

Best Practice Guide for Sustainable Operations

K-12 Schools

Acknowledgements

I would like to thank the following individuals and organizations for their immeasurable support in developing this paper; Scott Glick, Brian Dunbar, William Timpson, YRG sustainability (especially Josh Radoff and Lauren Yarmuth for their consistent encouragement toward this pursuit and for keeping me employed), the USGBC Colorado Green Schools Advocacy Committee (particularly Joel Asrael, Bill Franzen, Margaret Paulson, Pete Jefferson, and Bethany Strotham), and Elizabeth "Leez" Layton for her superior editing skills.

Additionally, I would like to thank my ever patient, loving, and supporting family Emily and Cody for their enduring participation in the long and enlightening journey that was this paper.

How to Use this Document

This document compiles a listing of best practices for sustainable operations in K-12 schools and is intended to be used by building operators, school administrators, facility managers, and teachers. The guidelines serve to establish clear strategies for sustainable operations, including building exterior and landscape management, water and energy efficiency, waste management, and procurement. The delivery and presentation of material provides a succinct and relevant resource and framework for schools to engage in key areas of sustainable operations. The guidelines also serve to provide the framework and tools to develop a sustainable operations plan for any K-12 school. The best practices included support achievement of a high level of sustainability and by focusing on daily and ongoing operations the guidelines support LEED for Existing Buildings: O&M certification for any existing school.

The guidelines are organized into nine independent sections related to sustainable operations in schools and include the following:

- Section 1: Building Exterior, Landscape, and Pest Management
- Section 2: Alternative Transportation
- Section 3: Indoor and Landscape Water Efficiency and Measurement
- Section 4: Green House Gas Footprinting
- Section 5: Energy Assessment and Improvement
- Section 6: Existing Building Commissioning
- Section 7: Sustainable Procurement
- Section 8: Solid Waste Management
- Section 9: Green Cleaning

Within each of these sections, best practices are outlined for specific sub-categories related to the section topic. For example, Section 2: Alternative Transportation includes sub-categories that outline best practices for Alternative Fuels, Bus Maintenance and Operations, Non-Fleet Vehicles, and Bicycle and Pedestrian Access. In addition to best practices, each section provides references for established curriculum related to the section topic and lists the LEED for Existing Buildings Operations and Maintenance credits and prerequisites that are directly related to the best practices included in the section.

In addition, to help provide direction for users of this guide, each section begins with Process Steps that provide a list of specific steps to take in addressing sustainable operations for the section topic. As an example, Section 2: Alternative Transportation outlines the following Process Steps to address the section topic:

- Investigate alternative fuel use and retrofit opportunities for the existing bus fleet.
- Develop and implement a bus idling reduction policy.
- Explore financing and opportunities to replace the oldest buses in the fleet.

- Develop and implement a low emitting and fuel efficient vehicles policy for upgrades and new purchases for all non-bus fleet vehicles.
- Implement incentive programs to support biking and walking to school for students and faculty.

These Process Steps tell the user what he/she can do and the best practices that follow provide direction on how to get there. In order to make best use of the guidelines, users can first establish what their goals are related to sustainable operations and define priorities accordingly. If operational cost savings are a priority then the user may choose to focus on Section 5: Energy Assessment and Improvement and Section 6: Existing Building Commissioning. However, if a healthy school is a priority, then users may elect to focus first on Section 9: Green Cleaning. Regardless the guidelines strive to support a holistic approach to sustainable operations and ultimately all facets of the guidelines are important to promote healthy, productive, environmentally friendly, economically sound, and sustainable schools.

Contents	
How to Use this Document	3
Contents	3
Building Exterior, Landscape, and Pest Management	5
Building Envelope Maintenance	5
Pest Management.....	6
Landscape Maintenance.....	6
Turf Areas.....	6
Site Hardscape	7
Snow and Ice Management.....	7
Maintenance Equipment.....	7
Introduction to Integrated Pest Management (IPM) Curriculum	8
Alternative Transportation	10
Alternative Fuels	10
Bus Maintenance & Operations	11
Non-Bus Fleet Vehicles	12
Bicycle & Pedestrian Access	12
Biodiesel Curriculum.....	12
Indoor and Landscape Water Efficiency and Measurement	14
Water Metering and Sub-Metering.....	14
Irrigation Systems Maintenance	14
Interior Systems Maintenance	15
Fixture Upgrades	15
Water Use Curriculum	16
Green House Gas Footprinting	18
EPA Climate CHECK.....	18
Greenhouse Gas Curriculum	20
Energy Assessment and Improvement	21
Energy Star Portfolio Manager	21
Energy Audit	22
Identify and Sequence Low Cost Improvements.....	22

Preventative Maintenance Plan	23
Performance Based Contracts – ESCOs.....	24
Energy Curriculum	25
Existing Building Commissioning.....	27
Planning.....	27
Investigation	28
Implementation	29
Handoff	29
Energy Curriculum	31
Sustainable Procurement	32
Ongoing Consumables	32
Durable Goods	33
Lamps.....	34
Procurement Curriculum.....	36
Solid Waste Management	38
Waste Audit	38
Source Reduction	39
Recycling	40
Composting	41
Waste Management Curriculum	42
Green Cleaning	45
Entryway Systems Maintenance.....	45
Cleaning Products	45
Cleaning Equipment	46
Integrated Pest Management	46
Quality Control	46
Indoor Air Quality (IAQ) Curriculum	47

Impacted Operations

Building Envelope Maintenance

Pest Management

Landscape Maintenance

Site Hardscape

Snow and Ice Management

Maintenance Equipment

Process Steps

- Compile and document current building exterior, site, and landscape maintenance operating procedures.
- Identify potentially hazardous chemicals employed including, cleaning agents, fertilizers, and de-icing agents.
- Identify opportunities to incorporate best practices to contribute to sustainable goals.
- Develop sustainable landscape and site maintenance plan to address all applicable Impacted Operations for site and landscape management.

Best Practices

Building Envelope Maintenance

- Conduct regular preventative maintenance inspections of the building exterior to monitor envelope conditions. Focus inspections on moisture detection as well as envelope components that contribute to structure integrity and energy performance.
- If cleaning compounds are used for the building exterior, select environmentally preferred products and avoid using products which contain chemicals or other pollutants which can harm vegetation or pollute groundwater. Select cleaning products which are 3rd party certified as environmentally preferred. Third party certifiers include but are not limited to Green Seal and Environmental Choice EcoLogo. Other environmental attributes to look for include:
 - Minimizes exposure to concentrates
 - No ozone depleting substances
 - Reduced bioconcentration factor
 - Reduced flammability
 - Reduced or no added dyes, except when added for safety purposes
 - Reduced or no added fragrances
 - Reduced or no skin irritants
 - Reduced or no volatile organic compounds (VOCs)
- Avoid sand and baking soda blasting along with solvent or acid based cleaning products for exterior envelope cleaning. Desalinated water may be used with a nylon brush for regular cleaning of sand and dirt and a high pressure wash can be used in marine environments to remove salt deposits and algae.

- Establish a plan for preventative measures to reduce occurrence of graffiti. When necessary, select graffiti removal products which are 3rd party certified as environmentally preferred. See above for third party certifiers and environmental attributes to look for.

Pest Management

- Engage in an integrated pest management program (IPM) where a combination of strategies including biological, cultural, physical, mechanical, educational, and chemical methods are used to keep pest numbers at an acceptable level.
- When necessary utilize least toxic pesticides that have low or no acute or chronic toxicity to humans, affect a narrow range of species, and are formulated to be applied in a manner that limits or eliminates exposure of humans and other non-target organisms. Use spot treatments rather than area-wide applications. See the Bio-Integral Resource Center Directory of Least Toxic Pest Controls for more information on least toxic pesticides, <http://www.birc.org/>.
- Identify the problem or pest before taking action.
- Provide routine maintenance to keep vegetation, shrubs and wood mulch at least one foot away from structures.
- Seal or eliminate cracks and crevices in walls, floors and pavement.
- Clean garbage cans and dumpsters regularly.
- Follow local ordinances or notify building occupants at least 72 hours under normal conditions and 24 hours in emergency situations prior to the use of any non-least toxic pesticides.

Landscape Maintenance

- Minimize the use of chemical fertilizers. Promote the use of locally adapted plantings and alternatives to fertilizers with artificial chemicals. Use organic fertilizers when possible.
- Divert landscape waste from the landfill by mulching or composting. Composting can take place on site or be sent off site to a facility dedicated to composting organic materials.
- Use non-chemical methods to control pests whenever possible.
- Create a list of environmentally preferable, low risk fertilizer and pesticide products for use in coordination with landscape maintenance.

Turf Areas

- Conduct spot treatments when applying chemicals and apply fertilizer only to areas that need it. Determine the nutrients that are deficient before applying amendments by performing regular soil tests and monitoring the color of turf.
- Use grasscycling techniques (leave clippings on turf) as a means to compost clippings, apply free fertilizer, and reduce pollutants in the soil. Schedule mowing so that no more than 1/3 the length of the blade is cut at any one mowing.
- Monitor turf condition and moisture levels when mowing to determine if aerating, nutrients, or other measures are needed.
- Select turf maintenance products that maximize the use of organic materials, including animal manures and compost.
- Maximize watering in the early morning to reduce inefficiency from evaporation but avoid watering in evening hours as prolonged dampness can promote disease.
- Water turf deeply and less frequently and consider intermittent watering cycles that split the times for an area to allow the water to soak in better.

Site Hardscape

- Clean hardscapes regularly and monitor for hazardous materials or pollutants and remove accordingly.
- Avoiding hosing for cleaning purposes in arid climates and do not hose areas where hazardous or polluting materials exist.
- Select low-emission maintenance equipment. Electric and battery powered equipment is preferred.
- Where cleaning agents are used, select environmentally preferred products and avoid using products which contain chemicals or other pollutants which can harm vegetation or pollute groundwater.

Snow and Ice Management

- Prevent the formation of ice after storms and reduce the need for use of de-icing chemicals by removing snow in a timely fashion using shovels, snow blowers and plows.
- Where mechanical equipment is employed, ensure that equipment is regularly and well maintained to minimize environmental impacts such as leaking gas, oil, or other lubricants. Provide equipment operators with access to safety goggles and ear protection along with yearly orientation and safety procedures.
- Where de-icing chemicals are used, select potassium and magnesium chloride based products over sodium and calcium chloride based products. Apply deicing compounds with a spreader to minimize the amount of product used.

Maintenance Equipment

- Minimize equipment emissions by selecting battery and electrically powered maintenance equipment and by standardizing regular routine maintenance of equipment and minimizing idling time for fuel based equipment.
- Select maintenance equipment with lower noise emissions. Where equipment levels exceed 85 decibels, equipment operators should be provided access to and required to wear ear protection.
- Establish dedicated hardscape pathways for heavy maintenance equipment to move through school grounds. Restrict travel on vegetated and landscaped surfaces.
- Adopt a district wide idling policy for maintenance equipment to minimize staff, students, and visitors to equipment emissions. See also, "Bus Idle Reduction" in the Alternative Transportation section.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
Building Envelope Maintenance	SSc2	SSc2 - Employ an environmentally sensitive, low-impact building exterior and hardscape management plan that helps preserve surrounding ecological integrity. The plan must significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical compared with standard practices
Pest Management	SSc3, EQc3.9	SSc3 – Have in place an environmentally sensitive management plan for the sites natural component

		including an outdoor integrated pest management plan (IPM). EQc3.9 – Have in place an indoor integrated pest management plan.
Landscape Maintenance	SSc3	See requirements above
Site Hardscape	SSc2	See requirements above
Snow & Ice Management	SSc2	See requirements above
Maintenance Equipment	SSc2	See requirements above

Curriculum Opportunities

Introduction to Integrated Pest Management (IPM) Curriculum

Developed by the Bio-Integral Resource Center <http://www.birc.org/>

Objectives

- Understand the IPM decision-making process and how it differs from conventional pest control.
- Learn how to use the IPM decision-making process when delivering professional structural pest control services.
- Understand how pest biology and behavior affects the success of management practices.
- Develop and increase skills in monitoring, record-keeping, setting treatment thresholds, using nonchemical prevention and treatment methods, using reduced-risk pesticides as a last resort, and developing customer cooperation with the IPM service.
- Learn how to incorporate IPM concepts and methods into a structural pest control business.

References and Additional Resources

Green Seal

<http://www.greenseal.org/>: Provides science-based environmental certification standards that are credible, transparent, and essential in an increasingly educated and competitive marketplace.

Eco Logo

<http://www.ecologo.org/>: Helps to identify, trust, buy, and sell environmentally preferable (“green”) goods and services.

The Collaborative for High Performance Schools, *Best Practice Manual Volume IV: Maintenance & Operations 2004*, <http://www.chps.net/manual/index.htm#BPM>

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Environmental Protection Agency Environmentally Preferred Purchasing, <http://www.epa.gov/epp/pubs/products/cleaning.htm>

Environmental Protection Agency Integrated Pest Management Principles, <http://www.epa.gov/opp00001/factsheets/ipm.htm>

Bio-Integrated Resource Council, <http://www.birc.org/>

California Integrated Waste Management Board, *Sustainable Turf Management*, <http://www.ciwmb.ca.gov>

Pennsylvania Department of General Services and Green Seal, *Pennsylvania Green Building Maintenance Guide*, <http://www.dgs.state.pa.us/dgs/cwp/view.asp?Q=118184>

U.S. Green Building Council, *LEED for Existing Buildings version 2.0*, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Alternative Fuels

Bus Maintenance & Operations

Non-Bus Fleet Vehicles

Bicycle & Pedestrian Access

Process Steps

- Investigate alternative fuel use and retrofit opportunities for the existing bus fleet.
- Develop and implement a bus idling reduction policy.
- Explore financing and opportunities to replace the oldest buses in the fleet.
- Develop and implement a low emitting and fuel efficient vehicles policy for upgrades and new purchases for all non-bus fleet vehicles.
- Implement incentive programs to support biking and walking to school for students and faculty.

Best Practices

Alternative Fuels

Biodiesel:

Biodiesel is a cleaner more energy efficient substitute for conventional petroleum and can often be used with conventional buses with no change to the engine and the existing fuel systems. It is a renewable fuel made from new and used vegetable oils and animal fats and is available in the form of 100% biodiesel (B100) and as a blended fuel with conventional diesel petroleum. The most common blend of biodiesel and conventional petroleum diesel is composed of 20% biodiesel and 80% petroleum diesel (B20). Using biodiesel as a substitute for conventional fuel reduces harmful emissions including carbon monoxide (CO), hydrocarbons (HC), sulfates, and particulate matter (PM). Greenhouse gas emissions are also reduced by 15% when using B20 and 75% when using B100. Consider the following when investigating use of biodiesel with an existing fleet.

- B20 and other lower level blends generally do not require engine modifications, however not all engine manufacturers cover biodiesel in their warranties. B100 can be used with some engines built since 1994 with biodiesel-compatible material for parts such as hoses and gaskets.
- Converting existing buses to biodiesel requires additional maintenance activities primarily in the first year of use including regular changing of the fuel filter.
- Check engine manufacturer warranties before using biodiesel.
- Ensure that biodiesel supplies meet prescribed quality standards of ASTM D6751-07b.
- Biodiesel contains 8% less energy per gallon compared to conventional diesel. For B20 this equates to a 1% to 2% but most B20 users report no difference in performance or fuel economy.

- Biodiesel users should be aware of potential issues with impact on engine warranties, low-temperature gelling, solvency/cleaning effect if regular diesel was previously used, and microbial contamination.

Compressed Natural Gas (CNG):

Compressed natural is a domestically produced, clean-burning alternative fuel which compared to diesel can produce significantly lower amounts of harmful emissions such as nitrogen oxides, particulate matter, and toxic and carcinogenic pollutants as well as the greenhouse gas carbon dioxide.

- Consider CNG for new bus purchases.
- CNG school buses can cost up to \$40,000 more than diesel buses. However, alternative fuel buses typically have lower operational and maintenance costs and can be eligible for state and federal incentives and other funding. http://www.eere.energy.gov/afdc/fuels/natural_gas_laws.html
- Pursue agreements with local suppliers of CNG to avoid high costs associated with building fueling infrastructure.

Hybrid Electric Vehicle (HEV):

HEV school buses are an emerging technology which has shown promise in pilot applications. Currently IC Corporation is the largest manufacturer producing HEV school buses. School buses are good candidates for HEV technology because regenerative braking allows the batteries to recharge during the frequent stopping and starting of school bus operation. HEV school buses may cost as much as 2 to 3 times that of a typical new bus but districts which have piloted the plug-in HEV school buses expect that the buses will pay for themselves through fuel efficiency within six years. Also, depending on the bus route, the school district expects to reduce fuel consumption by 40%–50% and reduce emissions up to 90%.

- Consider Plug-in HEV for new bus purchases.
- See the Hybrid Electric School Bus Technical Feasibility Report for additional information. <http://www.advancedenergy.org/corporate/initiatives/heb/pdfs/HESB%20Technical%20Feasibility%20Study.pdf>

Bus Maintenance & Operations

Idle Reduction Program:

- Develop and implement an idling reduction policy for school buses and student pick-up areas. See the sample policy at the following link. http://www.epa.gov/cleanschoolbus/idling_policy.htm
- Limit idling times for bus warm up to no more than 5 minutes.
- Buses should be moving whenever they are on.
- Turn off buses as soon as possible after arriving at loading or unloading areas.
- Post signage and encourage parents to turn off vehicles while waiting for students at pick-up areas.

Retrofit Technologies:

- Consider retrofitting new or existing buses with Diesel Oxidation Catalysts or Diesel Particulate Matter Filters to reduce bus emissions of particulate matter, hydrocarbons, and carbon monoxide.
- Ultra-low sulfur diesel must be used in conjunction with diesel particulate matter filters.
- The Environmental Protection Agency's Clean School Bus USA program provides grants and funding for school bus retrofits. See the program website for seeking grant funds and other EPA funding sources <http://epa.gov/cleanschoolbus/funding.htm> .

Vehicle Upgrades:

- Develop a plan to replace all buses built before 1990. It is estimated that buses built prior to 1990 carry six times the emissions as a similar bus built in 2004.
- Consider including funding for vehicle upgrades in the district Bond/Mill Levy. In addition to improved emissions, upgrades fleets will provide better fuel mileage and safer buses for students.

Non-Bus Fleet Vehicles

- Develop and implement a policy to replace fleet administrative vehicles with alternative fuel or low emitting or fuel efficient vehicles. Target vehicles which are classified as zero emission vehicles or have achieved a minimum green score of 40 on the American Council for Energy Efficient Economy annual vehicle rating guide.

Bicycle & Pedestrian Access

- Implement an incentive program for students and staff to encourage pedestrian and bike commutes to school. Support this program with a "safe route to school" program and/or partnership with the local municipality.
- Work with service organizations to provide free or reduced bike helmets for kids.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
All Areas	SSc4.1 – 4.4	SSc4 – Reduce the number of commuting round trips made by regular building occupant using single-occupant, conventionally powered and conventionally fueled vehicles. Alternative transportation includes mass transit, walking, bicycles, carpools, vanpools, and low-emitting or fuel-efficient or alternative-fuel vehicles.

Curriculum Opportunities

Biodiesel Curriculum

Developed by the NEED Project and available to download at

<http://www.biodiesel.org/resources/fuelfactsheets/default.shtm>

The curriculum provides background information on biodiesel as an alternative transportation fuel at three reading levels (elementary, intermediate, and secondary) with activities to reinforce knowledge and develop critical thinking and research skills.

Objective

- Teach students about biodiesel and encourage them to evaluate its economic and environmental advantages and disadvantages.

References and Additional Resources

National Biodiesel Board

<http://www.biodiesel.org/resources/fuelfactsheets/default.shtm>: Biodiesel fact sheets including link to biodiesel school curriculum

US Department of Energy – Alternative Fuels and Advanced Vehicles Data Center

http://www.eere.energy.gov/afdc/vehicles/idle_reduction_bus.html : Idle reduction strategies for School Buses

http://www.epa.gov/otaq/schoolbus/idle_fuel_calc.htm: Fuel savings calculator

http://www.eere.energy.gov/afdc/fleets/school_implementation.html: Alternative fuels implementation

EPA Clean School Bus Program

<http://www.epa.gov/cleanschoolbus/antiidling.htm>: National idle reduction campaign

<http://www.epa.gov/cleanschoolbus/retrofit.htm>: School bus retrofit opportunities

<http://www.epa.gov/cleanschoolbus/replacement.htm>: School bus replacement opportunities

US Department of Energy, *Biodiesel Handling and Use Guidelines*,

<http://www.eere.energy.gov/afdc/pdfs/40555.pdf>

EPA Clean School Bus Program, <http://www.epa.gov/cleanschoolbus/>

National Center for Safe Routes to School, <http://www.saferoutesinfo.org>

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*,

<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Water Metering and Sub-Metering

Irrigation Systems Maintenance

Interior Systems Maintenance

Fixture Upgrades

Process Steps

- Apply permanently installed water meters to track and measure building and grounds water use.
- From water use data, identify major water consuming systems and identify opportunities for increased efficiency.
- Monitor water use on a monthly basis to catch unusual or excessive water usage.
- Develop and implement a water systems maintenance program to optimize existing equipment and fixtures.
- Develop a plan to replace standard interior water fixtures with ultra water efficient fixtures.

Best Practices

Water Metering and Sub-Metering

- Apply permanently installed water meter(s) to measure the total water use for the building and school grounds.
- Investigate opportunities for and apply water meters to major subsystems including irrigation systems, indoor plumbing fixtures and fittings, cooling towers, domestic hot water, and other process water.
- Monitor water use by building or by subsystem to track usage patterns over the course of the year. Watch for signs of excessive water use to identify potential leaks or inefficient equipment or fixture operations.
- From tracked data identify major water consuming activities or subsystems and develop a plan to reduce consumption in those areas.

Irrigation Systems Maintenance

- Perform regular weekly inspections of irrigation equipment to check for damage such as leaks and perform adjustments and repairs as needed.
- Perform in-depth inspections of irrigation systems after annual activation in the spring and bring systems up to specified operating conditions.
- Check the backflow prevention device to ensure proper functioning.
- If irrigation water runs onto hardscapes, shut off irrigation systems and look for signs of leakage, jammed spray heads and torn hoses.
- Adjust water pressure to minimize wind effects and to make sure that sprinklers function according to manufacturer specifications to optimize efficiency.

- Perform annual inspection of system components including water valves, sprinkler heads, drip systems, and sensors to ensure optimal system performance.
- Provide signage with a maintenance phone number to call for broken heads, malfunctioning system, or water running down the gutter from the location.

Interior Systems Maintenance

- Develop a plumbing maintenance plan which identifies specific tasks to be performed by maintenance personnel, the frequency of the tasks, and the level of skill required to perform each task.
- Consider the following systems within the plumbing plan; domestic water systems, sanitary system, fixtures, pumps & controls, and back flow preventers & grease traps.

Fixtures

- Check piping on a regular maintenance schedule for leaks, corrosion or signs of deterioration.
- Check the seals of all fittings and valves for leaks, scaling or other signs of deterioration.
- Check drainage piping for blocked lines.
- Verify that shut-off valves and back-flow devices are fully operational for all equipment.
- Provide shutoff valves to isolate sections of the building when problems occur.

Domestic Water Systems

- Flush hot water tanks at least once a year.
- Pressure gauges and relief valves should be checked for proper operation four times a year.
- Limit hot water to a maximum of 140°F (60°C) and verify that mixing valves deliver a maximum outlet delivery temperature of 105-110°F.
- Install timers on water heaters to turn off heating during extended unoccupied times.
- Check condition of pumps and motors for circulation pumps.
- Perform preventative maintenance checks for leaks.
- Test pressure relief valves and check for trapped air.

Fixture Upgrades

- Develop a plan to replace standard flow or older fixtures with water conserving fixtures.
- Identify any local incentives for replacing water consumptive fixtures.
- Water conserving fixtures should be selected to improve upon the International Plumbing Codes (IPC) 2006 fixture and fitting performance requirements. Consider the following goals for fixture flow rates.
 - Toilets – Dual Flush (0.8/1.6 gpf) or < 1.6 gpf
 - Urinals – Waterless Urinals, Pint Urinals (0.225 gpf), or < 1 gpf
 - Lavatories – 0.5 gpm or < 2.5 gpm
 - Kitchen Sinks (non-commercial) – 1.0 gpm or < 2.5 gpm
 - Showers – 1.75 gpm or < 2.5

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
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Water Metering & Sub-Metering	WEc1.1 & WEc1.2	WEc1.1 – Have in place permanently installed water meter(s) that measure the total potable water use for the entire building and associate grounds. WEc1.2 – Have in place permanently installed metering for one or more of the following water subsystems: Irrigation, Indoor Plumbing Fixtures, Cooling Towers, Domestic Hot Water, and other Process Water.
Irrigation Systems Maintenance	WEc3	WEc3 – Reduce potable water use for irrigation compared with conventional means of irrigation. Points are awarded for the following reductions; 50% reduction (1 point), 75% reduction (2 points), 100% reduction (3 points).
Interior Systems Maintenance	WEc2	WEc2 – Reduce potable water usage of indoor plumbing fixtures to a level below the baseline calculated according to the Uniform Plumbing Codes (UPC) 2006 or International Plumbing Code (IPC) 2006.
Fixture Upgrades	WEc2	WEc2 – Reduce potable water usage of indoor plumbing fixtures to a level below the baseline calculated according to the Uniform Plumbing Codes (UPC) 2006 or International Plumbing Code (IPC) 2006.

Curriculum Opportunities

Water Use Curriculum

Developed by Project WET and available for purchase at <http://www.projectwet.org/usa/wetguide.htm>.

People's relationships to water are a major theme of the Project WET Curriculum and Activity Guide. The guide connects students to a thorough water education program including water's chemical and physical properties, quantity and quality issues, water user group needs, and ecosystems and management strategies.

This 561-page guide is a collection of multidisciplinary water-related activities for ages 5 through 18 that are hands-on, easy to use, and fun. The lessons incorporate a variety of formats, such as large and small group learning, whole-body activities, laboratory investigations, discussion of local and global topics, and community service projects.

References and Additional Resources

Project WET USA

<http://www.projectwet.org/usa/>: Water based curriculum for ages 5 – 18.

Water Sense

<http://www.epa.gov/watersense/>: Listing of water efficient products and partners.

City of Tampa, Florida

http://www.tampagov.net/dept_Water/information_resources/Efficiency_checklists/: Water efficiency checklist for schools.

http://www.tampagov.net/dept_Water/information_resources/Educators/Lesson_plans.asp: Water efficiency lesson plans for grades 3 – 12.

Green Industries of Colorado

http://www.greenco.org/bmp_list.htm: Best management practices for landscape water efficiency.

The Collaborative for High Performance Schools, *Best Practice Manual Volume IV: Maintenance & Operations 2004*, <http://www.chps.net/manual/index.htm#BPM>

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Energy Systems

Transportation

Waste Management

Site Maintenance

Process Steps

- Download EPA's Climate Check: <http://www.epa.gov/climatechange/wycd/school.html>
- Perform an inventory of the school's greenhouse gas (GHG) emissions.
- Analyze inventory results and develop a plan to reduce GHG emissions.

Best Practices

EPA Climate CHECK

The EPA has developed the climate change emission calculator, Climate CHECK to help schools educate students about climate change and GHG emissions, estimate the schools emissions by performing an emission inventory, and develop and implement a GHG reduction plan. The tool provides background information related GHG emissions as well as detailed instructions and a built in calculator to estimate the school's GHG emissions. The final stage of Climate CHECK is designed to help schools think of ways to reduce energy consumption by end use. Climate CHECK is a free tool and can be downloaded at the link listed above:

Inventory:

Climate CHECK provides step by step guidance to inventory and calculate an estimate of GHG emissions resulting from the operations of the school. The inventory estimates GHG emissions over a period of 1 year from 7 different sources including; Stationary Sources, Purchased Electricity and Steam, Mobile Sources, Waste Sent to Landfill, Wastewater, Land Management, and Refrigerants and Air Conditioners. Users of this tool should expect to research the following information related to the schools energy use and emission sources.

- Background
 - Student population of the school district.
 - School name.
 - Student population of the school.
 - Employee population of the school.
- Stationary Devices
 - Include the device type, type of fuel, units of measure for associated fuels and quantity of fuel used.
- School's Electricity Supplier
 - Amount of electricity purchased during the inventory year (kilowatt hours).
 - Amount of steam purchased during the inventory year (Btu).

- Type and percent fuel mix used to produce steam.
- Transportation
 - Number of commuter vehicles and average commuting distance required.
 - Fuel consumed by vehicles (cars, trucks, buses) owned by the school.
- Waste
 - Total amount of waste sent to the landfill during the inventory year (kilograms)
- Wastewater
 - Wastewater treated from the school.
- Refrigeration and Air Conditioning
 - Number of units and charge size for refrigerated appliances and air conditioning equipment.
- Land Management
 - Type and amount of fertilizer applied and the nitrogen content of the fertilizers.
 - Type and fuel consumed by non-road equipment.
 - Type age and amount of trees located on school property.

GHG Reduction Plan:

Climate CHECK provides an energy mitigation section to help the school to think of ways to reduce energy consumption by end-use. Useful links to applicable resources are provided and group discussion is encouraged to brainstorm strategies to reduce emissions. Once ideas have been generated, the tool provides the structure to turn ideas into action items and calculations to quantify a goal for emissions reduction.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
All Areas	EAc6	<p>Identify building performance parameters that reduce conventional energy use and emissions, quantify those reductions and report them to a formal tracking program:</p> <p>Track and record emissions reductions delivered by energy efficiency, renewable energy and other building emissions reduction measures, including reductions from the purchase of renewable energy credits.</p> <p>Report emissions reductions using a third-party voluntary reporting or certification program (e.g., EPA Climate Leaders, ENERGY STAR or WRI/WBCSD protocols).</p>

Curriculum Opportunities

Greenhouse Gas Curriculum

This tool is designed guide students and classrooms through the process of calculating GHG emissions resulting from school operations and then to brainstorm and quantify actions to reduce emissions by energy consumption end uses. Activities and curriculum can be adapted to meet the needs, time constraints, and goals of individual classrooms and student groups.

Climate CHECK's program was developed to meet aspects of the National Science Content Standards and the Environmental Education Material: Guidelines for Excellence developed by the North American Association for Environmental Education (NAAEE). Educational standards used in development of Climate CHECK are outlined in greater detail in the tool itself.

References and Additional Resources

US Environmental Protection Agency – At School

<http://www.epa.gov/climatechange/wycd/school.html>: Directory of education and action planning resources to understand, estimate, and reduce GHG emissions.

EPA's Climate Change Emission Calculator Kit

<http://www.epa.gov/climatechange/wycd/school.html>

Additional GHG Accounting Programs

Cleaner and Greener

<http://cleanerandgreener.org>

<http://cleanerandgreener.org/certification/singlebuilding.htm>

EPA Climate Leaders

<http://www.epa.gov/climateleaders/resources/inventory-guidance.html>

<http://www.epa.gov/climateleaders/>

The Greenhouse Gas Protocol Initiative

<http://www.ghgprotocol.org/calculation-tools/all-tools>

The Climate Registry

<http://www.theclimateregistry.org/voluntary.html>

Impacted Operations

Energy Star Portfolio Manager

Energy Audit

Identify and Sequence Low Cost Improvement

Preventative Maintenance Plan

Performance Based Contracts – ESCOs

Process Steps

- Benchmark and track the energy performance of the building through Energy Star Portfolio Manager.
- Conduct an Energy Audit to help identify economically viable improvements to the building energy systems and/or operations & maintenance activities.
- Identify and sequence low cost improvements to the building energy systems and/or operations and maintenance plan.
- Develop a preventive maintenance plan for routine inspection, maintenance, and repair of equipment.
- Consider engaging in a performance based contract with an Energy Service Contractor (ESCO) to facilitate building equipment upgrades and energy efficiency measures.

Best Practices

Energy Star Portfolio Manager

Portfolio Manager is an interactive energy management tool that allows facility managers to track and assess energy and water consumption, benchmark energy use against similar buildings, generate an Energy Star Rating, set investment priorities for systems and equipment upgrades, and track progress of improvement projects. Earning an Energy Star Rating of at least 75 qualifies the school to apply for an Energy Star plaque providing recognition of the building's energy efficiency achievement and raising awareness among the student body, staff, and community.

- Compile utility data including energy consumption and cost data from the previous 12 continuous months of operation.
- Set up an account on the Portfolio Manager home page <https://www.energystar.gov/istar/pmpam/>.
- Add each facility to be managed. Data can be entered manually or imported through a Microsoft Excel worksheet. Importing through Excel requires adding at least 10 buildings. Gather the following information to add a new school facility to Portfolio Manager.
 - Zip code
 - Gross floor area
 - Weekly operating hours
 - Student seating capacity
 - Number of months in operation
 - Percent of the gross floor area of this space that is air-conditioned

- Percent of the gross floor area of this space that is heated
- Number of personal computers
- Presence or absence of on-site cooking facilities
- Presence or absence of mechanical ventilation
- Create meters for each building by fuel type. Users can aggregate meter data or specify sub-meters and related consumption for each facility. The use of sub-meters will help to identify priorities and opportunities for efficiency improvements and/or equipment upgrades.
- Enter monthly billing data for energy consumption and fuel cost. When one full year of data without gaps has been input into Portfolio Manager, the facility will be eligible for a National Performance “Energy Star” Rating. This rating provides a meaningful metric to assess the current operations of the building. Facilities that achieve an Energy Star Rating of at least 75 and professionally verified, are eligible to apply for Energy Star.
- As operations continue and additional data is entered, current building performance can be compared against the baseline operations from the first period entered to help assess the progress of energy efficiency measures or upgrades implemented.
- If there was an energy model performed during the design of the school, compare utility data to that predicted by the energy model. Significant anomalies should trigger further investigation into the disparity through existing building commissioning or other analysis.

Energy Audit

In addition to the energy analysis performed above, conduct an Energy Audit to help identify economically viable improvements to the building energy systems and/or operations & maintenance activities that yield substantial annual energy savings. The energy audit should meet the requirements of the ASHRAE Level I Walk-Through Assessment as defined in ASHRAE’s Procedures for Commercial Building Energy Audits or better.

- Perform a space function analysis for individual spaces within the school and outline the following characteristics for each space: Function Type, Space Area, Occupancy Schedule (including seasonal variances), Lighting Type, and HVAC Type.
- Outline the building shell characteristics including glazing, exposed wall areas, roof area, exposed floor areas, and the level of insulation for each.
- Describe operations and maintenance activities related to energy efficiency.
- Estimate the approximate breakdown of energy use for significant end-use categories.

Energy Audit Resources

ASHRAE

- <http://www.ashrae.org/publications/>: Procedures for Commercial Building Energy Audits

Washington State University Energy Program

- www.energy.wsu.edu/documents/rem/energyaudit/audit2.pdf: Energy Audit Workbook. Detailed checklists for auditing energy use and facility operations and maintenance for institutions, including schools.

Identify and Sequence Low Cost Improvements

From the preliminary energy analysis and energy audit conducted above, identify and sequence low cost improvements to the building energy systems and/or operations and maintenance plan.

- Through its Energy Star Partners, the EPA has identified the following sequence as a rule of thumb for low cost energy improvements for commercial buildings.

Operations & Maintenance – Occupant Behavior – Lighting – Controls – Equipment

Low Cost  Higher Cost

- Operations & Maintenance:
 - Regularly inspect all equipment and controls to ensure they are functioning as designed.
 - Calibrate thermostats and ensure that thermostat settings equal actual space temperature.
 - Adjust dampers to provide the minimum outside air to meet design and indoor air quality requirements.
 - Coordinate janitorial activities to clean one floor or space at a time and maximize cleaning activities during normal school hours.
 - Incorporate preventative maintenance, standard operating procedures, and other energy efficiency operational strategies into the employee handbook to ensure continued adoption after employee turnover.
- Occupant Behavior:
 - Institute an energy awareness program for the building staff and students. Identify areas where building occupants can support energy efficiency and educate occupants on best practices accordingly.
- Lighting:
 - Change incandescent bulbs to compact fluorescent light.
 - Convert T12s to T8s / T5s and electronic ballasts. Eliminate magnetic ballasts.
 - De-lamp and disconnect unused ballasts and reduce lighting levels where possible.
 - Install occupancy sensors in variable occupant spaces and daylight sensors in perimeter spaces.
 - Replace exit signs with high efficiency LED exit signs.
 - Install timer or photocell controls for exterior lighting.
- Controls:
 - Adjust conditioning set-backs to match actual occupancy patterns in the school.
 - Adjust the start up time for HVAC systems to begin at the latest time possible while still meeting the conditioning needs when occupants arrive.
 - Revisit temperature set points to adjust to seasonal changes. Limit user override on any adjustable t-stat with consideration for thermal comfort goals.
- Equipment:
 - Consider equipment upgrades such as VAV air distribution, heat recovery, high efficiency boilers, high efficiency motors, variable frequency drives, and others.
 - Inspect and replace air filters on a regular basis to optimize system performance.

Preventative Maintenance Plan

Develop a preventive maintenance plan for routine inspection, maintenance, and repair of equipment to ensure maximized efficiency and longevity of equipment operation.

- Identify systems and equipment that require preventive maintenance.
- Determine the present condition, establish a level of maintenance and write preventive maintenance tasks for each system or component.
- Schedule and assign specific preventive maintenance tasks.
- Track history of equipment condition and maintenance and repair activities implemented.

Performance Based Contracts – ESCOs

Consider engaging in a performance based contract with an Energy Service Contractor (ESCO) to facilitate building equipment upgrades and energy efficiency measures.

- Performance based contracts allow schools to make upgrades to energy systems without paying upfront costs.
- Upfront costs are financed through a third party and then are paid back by the energy savings realized as a result of equipment upgrades. The ESCO contracted often guarantees the energy savings and will cover the difference in financing costs if energy cost savings do not meet expectations.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
Energy Star Portfolio Manager	EAc1	EAc1 – Using Energy Star Portfolio Manager, achieve an energy performance rating of at least 69. Up to 15 points available for increasing performance ratings.
Energy Audit	EAp1 EAc1	EAc1 – See details above. EAp1 – Develop a building operating plan that provides details on how the building is to be operated and maintained. Develop a systems narrative that describes the mechanical and electrical systems and equipment in the building. Create a narrative of the preventive maintenance plan for equipment described in the systems narrative. Conduct an energy audit that meets the requirements of the ASHRAE Level I walk-through

		assessment.
Identify and Sequence Low Cost Improvement	EAp1 EAc2	EAp1 – See details above. EAc2 – Conduct an energy audit that meets the requirements of ASHRAE Level II Energy Survey and Analysis. Document the breakdown of energy use in the building. Perform a savings and cost analysis of all practical measures that meet the owner’s constraints and economic criteria. List the identified capital improvements that will provide cost-effective energy savings and document the cost-benefit analysis.
Preventative Maintenance Plan	EAp1 EAc1	See details listed above. EAc1 – See details above.
Performance Based Contracts – ESCOs	EAc1	EAc1 – See details above.

Curriculum Opportunities

Energy Curriculum

See a listing of energy curriculum and resources for teachers at http://www1.eere.energy.gov/education/lesson_plans.html.

Resources are organized by grade level and cover a multitude of topics including, renewable energy, energy efficiency, energy audits, environmental issues related to energy, and others.

See Also:

National Energy Education Development project: <http://www.need.org/>

References and Additional Resources

Energy Star Portfolio Manager

<https://www.energystar.gov/istar/pmpam/>

ASHRAE Procedures for Commercial Building Energy Audits

<http://www.ashrae.org/publications/>: Energy audit walk-through data and tracking sheets.

Washington State University Energy Program

www.energy.wsu.edu/documents/rem/energyaudit/audit2.pdf: Energy Audit Workbook. Detailed checklists for auditing energy use and facility operations and maintenance for institutions, including schools

Energy Star Commercial Real Estate: Best Practices to Improve Energy Performance
http://www.energystar.gov/index.cfm?c=business.bus_internet_presentations_actionplans: Identify and Sequence Low Cost Improvement

Alaska School Facilities Preventive Maintenance Handbook
<http://www.eed.state.ak.us/facilities/publications/preventivemaintenance.pdf>: Guidelines for developing a preventive maintenance program for schools.

Performance Contracting: Financing Better Schools Through Energy Cost Savings
http://www.asbointl.org/ASBO/files/CCPAGECONTENT/docfilename/0000003168/Performance_Contracting_in_K-12_Schools.pdf: Case study and how-to guide for performance contracts for schools.

Department of Energy: Energy Efficiency and Renewable Energy
http://www1.eere.energy.gov/education/lesson_plans.html: Energy curriculum

National Energy Education Development project
<http://www.need.org/>

Energy Services Coalition
<http://www.energyservicescoalition.org/>

National Association of Energy Service Companies (NAESCO)
<http://www.naesco.org/>

The Collaborative for High Performance Schools, *Best Practice Manual Volume IV: Maintenance & Operations 2004*, <http://www.chps.net/manual/index.htm#BPM>

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*,
<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Planning
Investigation
Implementation
Handoff

Background

Existing building commissioning (EBCx) is the systematic investigation process for improving or optimizing a building's operations and maintenance. This process includes the identification of low /no cost and capital intensive facility improvements, training of O&M staff, and ensured continued performance. EBCx is generally divided into four distinct phases including Planning, Investigation, Implementation, and Handoff. Retrocommissioning refers to a single event in the ongoing commissioning process of an existing building.

Process Steps

Planning Phase

- Determine if retrocommissioning is appropriate for the building systems.
- Gather existing building systems documentation.
- Select a commissioning provider.

Investigation Phase

- Identify building system deficiencies and potential improvements.
- Select the most cost effective improvements to implement.

Implementation Phase

- Implement low-no cost improvements.
- Create a plan for capital improvements.

Handoff Phase

- Update building systems documentation.
- Provide training for building operators.
- Develop a plan for ongoing commissioning.

Best Practices

Planning

- Determine if retrocommissioning is appropriate for the building. In general, retrocommissioning is not appropriate for buildings where equipment and systems are outdated or near the end of their life, major system design problems exist, or equipment replacement is needed to correct major equipment malfunctions. Retrocommissioning may be appropriate if any of the following hold true.¹

¹ See also Appendix B of the Portland Energy Conservation / Oak Ridge National Laboratory - Practical Guide for Commissioning Existing Buildings, for a list of building characteristics that may be used to evaluate and compare multiple buildings across a portfolio.

- The building exhibits an unjustified, high energy-use index.
 - Buildings with computerized energy management control systems.
 - Persistent failure of equipment and/or control system.
 - Indoor Air Quality problems.
 - The building has newer equipment which is less than 12 years old.
- Consider implementing retrocommissioning activities prior to engaging in a performance based contract for capital improvements for building equipment. This will ensure that the low-cost energy savings will not become a part of the financial agreement and that existing equipment will be optimized to help select the most appropriate building equipment upgrades. If retrocommissioning is performed prior to the performance contract, the energy service contractor should be notified to ensure that the finance agreement is based on the most up to date information available.
 - Assign at least one in-house staff to work on the project. It is important that the selected staff person(s) have expertise with the building system controls, HVAC equipment, and lighting. If possible, the building operator should be selected to participate.
 - Gather the following information related to the building systems as available.
 - Drawings relevant to the commissioned systems.
 - Operations and Maintenance manuals.
 - Testing and Balancing Reports.
 - Equipment list with nameplate information dates of installation, and submittals including pump curves and fan curves.
 - Control system documentation including the sequence of operations, control diagrams, etc.
 - Energy efficient operating strategies.
 - Energy bills for the prior 24 months or access to the project on Energy Star Portfolio Manager.
 - Consider the following points in selecting a commissioning provider for the project.
 - Select a provider with prior experience with K-12 schools or with similar building systems.
 - Request and contact potential provider references.
 - Investigate providers from local utilities or state and local government organizations and providers that are a full member of the Building Commissioning Association. Search for full members of the Building Commissioning Association by location at the Association's website, <http://www.bcx.org/>.

Investigation

- Throughout the investigation phase, the commissioning provider will take the primary responsibility for and facilitate the following activities.
 - Review the existing building systems documentation compiled during the planning phase.
 - Develop the project commissioning plan including project goals / scope, roles and responsibilities, investigation methods, implementation phase requirements, and project hand off.
 - Hold a scoping meeting with team members to review, discuss, and approve the retrocommissioning plan.
- Perform a site assessment to address the following major issues.
 - Overall building energy use and demand.

- Current design and operational intent and actual control sequences for building equipment.
- Equipment nameplate information and maintenance issues.
- Current schedules.
- Severe control and operational problems.
- Location of comfort problems or trouble spots in the building.
- Uncover the best opportunities for optimizing the building systems and improving Operations & Maintenance practices.
- Identify where diagnostics and testing may be appropriate.
- Develop a Master List of Deficiencies and Improvements.
- Develop and implement the diagnostic and test plans.
- Prioritize recommended improvements based on which improvements are the most cost effective. Cost effective improvements often exhibit a simple payback of 18 months or less.

Implementation

- Retain the commissioning provider to develop the implementation plan for the most cost effective energy efficiency improvements.
- Implement plan with in-house staff or outside help as needed.
- Perform functional testing after implementation to ensure that the improvements are working as expected.

Handoff

- Retain the commissioning provider to update the building documentation addressing the following.
 - One line drawing schematics of each system investigated.
 - Finalize the O&M plan outline, including the examination of and enhancement of current maintenance or service contract procedures.
 - Develop a list of required O&M documentation and a systems operations manual, including full written sequences of operation for equipment that still may be missing documentation of its sequences.
 - Develop an energy-efficiency plan.
 - Develop guidelines for implementing a preventative maintenance plan.
 - Develop an operations assessment program and systems tune-up and recommissioning schedule.
 - Develop a comprehensive training plan or recommendations for appropriate building staff to attend training in general O&M concepts and for specific equipment and systems. This will include both building operators and facility managers or owners.
 - Develop guidelines and recommendations for incorporating an energy accounting and tracking system. Include benchmarks for whole building energy use and primary plant equipment efficiency tracking.
 - Develop a list of operational strategies for the owner to incorporate in the future.
- Through the direction of the commissioning provider, provide adequate training of the building operating staff to ensure continued energy efficiency and optimized system performance.
- Retain the commissioning provider to draft a final commissioning report including all relevant data from the commissioning activity as well as actual improvement costs for each improvement implemented and a list of capital improvements recommended for further investigation.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
Planning & Investigation	EAc2.1	<p>EAc2.1 - Develop a retrocommissioning plan for the building energy using systems. Conduct the investigation and analysis phase.</p> <p>Document the breakdown of energy use in the building.</p> <p>List the operating problems that affect occupants' comfort and energy use and develop potential operational changes that will solve them.</p> <p>List the identified capital improvements that will provide cost-effective energy savings and document the cost benefit associated with each.</p>
Implementation & Handoff	EAc2.2	<p>EAc2.2 – Implement no or low-cost operational improvements and create a capital plan for major retrofits or upgrades.</p> <p>Provide training for management staff that builds awareness and skills in a broad range of sustainable building operations topics.</p> <p>Demonstrate the observed and/or anticipated financial cost and benefits of measures that have implemented.</p> <p>Update the building operating plan as necessary to reflect any changes in the occupancy schedule, equipment run-time schedule, design set points and lighting levels.</p>
Handoff	EAc2.3	<p>EAc2.3 – Implement an ongoing commissioning program that includes elements of planning system testing, performance verification, corrective action response, ongoing measurement and documentation to proactively address operating problems.</p> <p>Create a written plan that summarizes the overall commissioning cycle for the building by equipment or building system group.</p> <p>Complete at least half of the scope of work in the first commissioning cycle (as indicated by the</p>

	<p>percentage of the plan's total budget) prior to the date of application for LEED for Existing Buildings: O&M certification.</p> <p>Update the building operating plan and/or systems narrative as necessary to reflect any changes in the occupancy, schedule, equipment run-time schedule, design set points, lighting levels or system specifications.</p>
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Curriculum Opportunities

Energy Curriculum

See a listing of energy curriculum and resources for teachers at http://www1.eere.energy.gov/education/lesson_plans.html.

Resources are organized by grade level and cover a multitude of topics including, renewable energy, energy efficiency, energy audits, environmental issues related to energy, and others.

See Also:

National Energy Education Development project: <http://www.need.org/>

References and Additional Resources

Portland Energy Conservation, *Retrocommissioning Handbook for Facility Manager*, <http://www.oregon.gov/ENERGY/CONS/BUS/comm/docs/retrocx.pdf> : See resources in Appendix A – Appendix J including a request for proposal checklist for retrocommissioning services, sample site-assessment forms, sample master-list, and strategies for increasing retrocommissioning cost effectiveness.

Portland Energy Conservation and Oak Ridge National Laboratory, *A Practical Guide for Commissioning Existing Buildings*, <http://eber.ed.ornl.gov/commercialproducts/retrocx.htm>

The Building Commissioning Association, *Best Practices in Commissioning Existing Building*, <http://www.bcxa.org/resources/index.htm>

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Ongoing Consumables

Durable Goods

Lamps

Process Steps

- Gather information on school procurement and develop a line item list of supplies and equipment purchased for the school on both a frequent and infrequent basis.
- Identify opportunities and alternative products to maximize the purchase of environmentally preferred products.
- Develop an Environmentally Preferred Purchasing Policy for the school including guidelines for the selection and location of environmentally preferred goods for the building's ongoing consumables, durable goods and electronics, building alterations, and lamps.

Best Practices

Ongoing Consumables

Office Paper & Paper Products

- Select paper products with the maximum possible post consumer waste (PCW) recycled content. Target a minimum of 30% PCW recycled content for office paper.
- Select paper with chlorine free certification. See links to the Chlorine Free Products Association, Totally Chlorine Free, and Processed Chlorine Free programs in the "Products and Certification Links" section below.
- Require virgin paper material sources from sustainably managed forests. Look for products with Forest Stewardship Council (FSC) chain-of-custody certification.
- Consider paper products with packaging that contains PCW recycled content.
- Paper products certified under the following certification programs are preferred.
 - Forest Stewardship Council
 - Green Seal – Paper certification
 - Chlorine Free Products Association – Totally Chlorine Free
 - Chlorine Free Products Association – Processed Chlorine Free
 - EcoLogo – Paper certification

Janitorial Supplies

- Select paper towels and napkins which contain 100% recycled content including at least 40% PCW recycled content.
- Select paper towels and napkins with chlorine free certification. Janitorial paper products with Green Seals GS-9 certification and the Chlorine Free Products Association's, Totally Chlorine Free, and Processed Chlorine Free programs are preferred.

- Select bathroom tissue with 100% recycled content including at least 20% PCW recycled content. Products with Green Seal's GS-01 certification are preferred.
- Select trash bags and trash can liners which contain at least 60% recycled content including at least 10% PCW recycled content. Products with Scientific Certification Systems certification or EPA Environmentally Preferred Products are preferred.

Cleaning Products

Procurement best practices for this category covered under the "Green Cleaning" section of this guide.

Office Supplies

- Purchase remanufactured toner and ink jet cartridges (remans) for laser printers, copiers, and fax machines. Work with suppliers to auto-substitute remans when orders are placed for new cartridges.
- Use rechargeable batteries with applicable electronic devices.
- Consider pencils with FSC chain-of-custody certification.
- Consider pens and pencils that meet the certification criteria of the Environmental Choice program CCD 168.

Durable Goods

Electronic Goods

- Select desktops, laptops, and computer monitors that have achieved Bronze registration or higher under the Electronic Products Environmental Assessment Tool (EPEAT). EPEAT is a procurement tool designed to help large volume purchasers evaluate, compare, and select desktop computers, laptops, and monitors based upon their environmental attributes as specified in the consensus-based IEEE Standard for the Environmental Assessment of Personal Computer Products (1680).
- Additional consideration should be provided for products that have achieved EPEAT Silver or EPEAT Gold registration. The registration criteria and a list of all registered equipment are provided at <http://www.epeat.net>.
- Select copiers, fax machines, printers, and scanners that earn the Energy Star and meet the Energy Star specifications for energy efficiency.
- Select refrigerators and vending machines that earn Energy Star and meet the Energy Star specifications for energy efficiency.

Furniture

- When purchasing new, select classroom furniture that meet the Greenguard Product Emission Standard for Children and Schools.
- When purchasing new, select office furniture and panel systems that meet the Greenguard Certification Standards for low emitting products.

Paint

- For regular building maintenance, use paints and coatings that do not exceed the volatile organic compound (VOC) and chemical component limits of Green Seal's Standard GS-11 requirements.

Carpet

- Select replacement carpet that meets the requirements of theCRI Green Label Plus Carpet Testing Program.
- Provide additional consideration for carpets that contain recycled content and carpet manufacturers that provide a take back program for recycling used carpet.

- Select carpet cushions that meet the requirements of the CRI Green Label program.

Landscaping, Site Exterior and Pest Management

Procurement best practices for this category covered under the “Building Exterior, Landscape, and Pest Management” of this guide.

Vehicle fleets

Procurement best practices for this category covered under the “Alternative Transportation” section of this guide.

Lamps

- Develop a lighting purchasing plan that outlines specifications for maximum levels of mercury as well as minimum energy performance requirements for lamps.
 - Select lamps that earn Energy Star and that meet the Energy Star requirements for energy efficiency.
 - Select lamps with a maximum average of 10 milligrams of mercury.
 - Select lamps with a lamp life greater than 10,000 hours.
 - Purchase lamps from a supplier that provides a take back program for recycling of used lamps.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
Ongoing Consumables	MRc1	<p>MRc1 – Maintain a sustainable purchasing program covering materials with a low cost per unit that are regularly used and replaced through the course of business. One, two or three points are awarded to projects that achieve sustainable purchases of at least 40%, 60% or 80% respectively. Sustainable purchases are those that meet one or more of the following criteria.</p> <p>At least 10% postconsumer and/or 20% postindustrial material.</p> <p>At least 50% rapidly renewable materials.</p> <p>At least 50% materials harvested and process or extracted and processed within 500 miles of the project.</p> <p>Consist of at least 50% Forest Stewardship Council (FSC) certified paper products.</p>

		Batteries are rechargeable.
Durable Goods	MRc2	<p>MRc2 – Maintain a sustainable purchasing policy covering items available at a higher cost per unit and durable goods that are replaced infrequently.</p> <p>MRc2.1 – One point is awarded to projects that achieve sustainable purchases of at least 40% of total purchase of electric-powered equipment. Sustainable purchases are those that meet one of the following criteria.</p> <p>The equipment is Energy Star labeled.</p> <p>The equipment (either battery or corded) replaces conventional gas powered equipment.</p> <p>MRc2.2 – One point is awarded to projects that achieve sustainable purchases of at least 40% of total purchases of furniture. Sustainable purchases are those that meet one or more of the following criteria.</p> <p>At least 10% postconsumer and/or 20% postindustrial material.</p> <p>At least 50% rapidly renewable materials.</p> <p>At least 50% materials harvested and process or extracted and processed within 500 miles of the project.</p> <p>Consist of at least 50% Forest Stewardship Council (FSC)</p> <p>At least 70% material salvaged from off-site or outside the organization.</p> <p>At least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program.</p>
Lamps	MRc4.1 MRc4.2	<p>MRc4.1 – Develop a lighting purchasing plan that specifies maximum levels of mercury permitted in mercury-containing lamps purchased for the building and associated grounds, including lamps for both indoor and outdoor fixture as well as both</p>

		<p>hard-wired and portable fixtures. One or two points are awarded to project for which at least 90% of all mercury containing lamps purchased during the performance period comply with the purchasing plan and meet the following overall targets for mercury content:</p> <p>MRc4.1 – 90 picograms per lumen-hour</p> <p>MRc4.2 – 70 picograms per lumen-hour</p>
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Curriculum Opportunities

Procurement Curriculum

Protecting Forests, Reducing Paper Waste, and Buying Recycled

Developed by the Green Schools Initiative and available for download at <http://www.greenschools.net/CurriculumIdeas2.htm>.

The Green Schools Initiative has developed a curriculum to help integrate issues of forest protection and reducing paper waste into students' studies. Sample data sheets, homework assignments, cost-benefit analysis of switching to recycled paper, and other internet resources are provided.

The Story of Stuff

Available for download at <http://www.storyofstuff.com/index.html>, the Story of Stuff is a short video which discusses the environmental and social issues intertwined with production and consumption patterns, the use and disposal of all the stuff in our lives that affect our communities at home and abroad.

References and Additional Resources

Office of the Federal Environmental Executive - Green Purchasing

<http://ofee.gov/gp/gp.asp>: Information and resources on green purchasing including the acquisition of recycled content products, environmentally preferable products and services, biobased products, energy- and water-efficient products, alternate fuel vehicles, products using renewable energy, and alternatives to hazardous or toxic chemicals.

Responsible Purchasing Network

http://www.responsiblepurchasing.org/purchasing_guides/all/: RPN produces green Purchasing Guides for a range of products and services, including: Bottled Water, Cleaners, Computers, Copy Paper, Green Power, Fleets, Lighting, Office Electronics, and Paint.

New American Dream, Conscious Consumer Marketplace

<http://www.newdream.org/marketplace/paper.php>: Resources for green product choices for a range of product types.

US EPA, Environmental Preferred Purchasing (EPP)

<http://yosemite1.epa.gov/oppt/eppstand2.nsf/Pages/Search.html?Open>: One stop shop for environmental information on products and services the federal government buys.

Consumer Reports - Greener Choices

<http://greenerchoices.org/>: Green buying guides for appliances and electronics, eco-label explanations and comparisons, electronics recycling center, and more.

Scientific Certifications Systems - Eco Products

<http://www.scscertified.com/ecoproducts/products/>: Offers evaluation and certification services to a broad range of manufacturing sectors.

Environmental Choice - EcoLogo

<http://www.ecologo.org/en/>: Launched by the Canadian Federal Government in 1988, EcoLogo is North America's oldest green certification and standards organization.

Greenguard

<http://www.greenguard.org>: Third party certification programs designed to improve public health and quality of life.

Green Seal

<http://www.greenseal.org/certification/environmental.cfm>: Provides science-based environmental certification standards that are credible, transparent.

Energy Star, Purchasing & Procurement

http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing#res_app: Voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions/

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*,

<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Waste Audit

Source Reduction

Recycling

Composting

Process Steps

- Conduct a waste audit to determine the contents of the school's waste stream.
- Interview stakeholders within the school to generate ideas to reduce the amount of waste sent to the landfill.
- Develop a waste reduction and recycling program based on the results of the waste assessment.

Best Practices

Waste Audit

A "waste audit" is the process of identifying the specific materials that make up a building's waste stream. This process involves the collection of a sample of the school's waste stream, sorting through the waste to determine its makeup, and calculating the percentage of waste recycled and sent to the landfill. Through this process, schools can identify opportunities to divert waste streams away from the landfill to recycling or composting opportunities. Use the following basic steps to conduct a waste audit for the school.

- Gather a team of students, teachers, janitorial staff, and administrative staff to develop a plan for and conduct the waste audit.
- Determine how and when to sample the waste stream.
- Make a plan for collecting, sorting and weighing individual waste types.
- Create tracking forms to document the waste observed during the audit.*
- Gather equipment and supplies necessary to conduct the audit. Consider the following items.
 - Appropriate clothing including rubber gloves, safety glasses.
 - Scales suitable for weighing bags or containers of materials.
 - Tarp or plastic sheet for waste sorting.
 - Copies of the waste audit tracking forms.*
 - Spare container or extra bags for weighing sorted materials.
- Conduct the waste audit and record the total weight, total weight recycled, and total weight landfilled for each type of waste observed.
 - Sort waste that has been channeled to landfill or incineration to identify weight of each waste category that is disposed of in conventional fashion.
 - Sort waste that has been channeled to recycling, reuse, composting or otherwise diverted, to identify the amount of each waste category that is disposed of by alternative means. Recycling data from waste haulers may be used if available.
 - Determine the percentage of the total waste stream for each waste type and the associated percentage diverted for each waste type

- Draft a summary report outlining the process and findings of the waste audit.

*Additional resources are listed below for the waste audit including guidelines, steps, and sample tracking forms.

Source Reduction

With the information gained from the waste audit, schools can identify priorities and areas of opportunity to reduce the amount of waste generated by the school and sent to the landfill.

Staff Interviews

In addition to the waste audit, it is beneficial to conduct interviews with various stakeholders in the school to understand how and why certain waste types are generated. These interviews can be instrumental in generating ideas for improvement.

- Conduct interviews with maintenance personnel, administrative staff, food service staff, teachers, and students as appropriate to generate ideas for reducing waste.

Landscaping

- Divert landscape waste from the landfill through mulching or composting. Composting can take place on site or be sent off site to a facility dedicated to composting organic materials.
- Minimize the use of fertilizer and apply precise amounts only to areas in need.
- Use grasscycling techniques (leave clippings on turf) as a means to compost clippings, apply free fertilizer, and reduce pollutants. Schedule mowing so that no more than 1/3 the length of the blade is cut at any one mowing.
- Use selective pruning of vegetation to avoid excessive growth.

Packaging

- Investigate opportunities to buy in bulk and purchase materials with minimal or no packaging.
- Develop “take-back” programs with suppliers to return cardboard packaging, fluorescent lights, printer toner cartridges, carpeting, equipment, and electronics.
- Select products with packaging that contains recycled content and that can easily be recycled or re-used at the school.

Janitorial Supplies

- Purchase cleaning products in concentrate form and re-use pump and spray bottles.
- Replace paper towels with durable microfiber towel or other reusable materials.
- Replace disposable liners with re-usable liners for recycling bins and control the use of disposable liners in trash bins.
- Consider using hand dryers in lieu of paper towels in bathrooms.
- Use reusable vacuum cleaner bags.

Food Service

- Eliminate packaging wherever possible. Where packaging is necessary select products that can be recycled after use such as milk cartons.
- Use reusable dishware and trays.
- Provide or sell zero waste lunch kits to students with reusable containers.
- Consider participating in a food recovery program to provide unused food to people in need. Food not suitable for consumption can also be donated to feed animals in some locations.

- Compost leftover or unused non-dairy / meat food products.

Office and School Supplies

- Use rechargeable batteries and recycle spent or non-rechargeable batteries.
- Recycle or refill used printer toner cartridges.
- Set up a school wide reuse program by setting up an area in the school where reusable school supplies are readily accessible.
- Set computer defaults to print double sided, preview all documents before printing, and print only what is needed.*
- Provide trays to collect and reuse one-sided paper, envelopes, and file folders.
- Send information electronically whenever possible.

*A waste characterization study of 101 California schools found that 47% of the total waste produced by schools is paper products. Source: California Integrated Waste Management Board.

Recycling

Recycling is the next step for waste management after the waste audit and waste reduction strategies. When planning for or implementing a recycling program in the school, it is important to consider the following components of the recycling process.

Waste Haulers & Recyclable Materials

- In many areas, the following materials can be recycled: Paper, Glass, Plastics, Cardboard, Metals, and Organic Waste.
 - As noted above, a study of 101 California schools found that 47% of the total waste produced by schools is paper. Any recycling program should place added emphasis on the management of paper waste reduction and recycling.
- Look for local waste haulers that specialize in recycling collection and schools. Put out a request for proposal for single stream recycling to increase recycling participation.
- If possible, contract with the waste hauler to provide monthly data on the amount of waste recycled and the amount sent to the landfill.

Leadership & Education

- As with the waste audit / assessment, organize a group of students, teachers, administrators, and staff to champion and coordinate the recycling effort for the school.
- Incorporate environmental stewardship and waste management, waste reduction, and recycling into the school curriculum to educate the student body on the importance of the recycling program.
- Take advantage of the opportunity to incorporate experiential learning into the curriculum by engaging students in the process of implementing recycling programs and tracking waste reduction.
- Track the progress of waste reduction and recycling activities and report the results to all stakeholders in the school.

Equipment & Convenience

- Locate recycling bins in every classroom, common areas, and administrative areas.
- Clearly identify recycling bins.
- Make recycling bins as or more accessible than trash bins. Strategically place recycling bins near source locations such as paper recycling bins near printers.

Composting

Outdoor Composting

Organic materials such as landscape waste and food waste can be composted on the school grounds or through off-site composting programs. Use the following steps to assess the feasibility and to develop a plan for composting at the school.

- Determine if off-site composting is available or if composting will be conducted on site.
- Organize a group of students, teachers, and staff to develop a plan for composting at the school.
- Research what is involved in school wide composting. Helpful resources include:
 - Connecticut Department of Environmental Protection, *School Composting: A Manual for Connecticut Schools*, http://www.ct.gov/dep/lib/dep/compost/compost_pdf/schmanual.pdf
 - Environmental Protection Agency - Composting Home, http://www.epa.gov/osw/conserve/rrr/composting/by_compost.htm
 - <http://www.howtocompost.org/>
- Determine what food scraps (referred to as "Greens") can be used for composting and develop a plan to collect and apply scraps to the composting pile.
- Develop a plan for collecting and storing landscape wastes (referred to as "Browns") for use with the compost pile. Browns help to keep the compost light, loose and allow air to move about the pile more freely.
- Determine the amount usable food scraps that are produced on a daily basis at the school.
- Determine the size and amount of compost bins necessary to process the desired food and landscape wastes. When starting a new program, it may be beneficial to start small.
- Make a plan for ongoing maintenance of the compost bin. Daily activities include collecting the food scraps, spreading scraps over the pile and layering with Browns, and taking the temperature of the pile.
- Understand when and how to turn the compost pile.
- Generate ideas for ways to use the compost once completed.

Vermicomposting

Vermicomposting is the process of using worms to process food waste in nutrient rich soil. In this process, organic materials are added to a bin with worms and as the worms feed on the organic materials and food scraps they process the materials into usable compost. Vermicomposting bins can be stored indoors or outdoors but generally perform best in an environment between 55 to 77°F. The following resources may be helpful in starting a vermicomposting program at the school.

- California Integrated Waste Management Board, *The Worm Guide: A Vermicomposting Guide for Teachers*, <http://www.ciwmb.ca.gov/Publications/Schools/56001007.pdf>
- North Carolina Cooperative Extension Service, <http://www.bae.ncsu.edu/topic/vermicomposting/pubs/worms.html>
- West Contra Costa Integrated Waste Management Authority, <http://www.recyclemore.org/article.asp?key=49>

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable	EBOM Requirement and Performance Metrics
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	EBOM Credits	
Waste Audit	MRC6	MRC6 – Conduct a waste audit of the building’s entire ongoing consumables waste stream, identify the types of waste making up the waste stream and, identify opportunities to increase recycling and waste diversion.
Source Reduction Recycling Composting	MRC7.1 & MRC7.2 MRC8 MRC9	<p>MRC7.1 & MRC7.2 – Maintain waste reduction and recycling program that addresses materials with a low cost per unit that are regularly used and replaced through the course of business. These materials include paper, toner cartridges, glass, plastics, cardboard, food waste and metals.</p> <p>Reuse recycle or compost 50% of the ongoing consumables waste stream for 1 point.</p> <p>Reuse, recycle or compost 75% of the ongoing consumables waste stream for 2 points.</p> <p>MRC8 – Maintain a waste reduction, reuse and recycling program that addresses durable goods that are replaced infrequently and/or may require capital program outlays to purchase. Examples include office equipment (computers, monitors, etc.), appliances, external power adapters, televisions and other audiovisual equipment.</p> <p>Reuse or recycle 75% of the durable goods waste stream during the performance period for 1 point.</p> <p>MRC9 – Divert at least 70% of waste generated by facility alterations and disposal to landfills and incineration facilities. This applies only to base building elements permanently or semi-permanently attached to the building itself that enter the waste stream during facility renovations.</p> <p>Examples include wall studs, insulation, doors, panels, drywall, trim, ceiling panels, carpet and other flooring materials.</p>

Curriculum Opportunities

Waste Management Curriculum

California Integrated Waste Management Board

The CIWMB has developed a group of activities and curriculum centered on waste management and the three R's of reduce, reuse, and recycle. The curriculum is available for download at no cost at <http://www.ciwmb.ca.gov/Schools/Curriculum/default.htm>. The following are two examples of the curriculum available:

The Adventures of Vermi the Worm

Developed by the California Integrated Waste Management Board and available for download at <http://www.ciwmb.ca.gov/Vermi/>. The Adventures of Vermi the Worm is an animated, interactive game that teaches the basics vermicomposting (composting using worms to do the work) and its benefits, plus the 3 R's of reduce, reuse, and recycle.

Closing the Loop

Closing the Loop is a compilation of 50 lessons focused on environmental stewardship and solid waste management and specifically issues surrounding landfills, recycling, packaging, resource conservation, and composting. Closing the Loop curriculum is available at <http://www.ciwmb.ca.gov/Schools/Curriculum/CTL/>.

References and Additional Resources

California Integrated Waste Management Board

<http://www.ciwmb.ca.gov/Schools/default.htm> : Curriculum and instructional materials, waste reduction best practices, model solid waste management programs are all available on this website. All resources are tailored to K-12 schools. The following sub-categories are accessed from this site:

<http://www.ciwmb.ca.gov/Schools/WasteReduce/Composition.htm>: Background on the typical waste composition of schools as well as waste audit and assessment resources.

<http://www.ciwmb.ca.gov/Schools/WasteReduce/Strategies.htm>: Best practices for waste reduction for different applications within the school including food service, administration, maintenance and operations, and facilities and planning.

<http://www.ciwmb.ca.gov/Schools/Gardens/default.htm>: Resources on starting a school garden.

Nature Center's Earth Flag Program, *Waste Audit Manual*,

http://www.ijams.org/template_assets/pdf/Waste%20Audit%20Manual.PDF

Oregon Green Schools Tools, What's in Your Waste: Steps for Organizing a Waste Audit,

<http://www.oregongreenschools.org/pdf/Whats-in-your-waste.pdf>

Resource Recovery Fund Board, *Waste Audit Guide*,

<http://www.rffb.com/pages/Secondary%20pages/WAudit.html>

The Resourceful Schools Project

<http://www.resourcefulschools.org/coordinators.html>: How to set up a successful recycling program

http://www.resourcefulschools.org/wastefree_lunch.html: Waste free lunch

Connecticut Department of Environmental Protection, *School Composting: A Manual for Connecticut Schools*, http://www.ct.gov/dep/lib/dep/compost/compost_pdf/schmanual.pdf: A comprehensive manual for composting in schools including curriculum opportunities.

Environmental Protection Agency
http://www.epa.gov/osw/conserve/rrr/composting/by_compost.htm: Information on how to create a compost pile.

HowToCompost
<http://www.howtocompost.org/>: Composting resources and information.

California Integrated Waste Management Board, *The Worm Guide: A Vermicomposting Guide for Teachers*, <http://www.ciwmb.ca.gov/Publications/Schools/56001007.pdf>

North Carolina Cooperative Extension Service
<http://www.bae.ncsu.edu/topic/vermicomposting/pubs/worms.html>: Basic how-to information on vermicomposting.

West Contra Costa Integrated Waste Management Authority
<http://www.recyclemore.org/article.asp?key=49>: Information on setting up a vermicomposting program.

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>

Impacted Operations

Entryway Systems Maintenance
Cleaning Products
Cleaning Equipment
Integrated Pest Management
Quality Control

Process Steps

- Develop a school wide green cleaning policy.
- Outline acceptable standards for cleaning products, equipment, and procedures.
- Provide adequate training for janitorial staff and implement green cleaning program.
- Conduct quality control activities to assess the performance of the green cleaning program.

Best Practices

Entryway Systems Maintenance

- Use walk-off mats or grills at all regular building entrances.
- Vacuum or clean mats daily and swap out mats as needed for thorough cleaning.
- Walk-off mats should be sized to allow contact several times with building occupant feet upon entry.

Cleaning Products

Select green cleaning products that are 3rd party certified by a credible certification body including Green Seal and EcoLogo (Environmental Choice). Look for the products with the following certifications for relevant applications.

- Cleaning Products
 - Green Seal GS-37: General purpose, bathroom , glass and carpet cleaners
 - Environmental Choice CCD-110: Cleaning and degreasing compounds
 - Environmental Choice CCD-146: Hard Surface Cleaners
 - Environmental Choice CCD-148: Carpet and Upholstery Care
- Disinfectants, Floor Finishes, and Strippers
 - Green Seal GS-40: Industrial and Institutional Floor Care
 - Environmental Choice CCD-112: Digestion Additives for Cleaning and Odor Control
 - Environmental Choice CCD-113: Drain or Grease Traps Additives
 - Environmental Choice CCD-115: Odor Control Additives
 - Environmental Choice CCD-147: Hard Floor Care
- Hand Soaps
 - No antimicrobial agents
 - Green Seal GS-41: Industrial and Institutional Hand Cleaners
 - Environmental Choice CCD-104: Hand Cleaners and Hand Soaps

- Use of chemical concentrates is preferred. Consider the use of closed dispensing systems in combination with chemical concentrates.

Cleaning Equipment

- Use vacuum cleaners certified by the Carpet and Rug Institute.
- Use vacuum cleaners that operate at a sound level of less than 70dBA.
- Powered maintenance equipment should be equipped with vacuums, guards and/or other devices for capturing fine particulates, and shall operate with a sound level less than 70dBA.
- Propane-powered floor equipment shall have high-efficiency, low-emissions engines.
- Automated scrubbing machines shall be equipped with variable-speed feed pumps to optimize the use of cleaning fluids.
- Battery-powered equipment shall be equipped with environmentally-preferable gel batteries.
- Where appropriate, active micro fiber technology shall be used to reduce cleaning chemical consumptions and prolong life of disposable scrubbing pads.
- Powered equipment shall be ergonomically designed to minimize vibration, noise and user fatigue.
- Equipment shall have rubber bumpers to reduce potential damage to building surfaces.

Integrated Pest Management

- Develop an integrated pest management policy for the school. See Section 1 Building Exterior, Landscape, and Pest Management for best practices.
- Any cleaning products included in the integrated pest management policy should follow the guidelines above.

Quality Control

- Engage in ongoing assessment and improvement of the green cleaning program. Consider the use of the following tools.
 - EPA HealthySeat Version 2: <http://www.epa.gov/schools/healthyseat/basicinformation.html>
EPA HealthySeat is a software tool to help school districts evaluate and manage their school facilities for key environmental, safety and health issues. The tool is designed to be customized and used by district-level staff to conduct completely voluntary self-assessments of their school (and other) facilities and to track and manage information on environmental conditions school by school.
 - APPA Leadership in Educational Facilities “Custodial Staffing Guidelines”: <http://www.appa.org>
The Custodial Staffing Guidelines include evaluation criteria and audit forms for determining the facilities level of cleanliness.

LEED for Existing Buildings O&M Applicable Credit Chart

Impacted Operations	Applicable EBOM Credits	EBOM Requirement and Performance Metrics
Entryway System Maintenance	EQc3.8	EQc3.8 - Utilize entryway systems to reduce the amount of dirt, dust, pollen, and other particles entering the building at all public entryways. The systems must be least 10 feet in length and maintained on a regular basis.

Cleaning Products	EQc3.4 EQc3.6	-	EQc3.4 – EQc3.6 - Implement sustainable purchasing for cleaning materials and products, disposable janitorial paper products and trash bags. On point is awarded for each 30% of the total annual purchases of products that meet the outlined sustainability criteria. See the EBOM Rating System for specific criteria.
Cleaning Equipment	EQc3.7		EQc3.7 - Implement a program for the use of janitorial equipment that reduces building contaminants and minimizes environmental impact. See the EBOM Rating System for specific equipment criteria required.
Integrated Pest Management	EQc3.9		EQc3.9 - Have in place an indoor integrated pest management plan that calls for using least-toxic chemical pesticides, minimum use of chemicals, targeted locations for targeted species. See the EBOM Rating System for additional requirements related to the IPM plan.
Quality Control	EQc3.2 EQc3.3	&	EQc3.2 & EQc3.2 – Conduct an audit in accordance with APA Leadership in Educational Facilities “Custodial Staffing Guidelines” to determine the appearance level of the facility.
All Areas	EQc3.1		EQc3.1 – Have in place a high performance cleaning program addressing; Staffing, Personnel Training, Use of Chemical Concentrates, Use of Sustainable Cleaning Materials, Use of Sustainable Floor Care Products, and Cleaning Equipment.

Curriculum Opportunities

Indoor Air Quality (IAQ) Curriculum

Developed by the National Education Association Health Information Network (NEA HIN) and available for download at http://www.neahin.org/Lesson_Plan/LessonPlanStartPage.htm.

NEA HIN has created a series of K-12 lesson plans that cover a range of topics surrounding IAQ including pollutant sources, ventilation and mechanical airflow, flooring, and public awareness. The lessons plans are designed to supplement the U.S. EPA's *IAQ Tools for Schools* program and kit and are tied to standards and can be easily integrated with the school district's curriculum.

NEA HIN also provides links to other IAQ curriculum developed outside of the organization.

References and Additional Resources

The Quick and Easy Guide to Green Cleaning in Schools

<http://www.healthyschoolscampaign.org> – Basic how-to for implementing green cleaning in schools.

Cleaning for Healthy Schools Toolkit
<http://www.cleaningforhealthyschools.org>

EPA Integrated Pest Management for Schools: A How-to Manual
<http://www.epa.gov/pesticides/ipm/schoolipm/index.html>

National Clearing House for Educational Facilities
http://www.ncef.org/rl/green_cleaning.cfm - Links to green cleaning resources for schools.

The Collaborative for High Performance Schools, *Best Practice Manual Volume IV: Maintenance & Operations 2004*, <http://www.chps.net/manual/index.htm#BPM>

U.S. Green Building Council, *LEED for Existing Buildings: Operations & Maintenance Rating System*,
<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221>