.

Implementation

Demonstration areas are required for three out of the five major high performance categories in HI-CHPS Criteria. Each demonstration area will showcase a minimum of one feature included in a high performance category. This feature will have been utilized in the design of the new school, new building, or renovation project. The design of the demonstration areas may include, but are not limited to, signage, kiosks, weather stations, cut-always, meters, graphic illustrations, artistic murals, videos, real-time displays, or other design elements. For example, a demonstration area could be a meter of resource flows/usage, or a visual display of electrical generation provided by the photovoltaics. The display may be electronic and interactive, but must be physically present at the school site and dedicated for this function. It may not be a virtual display only accessible via computer, unless that computer is permanently located as described above.

When choosing materials or media to portray a high performance feature, ensure that they do not conflict with the other intents of a high performance school. For example, a kiosk made out of virgin wood, or an electronic display not labeled by Energy Star®.

Schools are encouraged, but not required, to develop curriculum and dedicate instructional hours for high performance school education. Schools that do this may consider applying for an innovation credit.

Verification

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

Construction Review Requirements	
II.C2.1	Submit a picture of the installed demonstration areas with a brief description of each.
II.C2.2	Provide the training manual or a link if offered through the school's website. Provide a copy of training materials and attendee list.
II.C2.3	Submit pictures from the school's open house. Provide a copy of the invitation, tour features, and guest book of attendees.

Resources

Real Goods Solar Living Center, Hopland, CA: http://www.solarliving.org/design.cfm

School Diversion and Environmental Education Law (DEEL)

Integration

II.C3 Life Cycle Cost Analysis — 2 Points

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

Intent: Optimize environmental performance and economic savings through making decisions based on operational life.

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 that the employed strategy will prove economically advantageous or not. According to the Sustainable Building Technical Manual, a publication of the Public Technologies Institute, when viewed over a 25-year period, initial building costs for major building systems account for approximately just 2% of the total, while operations and maintenance costs equal 6%, and personnel costs equal 92%.

Requirement

2 points	II.C3.1 As part of the design process, perform a life cycle cost analysis showing net present value over 25 years, with a discount rate of 3%, for the major building systems considered for the project that are anticipated to consume significant amounts of energy, water, or other natural resources.

Implementation

A Life Cycle Cost Analysis (LCCA) will provide a much more accurate context for decision making than a tally of short-term initial costs. Ideally, this analysis compares alternatives that are relevant and viable options of interest to the owner and project participants. Major building systems with significant energy or water use should include, but are not limited to the following, HVAC, lighting, ventilation, and flooring. At least three options should be studied for each major system.

There are a variety of methods to use to conduct an LCCA, varying in complexity. The design team should select the tool that meets the spirit of the above requirements, while meeting the goals of the project. Some of those tools are listed below.

The Hawaii Department of Business, Economic Development and Tourism provides a spreadsheet and methodology for calculating the LCCA for Hawaii schools.

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.

The spreadsheet available through the Washington State ELCCA program is available electronically and can be modified to address alternatives other than energy. As an alternative to ELCCA, the Pacific Northwest National Laboratory has developed Facility Energy Decision System – FEDS 5.0 that analyzes energy efficiency in single or multiple buildings. In addition, FEDS can determine the impact of energy efficiency retrofits on emissions of CO, CO2, NOx, SO2, hydrocarbons, and particulates.

Verification

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

Design Review Requirements	
II.C3.1	Submit a copy of the project specific life cycle cost analysis.

Resources

Hawaii Department of Business, Economic Development and Tourism LCCA Worksheet: http://hawaii.gov/dbedt/info/energy/publications/schools/calculations.pdf

Energy Life Cycle Cost Analysis Spreadsheet, Washington State General Administration, available at http://www.ga.wa.gov/EAS/elcca/sheets.html

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

Whole Building Design Guide LCCA: http://www.wbdg.org/resources/lcca.php

Whole Building Design Guide, National Institute of Building Sciences, http://www.nibs.org/index.php/wbdg

Building Life-Cycle Cost (BLCC) Programs, U.S. Department of Energy, Energy Efficiency and Renewable Energy, Federal Energy Management Program, http://www1.eere.energy.gov/femp/information/download_blcc.html

Energy-10, National Renewable Energy Lab, http://www.nrel.gov/buildings/energy10.html

Integration

II.C4 Outdoor Classrooms — 1 Point

Applicability	Verification Required		
All projects. A major renovation project can claim this credit if the existing site qualifies.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Design outdoor classroom space for students to spend learning time outdoors.

Hawaii's climate and natural resources provide excellent opportunities for untraditional learning environments. Outdoor areas can be utilized as classrooms when well designed and thoughtful solutions are provided for seating and shade so that students can take advantage of fresh air and a change of pace from the formal classroom.

Requirement

1 point	II.C4.1 Provide at least one outdoor classroom on the school site with the following features: • Permanently installed seating for a minimum of 25-32 students for Elementary and Middle Schools, and a minimum of 25-35 for High Schools. The seating should be durable, and minimize the potential for abuse and damage from vandalism such as skateboarding. • An easily viewable instructional area from all student seats. Four (4) linear feet of instructional surface is desirable, but not required. • Protection from weather (ie direct sunlight, rain, and harsh winds). • The space shall be accessible, or on an accessible route. • Design decisions should include strategies to mitigate acoustical and visual distractions such as traffic (both major paths of travel within the school and vehicular), parking or recreational spaces. • Access to utilities (outdoor power, wifi, water).

Implementation

To earn this credit the project shall designate an area(s) appropriate for an outdoor classroom and provide the necessary amenities. The space and construction requirements should be noted in plans. Consider the relationships, and flow between the outdoor and an indoor learning space(s). In addition, consider how the space would be drained, cleaned and its security outside of school hours.

Cross Category and Other Considerations

The school may consider using the outdoor classroom as an outdoor learning laboratory for science, environment, cultural and project based learning, but it is not required.

Verification

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

Design Review Requirements

II.C4	Construction drawings must include an outdoor classroom space including the required features.
Construction Review Requirements	
II.C4	Submit a picture(s) of the completed outdoor classroom(s).

Resources

None.

Integration

II.C5 School Garden — 1 Point

Applicability	Verification Required		
All projects. A major renovation project can claim this credit if the existing site qualifies.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: To encourage schools to incorporate teaching gardens into their sites and curriculum.

School gardens can provide a diverse learning environment as well as a beautiful respite from the demands of the rest of the school day. Gardens promote learning about the environment, natural systems and/or healthy foods. Students who are not engaged by traditional learning methods often find the experience of working and learning in the garden a welcome path to understanding.

Gardens can be integrated into curriculum and should promote alternatives to the use of pesticides and herbicides. School Gardens can also be the site of school-wide composting programs.

Requirement

1 point	II.C5.1 Provide a site on campus for one or more school gardens with a minimum of 200 sf for a student enrollment of 499 or less, and 500 sf for student enrollment greater than or equal to 500. The garden must promote learning about the environment, natural systems and/or healthy foods, and may not be used to count for other credit.
	II.C5.2 Provide the garden with a permanent source of water for irrigation that may include access to a tap and hose, an installed irrigation system, or access to a rain barrel or other storage collection system.
	II.C5.3 Provide dedicated storage space for garden maintenance supplies and tools.
	II.C5.4 Provide signage to designate the area as a school garden and to differentiate it from the surrounding grounds.
	II.C5.5 Develop an annual maintenance plan to ensure the garden is implemented and continues to thrive.
	II.C5.6 For existing school sites (major renovations or new building on existing campus project) the soil must be tested to ensure there are no harmful contaminants. New school sites should be covered under prerequisite SS.P1 site requirements.

Implementation

To earn this credit, the project shall designate an area(s) appropriate for gardening by the school community. Examples of acceptable uses of garden space include a vegetable garden, taro loi, aqua gardening, aquaponics, bee or butterfly habitat, or for animals such as turtles, fish and ducks.

A school garden can come in many different forms. It can be fenced off, or physically separated from buildings, making it easily accessible to the school and to community members, or it can be integrated onto the school site in multiple areas or planters. Unique gardens, such as roof gardens, can also be considered for credit.

It is highly recommended that school community members, including staff and parents, are involved the school garden and its development. When school is closed during summer months, the garden will still need care, and community support is essential for this purpose.

The garden must have:

- A prominent entrance that is easily accessible and/or identified by signage.
- A long-term maintenance plan to ensure the garden is implemented and continues to thrive.
- Soil that has been tested (for existing school sites or redeveloped sites) to ensure there are no contaminants.
- Permanent source of water for irrigation (a rain barrel or other collection system could be considered in areas where rainfall can provide the necessary supply).

Verification

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

Design Review Requirements	
II.C5	Construction drawings should identify the location and size of the garden as well as its storage space. Irrigation for the garden should be identified on a landscape irrigation design plan.
Construction Review Requirements	
II.C5	Submit a picture(s) of the completed garden(s).
II.C5	Submit the long-term maintenance plan for the garden spaces.
II.C5	For existing schools, submit proof that the garden site soil has been tested and no harmful contaminants are present.

Resources

Hawaii Island School Garden Network: http://www.kohalacenter.org/HISGN/

The Edible Schoolyard: http://www.edibleschoolyard.org/Board of Water Supply Native Hawaiian Plants: http://www.hbws.org/cssweb/display.cfm?sid=1155

Department of Health Office of Environmental Quality Control, *How To Plant A Native Hawaiian Garden*, An On-Line Handbook
http://oeqc.doh.hawaii.gov/Shared%20Documents/Misc_Documents/1992_How_to_Plant_a_Native_Hawaiian_Garden.pdf

University of Hawai'i at Manoa College of Tropical Agriculture and Human Resources Hawaiian Native Plant Propagation Database
http://pdcs.ctahr.hawaii.edu:591/hawnprop/

Bornhorst, Heidi L. 1996. *Growing Native Hawaiian Plants: A How-To Guide For The Gardener*. Honolulu: The Bess Press.

Culliney, John L., and Bruce P. Koebele. 1999. *A Native Hawaiian Garden: How To Grow And Care For Island Plants*. Honolulu: University of Hawai'i Press.

Lilleeng-Rosenberger, Kerin E. 2005. *Growing Hawaii's Native Plants: A Simple Step-By-Step Approach for Every Species.* Honolulu: Mutual Publishing.

Kokuah Hawaii Foundation: http://kokuahawaiifoundation.org/

Hawaii Farm to School:
http://web.me.com/kokuahawaii/HFSSGHui/Hawaii_Farm_to_School_&_School_Garden_Hui.html

Hawaii Plant Images: http://www.hear.org/starr/images/?o=plants

Integration

II.C6 Grid Neutral / Zero Net Energy — 6 Points

Applicability	Verification Required		
All projects. For a new building on an existing campus, the buildings energy use needs to be separated from the rest of the schools to claim this credit.	⊗ at Design Review	○ At Construction Review	⊗ at Performance Review

Intent: Encourage grid neutral, or zero net energy schools to conserve energy, and take advantage of clean, efficient renewable energy solutions.

Buildings have a significant impact on energy use and the environment. This credit seeks to show that schools can meet all of their energy needs through energy conservation strategies combined with on-site, nonpolluting, renewable energy sources.

Points for this credit are in addition to points that can be claimed under EE.C1 Superior Energy Efficiency and EE.C2 Renewable Energy. Projects that choose this credit will minimize if not eliminate their dependence on off-site energy sources through use of a combination of strategies to minimize energy consumption while using on-site renewable energy generation. Schools must first consider energy conservation measures in this credit (demand side strategies) before choosing renewable energy technologies to provide on-site generation (supply side strategies). Demand side strategies include utilizing daylighting, natural ventilation, high efficiency electric lighting and HVAC systems, and building orientation. Supply side renewable energy strategies include photovoltaics, solar hot water, wind, hydroelectric, geothermal sources and biofuels.

Requirement

5 points	II.C6.1 Grid Neutral • The project must produce at least as much electricity from renewable sources as it uses in a year and; • Must exceed energy baseline used in EE.P1 by at least 40% and; • Must receive points in three of the following four credits; EE.C3 Advanced Energy Management System, SS.C10 Cool Roofs, SS.C11 Light Pollution Reduction, and EQ.C2 Daylighting.
Or 6 points	II.C6.2 Zero Net Energy • The project must produce at least as much energy (electricity and gas/fuel) as it uses in a year, and that energy produced must be renewable energy and; • Must exceed energy baseline used in EE.P1 by at least 40% and; • Must receive points in three of the following four credits; EE.C3 Advanced Energy Management System, SS.C10 Cool Roofs, SS.C11 Light Pollution Reduction, and EQ.C2 Daylighting.

Implementation

Grid neutral is defined as a "site that produces at least as much electricity as it uses in a year". A grid neutral school may use electricity from the grid during certain times of the year and provide electricity back to the grid at other times of the year; so long as the electricity used from the grid is balanced at the end of the year with on-site energy production. Grid neutral allows a school to use fossil fuel based outside energy sources for uses

such as cooking, water heating, space heating, or backup generators. The strategies used should be available for the life of the buildings.

Zero net energy is defined as a "site, which produces at least as much renewable energy as it consumes on an annual basis." School projects will need to use a combination of energy efficiency design strategies to conserve energy and find renewable energy sources for supply. District generated off-site renewable energy sources, which supply the project, qualify for this credit. Third party generated off-site renewable energy sources do not qualify for this credit. The strategies used should be available for the life of the buildings. An example would be using solar thermal to offset gas use for water heating.

On-site energy production can be financed by a third party, such as a power purchase agreement contract, and qualify for this credit so long as the energy produced on site, is used on site.

Verification

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

Design Review Requirements	
II.C6	Compliance will be verified through following the requirements under EE.C1 Superior Energy Efficiency and EE.C2 Renewable Energy.
Performance Review Requirements	
II.C6	Prove performance as a grid neutral or zero neutral school after one year of operation.

Resources

See resources under EE.P1 Minimum Energy Performance

See resources under EE.C2 Renewable Energy

Integration

II.C7 Plug Load Reduction — 1 Point

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

Intent: Reduce the electric load from plugged-in equipment where efficiencies are available and controls can be utilized.

Plug loads can contribute to a significant amount of the total school energy load. Choosing equipment and appliances carefully to ensure they are energy efficient, and understanding what the future plug loads of the school will be once opened, are important steps during school design, planning and construction to reduce these energy loads.

Requirement

1 point	II.C7.1 Develop a plug load reduction plan that identifies all potential plug loads in the school and devices to turn off or "sleep" when not in use. Plug loads identified in the plan should be incorporated into the energy model used in prerequisite EE.P1 Minimum Energy Performance.

Implementation

Plug loads can include computers, vending machines, kitchen cooking equipment, shop/vocational equipment, and general miscellaneous equipment that are not hard-wired to the building. Examples of plug load reduction techniques include putting timers or smart socket technology on computers or other such equipment to turn them off or to sleep at night or when not in use, installing Energy Misers™ on vending machines, and limiting or prohibiting personal appliances in individual classrooms such as refrigerators and microwaves.

Consider providing kilowatt meters in high plug load reduction rooms (computer labs, home ec rooms) for user awareness or other integrated systems. (onsetcomp.com/hobo)

Verification

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

Construction Review Required	
II.C7	Submit the plug load reduction plan, including the inventory of equipment and identification of the responsible party for implementation of the plan.

Resources

None.

Integration

II.C8 School Master Plan — 1 Point

Applicability	Verification Required		
All projects. For major renovations and a new building on an existing campus, this credit may be earned if the master plan is developed for the entire school site, not just the portion being renovated or built.	○ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Ensure high performance school priorities are carried out throughout the life of the school.

While a school is being renovated or designed it is important to consider the needs the school may have in the future, and how those needs may be met while keeping high performance principles in mind. It is also important to have a master plan in place to ensure that the intent of the design or renovation is carried out when the school is renovated and maintained in its future.

Requirement

1 point	II.C8.1	Develop a School Master Plan for the site and facilities of the individual school. Community stakeholders are encouraged to contribute. The plan shall include: • Support for the continued compliance with high performance strategies followed in this Criteria. • Assessment and plan for future transportation impacts on the school and flexibility for addition of alternative forms of transportation. • Assessment and plan for the possibility of increased and decreased student enrollment. • Assessment using the school for emergency preparedness such as a shelter. • Assessment and plan for future high performance upgrades and renovations by documenting the life cycle of major materials and systems, and documenting opportunities for high performance replacement such as recycle or reuse. • Identification of current and future opportunities for pedestrian and bike connections to surrounding neighborhoods, community services and bike paths.

Implementation

The School Master Plan should cover ten (10) to fifteen (15) years from the school opening or a major renovation being completed. Some schools in Hawaii may already have a master plan, so a new plan may not be needed. The existing plan can be reviewed for compliance with the above requirements, and updated if needed.

Verification

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

Construction Review Requirements

II.C8	Submit school master plan.

Resources

Hawaii State Civil Defense Emergency Preparedness http://www.scd.hawaii.gov/preparedness.html

Integration

II.C9 Innovation — 6 Points

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

Intent: Test, understand and implement innovative approaches to improving the health of school occupants and the performance of school facilities.

The purpose of this credit is to allow school project teams to be creative and to take advantage of and/or test new technologies or strategies for improving the health and performance of students, schools and the environment. The innovation may take an existing HI-CHPS credit to a new height, or take a direction not offered by HI-CHPS.

The following may be considered for innovation points under HI-CHPS, however are not guaranteed:

- Performance beyond that awarded in an existing HI-CHPS credit or prerequisite such as the minimum ASHRAE standard for ventilation.
- Concepts that significantly ease implementation of a credit defined in the CHPS Operations Report Card (ORC).
- Innovative strategies or technologies such as displacement ventilation or non-traditional passive cooling systems.
- School programs with high performance benefits.

Requirement

1-6 points	II.C9.1	Implement new technologies or strategies that provide at least one of the following not currently offered in the CHPS rating program: • Improved health and performance of students and staff. • Improved performance and efficiency of school facilities, or operation of those facilities. • Improved natural environment. **OR** The innovation credit can reward exceptional performance in an existing credit area through submission of a narrative explaining how the credit was exceeded by a significant amount.

Implementation

The point value of the credit will be determined through the HI-CHPS Verified Program review process. A maximum of 3 points will be awarded per strategy, technology or for exceptional performance beyond an existing threshold. Points will be awarded based on the technology or strategy's ability to:

- Improve the health and performance of students and staff.
- Improve the performance and efficiency of school facilities, or operation of those facilities.
- Improve the natural environment.

The HI-CHPS Criteria are designed to be a comprehensive guide to high performance design, but as new technologies and creative designs evolve, there is a need to support and encourage them. These credits are also offered for communities that go beyond what is required by the guidelines and push to achieve superior performance, educational and environmental benefits, and excellent policies.

As innovation credits are achieved in HI-CHPS projects, they will be made publicly available on the HI-CHPS website.

Ideas for innovation credits are listed below:

- Develop a comprehensive and innovative plan for using the sustainable aspects of the school as teaching tools.
- Install sensors and monitor indoor air quality.
- Implement green construction practices, such as limiting dust, noise and exhaust into nearby neighborhoods.
- Adopt an indoor temperature setting policy that establishes the air temperature for all rooms and is publicized so that occupants know what to expect.
- Adding a permanent weather station to the school site that is integrated with the schools energy management system.
- Prohibiting use of materials on the site that are on the Living Building Challenges Red List for construction materials.

Verification

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

Construction Review Requirements		
○	II.C8	For each new credit attempted: 1) define the credit and its purpose; 2) describe the proposed criteria for compliance including any applicable standards; 3) identify documentation requirements that verify compliance with the proposed credit; 4) submit a narrative describing how the credit reflects sustainable or environmental health and safety practices, and 5) submit documentation identified in 3). For claiming credit for exceptional performance in an existing credit area, submit a narrative of the design approach, including an explanation of how the original credit was exceeded by a significant amount.

Resources

None.

Integration

II.C10 Design for Adaptability, Durability and Disassembly — 2 Points

Applicability	Verification Required		
All projects. This credit may be used by major modernization projects; however it most likely more difficult to obtain due to existing system and building constraints.	⊗ at Design Review	⊗ at Construction Review	○ at Performance Review

Intent: Reduce building material waste and promote local building material reuse during construction, renovation, repurposing of space, and disassembly. Provide spaces that are adaptable, durable, and flexible. Drive innovation in designing schools to support disassembly and reuse.

Construction, renovation and demolition waste comprises 30-40% of all solid waste in the US each year and 60% of the material resources that flow through the US economy annually (excluding food and fuel) are consumed by the built environment. (U.S. EPA and USGS) These figures are of particular concern because the average age of a school building in the U.S. is 40 years, and most schools are typically demolished by the age of 60 (NCER, 2000). In addition, school owners may spend up to three times the cost of the original construction in repairs, renovations and demolition over a school's lifespan. (Brand, 1994)

Designing for adaptability and disassembly will allow schools to economically act as stocks of materials for future buildings with minimal to zero loss of the materials during renovations and disassembly. As a by-product of this design concept, schools will be more adaptable and will extend the lives of their materials through whole building flexibility. The U.S. EPA Life Cycle Building Challenge and the Building Materials Reuse Association inspired this credit.

Requirement

1 point	II.C10.1 Provide the school owner, builder and records management systems with a Disassembly Plan that has the method of disassembly of major systems during renovations and end-of-life, and the properties of major materials and components. At minimum the plan should include: • An explanation of reusable, recyclable, and durable component and material selections. • An explanation of modular components and dimensions, and plug-and-play components for major systems. • A plan for major component repairs and replacements, potential conversions, and end-of-life disassembly. • A complete set of as-built drawings if different than design drawings. • An inventory of chemical and mechanical properties as appropriate, ratings and warranties, manufacturer name and date and production. • A description of strategies to minimize the use of coatings and composites. • A plan to allow for movement of workers and equipment in the deconstruction phase.

1 point	II.C10.2 Comply with II.C10.1 and design major systems with differing functions and lifespan to promote disentanglement. Comply with two of the following to receive credit: • Separation of envelope from structure. • Dedicated service voids (cores, chases, tracks, raceways). • Separation of interior spatial plan from structure. • Separation of finishes from substrate associated with spatial plan, structure or weather envelope. **AND** II.C10.3 Provide access to, and types of connections that allow, disassembly. To receive credit choose one major system (roof or HVAC) and provide: • Visible and/or ergonomic connections. • Human scale components and use of industry standard connectors and tools / equipment that are trade-friendly. • Minimize number and different types of connectors over whole building. • Use of reversible connections (screws, bolts, nails, clips).

Implementation

II.C10.1

Develop a Disassembly Plan that incorporates design for disassembly, durability, and adaptability principles. Even the best design for adaptability and disassembly will not be realized if the building constructors, operators, and deconstructors do not understand how to implement the disassembly processes as they were intended. Therefore, an important element of the design process is the documentation and dissemination of the building's design intent per its materials, components, connections and form. The Disassembly Plan should also be updated to mitigate the deconstructor's need to "start from scratch" to understand the building. Include in specifications and contractor agreement language that stipulates development of as-built drawings and materials inventory of major systems.

A successful Disassembly Plan should include:

- Statement of strategy for design for disassembly and adaptability relating to the building.
  - Demonstrate the strategy behind the designed re-usable elements and describe best practices to ensure they are handled in a way, which preserves maximum reusability.
  - Building elements.
  - Provide an inventory of all materials and components used in the project together with specifications (including Material Safety Data Sheets (MSDS) as applicable) and all warranties, including manufacturers' details and contacts.
  - Describe the design life and/or service life of materials and components.
  - Explain reusable, recyclable, and durable component and material selections that facilitate adaptability, disassembly, reuse, and recycling.
  - Describe modular components and dimensions, and plug and play components for major systems.
  - Identify best options for reuse, reclamation, and recycling for all building elements. This may change between time of construction and time of disassembly so the Plan should be updated.
- Provide instructions on how to deconstruct elements.
  - Provide up-to-date plans for identifying information on how to adapt and deconstruct the school.
  - Where necessary add additional information to the "as built" set of drawings to demonstrate the optimum technique for removal of specific elements.
  - Describe the equipment required to dismantle the building, the sequential processes involved and the implications for health and safety as part of the management requirements.
  - Advise the future contractors on the best means of categorizing, recording and storing dismantled elements.

- Distribution of Disassembly Plan.
  - Revise the plan as necessary and reissue to all parties at the building completion stage, so that there is maximum awareness of the design for disassembly requirements for the future, including the school owner, architects, and builder.
  - Place copies of the revised Disassembly Plan with the legal documents of the building, and any building commissioning, or operations and maintenance files and with the school's electronic documentation.

Submit a Disassembly Plan including as-built drawings or design drawings and an inventory of chemical and mechanical properties.

II.C10.2

Construction drawings should indicate compliance. Photo-documentation can serve as evidence of compliance. For examples, see *Design for Disassembly in the Built Environment: An Atlanta Home Case Study*, by Andrea Korber and Brad Guy, Pages 5-10. http://www.lifecyclebuilding.org/files/DfDCaseStudyHomeSummary.pdf

Submit construction drawings and photo documentation indicating specific disentanglement strategy used.

II.C10.3

Choose a major system to provide access to and types of connections that allow disassembly. Choose systems such as roofs and HVAC's that have a high rate of repair or replacement in schools. This can be as simple as access hatches to tie-offs to exposed systems. Provide system and connector drawings or other documentation.

Cross Category Considerations

There are further credits that provide support for durable schools including II.C3 Life Cycle Cost Analysis, and MW.C7 Durable and Low Maintenance Flooring.

Verification

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

Design Review Requirements	
II.C10.2	Construction drawings must show major system designs to promote disentanglement. It may be necessary to provide additional sketches or drawings that are not typically found in plan sets.
II.C10.3	Construction drawings must show system connection drawings.
Construction Review Requirements	
II.C10.1	Submit Disassembly Plan.
II.C10.1, II.C10.2, and II.C10.3	Submit pictures of the features taken during construction with narratives of what is shown.

Resources

U.S. EPA Lifecycle Building Challenge: http://www.lifecyclebuilding.org/resources.php

Building Materials Reuse Association: http://www.buildingreuse.org

Reuse Development Organization, Inc: http://www.redo.org.

Disassembly Plan: http://www.lifecyclebuilding.org/files/DfDseattle.pdf pp. 16-17 (Adapted from SEDA, 2006)