

# LEED 2009 FOR EXISTING BUILDINGS OPERATIONS AND MAINTENANCE

For Public Use and Display  
LEED 2009 for Existing Buildings:  
Operations & Maintenance Rating System  
USGBC Member Approved November 2008





# PREFACE FROM USGBC

The built environment has a profound impact on our natural environment, economy, health, and productivity. Breakthroughs in building science, technology, and operations are now available to designers, builders, operators, and owners who want to build green and maximize both economic and environmental performance.

Through the LEED® green building certification program, the U.S. Green Building Council (USGBC) is transforming the built environment. The green building movement offers an unprecedented opportunity to respond to the most important challenges of our time, including global climate change, dependence on non sustainable and expensive sources of energy, and threats to human health. The work of innovative building professionals is a fundamental driving force in the green building moment. Such leadership is a critical component to achieving USGBC's mission of a sustainable built environment for all within a generation.

## **USGBC MEMBERSHIP**

USGBC's greatest strength is the diversity of our membership. USGBC is a balanced, consensus based nonprofit with more than 18,000 member companies and organizations representing the entire building industry. Since its inception in 1993, USGBC has played a vital role in providing a leadership forum and a unique, integrating force for the building industry. USGBC's programs have three distinguishing characteristics:

### **Committee-based**

The heart of this effective coalition is our committee structure, in which volunteer members design strategies that are implemented by staff and expert consultants. Our committees provide a forum for members to resolve differences, build alliances, and forge cooperative solutions for influencing change in all sectors of the building industry.

### **Member-driven**

Membership is open and balanced and provides a comprehensive platform for carrying out important programs and activities. We target the issues identified by our members as the highest priority. We conduct an annual review of achievements that allows us to set policy, revise strategies, and devise work plans based on members' needs.

### **Consensus-focused**

We work together to promote green buildings, and in doing so, we help foster greater economic vitality and environmental health at lower costs. We work to bridge ideological gaps between industry segments and develop balanced policies that benefit the entire industry.

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## ACKNOWLEDGMENTS

The LEED 2009 Rating System has been made possible only through the efforts of many dedicated volunteers, staff members, and others in the USGBC community. The Rating System improvement work was managed and implemented by USGBC staff and included review and input by many Technical Advisory Group (TAG) members with oversight by the LEED Steering Committee. We extend our deepest gratitude to all of our LEED committee members who participated in the development of this rating system, for their tireless volunteer efforts and constant support of USGBC's mission:

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Christopher Schaffner	The Green Engineer
Dennis Stanke	Trane Company

The LEED 2009 for Existing Buildings: Operations & Maintenance Rating System builds on the work of those who helped create previous version:

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Paul Walitsky	The Industrial Ecology Co. LLC
Richard Walker	Transwestern

# LEED 2009 FOR EXISTING BUILDINGS: OPERATIONS & MAINTENANCE PROJECT CHECKLIST

<b>Sustainable Sites</b>		<b>26 Possible Points</b>
<input type="checkbox"/>	Credit 1 LEED Certified Design and Construction	4
<input type="checkbox"/>	Credit 2 Building Exterior and Hardscape Management Plan	1
<input type="checkbox"/>	Credit 3 Integrated Pest Management, Erosion Control, and Landscape Management Plan	1
<input type="checkbox"/>	Credit 4 Alternative Commuting Transportation	3-15
<input type="checkbox"/>	Credit 5 Site Disturbance—Protect or Restore Open Habitat	1
<input type="checkbox"/>	Credit 6 Stormwater Quantity Control	1
<input type="checkbox"/>	Credit 7.1 Heat Island Reduction—Nonroof	1
<input type="checkbox"/>	Credit 7.2 Heat Island Reduction—Roof	1
<input type="checkbox"/>	Credit 8 Light Pollution Reduction	1
<b>Water Efficiency</b>		<b>14 Possible Points</b>
<input checked="" type="checkbox"/>	Prerequisite 1 Minimum Indoor Plumbing Fixture and Fitting Efficiency	Required
<input type="checkbox"/>	Credit 1 Water Performance Measurement	1-2
<input type="checkbox"/>	Credit 2 Additional Indoor Plumbing Fixture and Fitting Efficiency	1-5
<input type="checkbox"/>	Credit 3 Water Efficient Landscaping	1-5
<input type="checkbox"/>	Credit 4 Cooling Tower Water Management	1-2
<b>Energy and Atmosphere</b>		<b>35 Possible Points</b>
<input checked="" type="checkbox"/>	Prerequisite 1 Energy Efficiency Best Management Practices—Planning, Documentation, and Opportunity Assessment	Required
<input checked="" type="checkbox"/>	Prerequisite 2 Minimum Energy Efficiency Performance	Required
<input checked="" type="checkbox"/>	Prerequisite 3 Fundamental Refrigerant Management	Required
<input type="checkbox"/>	Credit 1 Optimize Energy Efficiency Performance	1-18
<input type="checkbox"/>	Credit 2.1 Existing Building Commissioning—Investigation and Analysis	2
<input type="checkbox"/>	Credit 2.2 Existing Building Commissioning—Implementation	2
<input type="checkbox"/>	Credit 2.3 Existing Building Commissioning—Ongoing Commissioning	2
<input type="checkbox"/>	Credit 3.1 Performance Measurement—Building Automation System	1
<input type="checkbox"/>	Credit 3.2 Performance Measurement—System Level Metering	1-2
<input type="checkbox"/>	Credit 4 On-site and Off-site Renewable Energy	1-6
<input type="checkbox"/>	Credit 5 Enhanced Refrigerant Management	1
<input type="checkbox"/>	Credit 6 Emissions Reduction Reporting	1
<b>Materials and Resources</b>		<b>10 Possible Points</b>
<input checked="" type="checkbox"/>	Prerequisite 1 Sustainable Purchasing Policy	Required
<input checked="" type="checkbox"/>	Prerequisite 2 Solid Waste Management Policy	Required
<input type="checkbox"/>	Credit 1 Sustainable Purchasing—Ongoing Consumables	1
<input type="checkbox"/>	Credit 2 Sustainable Purchasing—Durable Goods	1-2
<input type="checkbox"/>	Credit 3 Sustainable Purchasing—Facility Alterations and Additions	1
<input type="checkbox"/>	Credit 4 Sustainable Purchasing—Reduced Mercury in Lamps	1
<input type="checkbox"/>	Credit 5 Sustainable Purchasing—Food	1

<input type="checkbox"/>	Credit 6	Solid Waste Management—Waste Stream Audit	1
<input type="checkbox"/>	Credit 7	Solid Waste Management—Ongoing Consumables	1
<input type="checkbox"/>	Credit 8	Solid Waste Management—Durable Goods	1
<input type="checkbox"/>	Credit 9	Solid Waste Management—Facility Alterations and Additions	1

### Indoor Environmental Quality

**15 Possible Points**

<input checked="" type="checkbox"/>	Prerequisite 1	Minimum Indoor Air Quality Performance	Required
<input checked="" type="checkbox"/>	Prerequisite 2	Environmental Tobacco Smoke (ETS) Control	Required
<input checked="" type="checkbox"/>	Prerequisite 3	Green Cleaning Policy	Required
<input type="checkbox"/>	Credit 1.1	Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program	1
<input type="checkbox"/>	Credit 1.2	Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring	1
<input type="checkbox"/>	Credit 1.3	Indoor Air Quality Best Management Practices—Increased Ventilation	1
<input type="checkbox"/>	Credit 1.4	Indoor Air Quality Best Management Practices—Reduce Particulates in Air Distribution	1
<input type="checkbox"/>	Credit 1.5	Indoor Air Quality Best Management Practices—Indoor Air Quality Management for Facility Alterations and Additions	1
<input type="checkbox"/>	Credit 2.1	Occupant Comfort—Occupant Survey	1
<input type="checkbox"/>	Credit 2.2	Controllability of Systems—Lighting	1
<input type="checkbox"/>	Credit 2.3	Occupant Comfort—Thermal Comfort Monitoring	1
<input type="checkbox"/>	Credit 2.4	Daylight and Views	1
<input type="checkbox"/>	Credit 3.1	Green Cleaning—High Performance Cleaning Program	1
<input type="checkbox"/>	Credit 3.2	Green Cleaning—Custodial Effectiveness Assessment	1
<input type="checkbox"/>	Credit 3.3	Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	1
<input type="checkbox"/>	Credit 3.4	Green Cleaning—Sustainable Cleaning Equipment	1
<input type="checkbox"/>	Credit 3.5	Green Cleaning—Indoor Chemical and Pollutant Source Control	1
<input type="checkbox"/>	Credit 3.6	Green Cleaning—Indoor Integrated Pest Management	1

### Innovation in Operations

**6 Possible Points**

<input type="checkbox"/>	Credit 1	Innovation in Operations	1-4
<input type="checkbox"/>	Credit 2	LEED Accredited Professional	1
<input type="checkbox"/>	Credit 3	Documenting Sustainable Building Cost Impacts	1

### Regional Priority

**4 Possible Points**

<input type="checkbox"/>	Credit 1	Regional Priority	1-4
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### LEED 2009 for Existing Buildings: Operations & Maintenance

100 base points; 6 possible Innovation in Operations and 4 Regional Priority points

Certified	40–49 points
Silver	50–59 points
Gold	60–79 points
Platinum	80 points and above



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<b>Sustainable Sites (SS)</b>	<b>1</b>
Credit 1 LEED Certified Design and Construction	1
Credit 2 Building Exterior and Hardscape Management Plan	2
Credit 3 Integrated Pest Management, Erosion Control, and Landscape Management Plan	3
Credit 4 Alternative Commuting Transportation	4
Credit 5 Site Development—Protect or Restore Open Habitat	6
Credit 6 Stormwater Quantity Control	7
Credit 7.1 Heat Island Reduction—Nonroof	8
Credit 7.2 Heat Island Reduction—Roof	10
Credit 8 Light Pollution Reduction	12
<b>Water Efficiency (WE)</b>	<b>15</b>
Prerequisite 1 Minimum Indoor Plumbing Fixture and Fitting Efficiency	15
Credit 1 Water Performance Measurement	17
Credit 2 Additional Indoor Plumbing Fixture and Fitting Efficiency	19
Credit 3 Water Efficient Landscaping	20
Credit 4 Cooling Tower Water Management	22
<b>Energy and Atmosphere (EA)</b>	<b>23</b>
Prerequisite 1 Energy Efficiency Best Management Practices—Planning, Documentation, and Opportunity Assessment	23
Prerequisite 2 Minimum Energy Efficiency Performance	24
Prerequisite 3 Fundamental Refrigerant Management	26
Credit 1 Optimize Energy Efficiency Performance	27
Credit 2.1 Existing Building Commissioning—Investigation and Analysis	30
Credit 2.2 Existing Building Commissioning—Implementation	31
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Credit 3.1 Performance Measurement—Building Automation System	33

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**Materials and Resources (MR) 41**

Prerequisite 1	Sustainable Purchasing Policy	41
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Credit 1	Sustainable Purchasing—Ongoing Consumables	43
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**Indoor Environmental Quality (IEQ) 55**

Prerequisite 1	Minimum Indoor Air Quality Performance	54
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Credit 1.1	Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program	60
Credit 1.2	Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring	61
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Credit 3.1	Green Cleaning—High-Performance Cleaning Program	75
Credit 3.2	Green Cleaning—Custodial Effectiveness Assessment	76
Credit 3.3	Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	77
Credit 3.4	Green Cleaning—Sustainable Cleaning Equipment	79
Credit 3.5	Green Cleaning—Indoor Chemical and Pollutant Source Control	80
Credit 3.6	Green Cleaning—Indoor Integrated Pest Management	81

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# INTRODUCTION

## I. LEED® GREEN BUILDING RATING SYSTEM

### Background on LEED®

Following the formation of the U.S. Green Building Council (USGBC) in 1993, the organization's members quickly realized that the sustainable building industry needed a system to define and measure "green buildings." USGBC began to research existing green building metrics and rating systems. Less than a year after formation, the members acted on the initial findings by establishing a committee to focus solely on this topic. The composition of the committee was diverse; it included architects, real estate agents, a building owner, a lawyer, an environmentalist, and industry representatives. This cross section of people and professions added a richness and depth both to the process and to the ultimate product.

The first LEED Pilot Project Program, also referred to as LEED Version 1.0, was launched at the USGBC Membership Summit in August 1998. After extensive modifications, LEED Green Building Rating System Version 2.0 was released in March 2000, with LEED Version 2.1 following in 2002 and LEED Version 2.2 following in 2005.

As LEED has evolved and matured, the program has undertaken new initiatives. In addition to a rating system specifically devoted to building operations and maintenance issues (LEED for Existing Buildings: Operations & Maintenance), LEED addresses the different project development and delivery processes of the U.S. building design and construction market through rating systems for specific building typologies, sectors, and project scopes: LEED for Core & Shell, LEED for New Construction, LEED for Schools, LEED for Neighborhood Development, LEED for Retail, LEED for Healthcare, LEED for Homes, and LEED for Commercial Interiors.

Project teams interact with the Green Building Certification Institute (GBCI) for project registration and certification. GBCI was established in 2008 as a separately incorporated entity with the support of the U.S. Green Building Council. GBCI administers credentialing and certification programs related to green building practice. These programs support the application of proven strategies for increasing and measuring the performance of buildings and communities as defined by industry systems such as LEED.

The green building field is growing and changing daily. New technologies and products are being introduced into the marketplace, and innovative designs and practices are proving their effectiveness. The LEED rating systems and reference guides will evolve as well. Project teams must comply with the version of the rating system that is current at the time of their registration. USGBC will highlight new developments on its website on a continual basis; see [www.usgbc.org](http://www.usgbc.org).

### Features of LEED®

The LEED Green Building Rating Systems are voluntary, consensus-based, and market-driven. Based on existing and proven technology, they evaluate environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a green building in design, construction, and operation.

The LEED rating systems are designed for rating new and existing commercial, institutional, and residential buildings. They are based on accepted energy and environmental principles and strike a balance between known, established practices and emerging concepts. Each rating system is organized into 5 environmental categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental

Quality. An additional category, Innovation in Design (or Operations), addresses sustainable building expertise as well as measures not covered under the 5 environmental categories. Regional bonus points are another feature of LEED and acknowledge the importance of local conditions in determining best environmental design and construction practices.

### **The LEED Credit Weightings**

In LEED 2009, the allocation of points between credits is based on the potential environmental impacts and human benefits of each credit with respect to a set of impact categories. The impacts are defined as the environmental or human effect of the design, construction, operation, and maintenance of the building, such as greenhouse gas emissions, fossil fuel use, toxins and carcinogens, air and water pollutants, indoor environmental conditions. A combination of approaches, including energy modeling, life-cycle assessment, and transportation analysis, is used to quantify each type of impact. The resulting allocation of points among credits is called credit weighting.

LEED 2009 uses the U.S. Environmental Protection Agency's TRACI<sup>1</sup> environmental impact categories as the basis for weighting each credit. TRACI was developed to assist with impact evaluation for life-cycle assessment, industrial ecology, process design, and pollution prevention.

LEED 2009 also takes into consideration the weightings developed by the National Institute of Standards and Technology (NIST); these compare impact categories with one another and assign a relative weight to each. Together, the 2 approaches provide a solid foundation for determining the point value of each credit in LEED 2009.

The LEED 2009 credit weightings process is based on the following parameters, which maintain consistency and usability across rating systems:

- All LEED credits are worth a minimum of 1 point.
- All LEED credits are positive, whole numbers; there are no fractions or negative values.
- All LEED credits receive a single, static weight in each rating system; there are no individualized scorecards based on project location.
- All LEED rating systems have 100 base points; Innovation in Design (or Operations) and
- Regional Priority credits provide opportunities for up to 10 bonus points.

Given the above criteria, the LEED 2009 credit weightings process involves 3 steps:

1. A reference building is used to estimate the environmental impacts in 13 categories associated with a typical building pursuing LEED certification.
2. The relative importance of building impacts in each category are set to reflect values based on the NIST weightings.<sup>2</sup>
3. Data that quantify building impacts on environmental and human health are used to assign points to individual credits.

Each credit is allocated points based on the relative importance of the building-related impacts that it addresses. The result is a weighted average that combines building impacts and the relative value of the impact categories. Credits that most directly address the most important impacts are given the greatest weight, subject to the system design parameters described above. Credit weights also reflect a decision by LEED to recognize the market implications of point allocation. The result is a significant change in allocation of points compared with previous LEED rating systems. Overall, the changes increase the relative emphasis on the reduction of energy consumption and greenhouse gas emissions associated with building systems, transportation, the embodied energy of water, the embodied energy of materials, and where applicable, solid waste.

The details of the weightings process vary slightly among individual rating systems. For example, LEED for Existing Buildings: O&M includes credits related to solid waste management but LEED for New Construction does not. This results in a difference in the portion of the environmental footprint addressed by each rating system and the relative allocation of points. The weightings process for each rating system is fully documented in a weightings workbook.

The credit weightings process will be reevaluated over time to incorporate changes in values ascribed to different building impacts and building types, based on both market reality and evolving scientific knowledge related to buildings. A complete explanation of the LEED credit weightings system is available on the USGBC website, at [www.usgbc.org](http://www.usgbc.org).

### **Regional Priority Credits**

To provide incentive to address geographically specific environmental issues, USGBC regional councils and chapters have identified 6 credits per rating system that are of particular importance to specific areas. Each regional priority credit is worth an additional 1 point, and a total of 4 regional priority points may be earned. Upon project registration, LEED-Online automatically determines a project's regional priority credits based on its zip code. If the project achieves more than 4 regional priority credits, the team can choose the credits for which these points will apply. The USGBC website also contains a searchable database of regional priority credits.

## **II. OVERVIEW AND PROCESS**

The LEED 2009 Green Building Rating System for Existing Buildings: Operations & Maintenance is a set of performance standards for certifying the operations and maintenance of existing commercial or institutional buildings and high-rise residential buildings of all sizes, both public and private. The intent is to promote high-performance, healthful, durable, affordable, and environmentally sound practices in existing buildings.

Prerequisites and credits in the LEED 2009 for Existing Buildings: Operations & Maintenance Rating System address 7 topics:

- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy and Atmosphere (EA)
- Materials and Resources (MR)
- Indoor Environmental Quality (IEQ)
- Innovation in Operations (IO)
- Regional Priority (RP)

LEED 2009 for Existing Buildings: Operations & Maintenance certifications are awarded according to the following scale:

Certified	40–49 points
Silver	50–59 points
Gold	60–79 points
Platinum	80 points and above

GBCI will recognize buildings that achieve 1 of these rating levels with a formal letter of certification.

## **When to Use LEED 2009 for Existing Buildings: Operations & Maintenance**

LEED for Existing Buildings: Operations & Maintenance was designed to certify the sustainability of ongoing operations of existing commercial and institutional buildings. All such buildings, as defined by standard building codes, are eligible for certification under LEED for Existing Buildings: Operations & Maintenance and include offices, retail and service establishments, institutional buildings (libraries, schools, museums, churches, etc.), hotels, and residential buildings of 4 or more habitable stories.

LEED for Existing Buildings: Operations & Maintenance provides owners and operators of existing buildings an entry point into the LEED certification process and is applicable to the following:

- building operations, processes, systems upgrades, minor space-use changes, and minor facility alterations or additions; and
- buildings new to LEED certification as well as buildings previously certified under LEED for New Construction, LEED for Schools, or LEED for Core & Shell; these may be either ground up new construction or existing buildings that have undergone major renovations.

LEED for Existing Buildings: Operations & Maintenance encourages owners and operators of existing buildings to implement sustainable practices and reduce the environmental impacts of their buildings over their functional life cycles. Specifically, the rating system addresses exterior building site maintenance programs, water and energy use, environmentally preferred products and practices for cleaning and alterations, sustainable purchasing policies, waste stream management, and ongoing indoor environmental quality. LEED for Existing Buildings: Operations & Maintenance is targeted at single buildings, whether owner occupied, multitenant, or multiple-building campus projects. It is a whole-building rating system; individual tenant spaces are ineligible.

Many projects neatly fit the defined scope of only 1 LEED rating system; others may be eligible for 2 or more. The project is a viable candidate for LEED certification if it can meet all prerequisites and achieve the minimum points required in a given rating system. If more than 1 rating system applies, the project team can decide which to pursue. For assistance in choosing the most appropriate LEED rating system, please e-mail [leedinfo@usgbc.org](mailto:leedinfo@usgbc.org).

## **Registration**

Project teams interested in earning LEED 2009 for Existing Buildings: Operations & Maintenance certification for their buildings must first register the project with GBCI. Projects can be registered on the GBCI website ([www.gbci.org](http://www.gbci.org)). The website also has information on registration costs for USGBC national members as well as nonmembers. Registration is an important step that establishes contact with GBCI and provides access to software tools, errata, critical communications, and other essential information.

## **Certification & Recertification**

To earn LEED certification, the applicant project must satisfy all the prerequisites and qualify for a minimum number of points to attain the established project ratings as listed below. Having satisfied the basic prerequisites of the program, applicant projects are then rated according to their degree of compliance within the rating system.

Any first-time certification application to the LEED 2009 for Existing Buildings: Operations & Maintenance program is considered an initial LEED for Existing Buildings: Operations & Maintenance certification. This includes applications for both buildings never certified under LEED and buildings previously certified under LEED for New Construction, LEED for Schools, or LEED for Core & Shell. Any LEED for Existing Buildings: Operations & Maintenance application for a building previously certified using LEED for Existing Buildings: Operations & Maintenance is considered a LEED for Existing Buildings: Operations & Maintenance recertification. These buildings can apply for recertification as frequently as each year but must file for recertification at least once every 5 years to maintain their LEED for Existing Buildings: Operations & Maintenance status; if projects do not recertify

at the 5 year mark, their next application will be considered an initial certification application. The project must recertify all prerequisites but may drop previously earned credits or add new credits as desired.

For more information on the LEED certification process including LEED-Online, Credit Interpretation Requests and Rulings, Certification, Appeals, and Fees please see the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition and visit [www.usgbc.org](http://www.usgbc.org) or [www.gbci.org](http://www.gbci.org).

### **III. PERFORMANCE PERIOD**

LEED 2009 for Existing Buildings: Operations & Maintenance certification application includes performance data for the building and site over the performance period—the continuous, unbroken time during which sustainable operations performance is being measured. The performance period may not have any gaps, defined as any period of time longer than 1 full week.

#### **Requirements for Initial Certification**

Some prerequisites and credits in LEED 2009 for Existing Buildings: Operations & Maintenance require that operating data and other documentation be submitted for the performance period. For the initial LEED for Existing Buildings: Operations & Maintenance certification, the performance period is the most recent period of operations preceding certification application; it must be a minimum of 3 months for all prerequisites and credits except Energy and Atmosphere Prerequisite 2 and Credit 1, which have longer minimum durations of 1 year. At the project team's option, the performance period for any prerequisite or credit may be extended to a maximum of 24 months preceding certification application.

Consistent start times and durations of the performance periods for each prerequisite and credit are preferred but not strictly necessary. However, all performance periods must overlap and terminate within 1 week of each other.

#### **Requirements for Recertification**

The performance period for recertification depends on whether the credit is newly pursued. For prerequisites and all credits earned in the initial LEED 2009 for Existing Buildings: Operations & Maintenance certification, the performance period is the entire period between the previous certification and the current application. For all credits not earned in the initial LEED for Existing Buildings: Operations & Maintenance certification, the performance period is the same as for initial certification.

The performance period for recertification applications can be as short as 1 year and as long as 5 years.

For more information on the Performance Period requirements, please see the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

### **IV. MULTITENANT BUILDINGS**

LEED 2009 for Existing Buildings: Operations & Maintenance certification applies only to whole buildings. Multitenant buildings (single buildings that contain floor area under the ownership or tenancy of more than 1 entity) must meet the LEED for Existing Buildings: Operations & Maintenance minimum program requirements (see Section IV). That is, the project for a multitenant building must involve at least 90% of the total gross floor space. Calculate project scope floor space by dividing the project's floor space by the total gross floor space.

For more information on the Performance Period requirements, please see the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

## V. FACILITY ALTERATIONS AND ADDITIONS

Although LEED for Existing Buildings: Operations & Maintenance focuses mainly on sustainable ongoing building operations, it also embraces sustainable alterations and new additions to existing buildings.

In general parlance, alterations and additions may range from a complete gutting, major renovation, or large new wing to the replacement of an old window, sheet of drywall, or section of carpet.

In LEED for Existing Buildings: O&M, however, alterations and additions has a specific meaning. It refers to changes that affect usable space in the building. Mechanical, electrical, or plumbing system upgrades that involve no disruption to usable space are excluded.

Only alterations and additions within the following limits are eligible for inclusion in LEED for Existing Buildings: O&M certification:

- **Maximum.** Alterations that affect no more than 50% of the total building floor area or cause relocation of no more than 50% of regular building occupants are eligible. Additions that increase the total building floor area by no more than 50% are eligible. Buildings with alterations or additions exceeding these limits should pursue certification under the LEED for New Construction program.
- **Minimum.** Alterations that include construction activity by more than 1 trade specialty, make substantial changes to at least 1 entire room in the building, and require isolation of the work site from regular building occupants for the duration of construction are eligible. Additions that increase the total building floor area by at least 5% are eligible. Alterations or additions below these limits are considered repairs, routine replacements, or minor upgrades and are ineligible to earn points under LEED for Existing Buildings: O&M. The minimum applies to Materials and Resources (MR) Credits 3 and 9, and Indoor Environmental Quality (IEQ) Credit 1.5.

## VI. MINIMUM PROGRAM REQUIREMENTS

The LEED 2009 Minimum Program Requirements (MPRs) define the minimum characteristics that a project must possess in order to be eligible for certification under LEED 2009. These requirements define the categories of buildings that the LEED rating systems were designed to evaluate, and taken together serve three goals: to give clear guidance to customers, to protect the integrity of the LEED program, and to reduce challenges that occur during the LEED certification process. It is expected that MPRs will evolve over time along with LEED rating system improvements. The requirements will apply only to those projects registering under LEED 2009.

To view the list of MPRs, please read the Minimum Program Requirements section of this document.

## VII. EXEMPLARY PERFORMANCE STRATEGIES

Exemplary performance strategies result in performance that greatly exceeds the performance level or expands the scope required by an existing LEED 2009 for Existing Buildings: Operations & Maintenance credit. To earn exemplary performance credits, teams must meet the performance level defined by the next step in the threshold progression. For credits with more than 1 compliance path, an Innovation in Operations point can be earned by satisfying more than 1 compliance path if their benefits are additive.

The credits for which exemplary performance points are available through expanded performance or scope are noted in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition and in LEED-Online.

## Endnotes

- <sup>1</sup> Tools for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). U.S. Environmental Protection Agency, Office of Research and Development. <http://www.epa.gov/nrmrl/std/sab/traci/>.
- <sup>2</sup> Relative impact category weights based on an exercise undertaken by NIST (National Institute of Standards and Technology) for the BEES program. <http://www.bfrl.nist.gov/oe/software/bees/>.

# MINIMUM PROGRAM REQUIREMENTS

**NOTE: Definitions, exceptions, and more extensive guidance on issues in this document are available in a separate document titled: ‘LEED 2009 MPR Supplemental Guidance’. Terms that are *italicized and underlined* here are defined in the Supplemental Guidance document (they are marked as such only the first time that they appear).**

This document identifies the Minimum Program Requirements (MPRs), or minimum characteristics that a project must possess in order to be eligible for LEED Certification. ***LEED projects must comply with each applicable MPR described below.*** These requirements define the types of buildings that the LEED Green Building Rating Systems were designed to evaluate, and taken together serve three goals: to give clear guidance to customers, to protect the integrity of the LEED program, and to reduce complications that occur during the LEED Certification process. The requirements in this document will apply to all those, and only those projects certifying under LEED 2009. Projects that upgrade to LEED 2009 from earlier versions of LEED are subject to the MPRs. It is expected that MPRs will evolve over time with the LEED rating system, however only those MPRs in place at the time that a LEED project registers or upgrades will apply to that project.

LEED for New Construction, Core & Shell, Schools, and Existing Buildings: Operations & Maintenance were designed to evaluate commercial, institutional, or high-rise residential buildings; as such, any project applying for LEED Certification under one of these rating systems must include a building that falls under one of these categories.

LEED for Commercial Interiors was designed to evaluate interior spaces of commercial or institutional buildings; as such, projects applying for certification under LEED for Commercial Interiors must include a space that falls under one of these categories.

**NOTE: CERTIFICATION MAY BE REVOKED FROM ANY LEED PROJECT UPON GAINING KNOWLEDGE OF NON-COMPLIANCE WITH ANY APPLICABLE MPR. IF SUCH A CIRCUMSTANCE OCCURS, REGISTRATION AND/OR CERTIFICATION FEES WILL NOT BE REFUNDED.**

**All exceptions to MPRs that are not already defined in the LEED 2009 MPR Supplemental Guidance document will be considered on a case-by-case basis for special circumstances.** Details on the process for review of MPR clarification requests will be posted in summer 2009.

## **LEED 2009 Minimum Program Requirements for Existing Buildings: Operations & Maintenance**

### **1. Must Comply with Environmental Laws**

The LEED project building, all other real property within the LEED project boundary, any project work, and all *normal building operations* occurring within the LEED project building and the LEED project boundary must comply with all applicable federal, state, and local building-related environmental laws and regulations in place where the project is located. This condition must be satisfied from the start of the LEED project’s first LEED-EB: O&M *performance period* through the expiration date of the LEED Certification.

### **2. Must be a Complete, Permanent Building or Space**

All LEED projects must be designed for, constructed on, and operated on a permanent location on already existing *land*. No building or space that is designed to move at any point in its lifetime may pursue LEED Certification.

LEED projects must include at least one existing building in its entirety.

### 3. Must Use a Reasonable Site Boundary

1. The LEED project boundary must include all contiguous land that is associated with and supports normal building operations for the LEED project building, including all land that was or will be disturbed for the purpose of *undertaking the LEED project*.
2. The LEED project boundary may not include land that is owned by a party other than that which owns the LEED project unless that land is associated with and supports normal building operations for the LEED project building.
3. LEED projects located on a campus must have project boundaries such that if all the buildings on campus become LEED certified, then 100% of the gross land area on the campus would be included within a LEED boundary. If this requirement is in conflict with MPR #7, Must Comply with Minimum Building Area to Site Area Ratio, then MPR #7 will take precedence.
4. Any given parcel of real property may only be attributed to a single LEED project building.
5. *Gerrymandering* of a LEED project boundary is prohibited: the boundary may not unreasonably exclude sections of land to create boundaries in unreasonable shapes for the sole purpose of complying with prerequisites or credits.

### 4. Must Comply with Minimum Floor Area Requirements.

The LEED project must include a minimum of 1,000 square feet (93 square meters) of gross floor area.

### 5. Must Comply with Minimum Occupancy Rates

#### Full Time Equivalent Occupancy

The LEED project must serve 1 or more *Full Time Equivalent* (FTE) occupant(s), calculated as an annual average in order to use LEED in its entirety. If the project serves less than 1 annualized FTE, optional credits from the Indoor Environmental Quality category may not be earned (the prerequisites must still be earned).

#### Minimum Occupancy Rate

The LEED project must be in a state of *typical physical occupancy*, and all building systems must be operating at a capacity necessary to serve the current occupants, for a period that includes all performance periods as well as at least the 12 continuous months immediately preceding the first submission for a review.

### 6. Must Commit to Sharing Whole-Building Energy and Water Usage Data

All certified projects must commit to sharing with USGBC and/or GBCI all available actual whole-project energy and water usage data for a period of at least 5 years. This period starts on the date that the LEED project begins typical physical occupancy if certifying under New Construction, Core & Shell, Schools, or Commercial Interiors, or the date that the building is awarded certification if certifying under Existing Buildings: Operations & Maintenance. Sharing this data includes supplying information on a regular basis in a free, accessible, and secure online tool or, if necessary, taking any action to authorize the collection of information directly from service or utility providers. This commitment must carry forward if the building or space changes ownership or lessee.

### 7. Must Comply with a Minimum Building Area to Site Area Ratio

The gross floor area of the LEED project building must be no less than 2% of the gross land area within the LEED project boundary.



# SUSTAINABLE SITES

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## **SS Credit 1: LEED Certified Design and Construction**

### **4 points**

#### **Intent**

To reward environmentally sensitive building design and construction, thereby enabling high-performance building operations to be achieved more easily.

#### **Requirements**

Choose 1 of the following options:

##### **OPTION 1**

Show that the building has previously been certified under LEED for New Construction and Major Renovations.

OR

##### **OPTION 2**

Show that the building has been previously certified under LEED for Schools.

OR

##### **OPTION 3**

Show that the building has previously been certified under LEED for Core & Shell Development

AND

at least 75% of the floor area has also been certified under LEED for Commercial Interiors.

#### **Potential Technologies & Strategies**

Pursue and earn LEED certification for new buildings or major renovations.

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## **SS Credit 2: Building Exterior and Hardscape Management Plan**

### **1 point**

#### **Intent**

To encourage environmentally sensitive building exterior and hardscape management practices that provide a clean, well-maintained and safe building exterior while supporting high-performance building operations.

#### **Requirements**

Employ an environmentally sensitive, low-impact building exterior and hardscape management plan that helps preserve surrounding ecological integrity. The plan must employ best management practices that significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared with standard practices. The plan must address all of the following operational elements that occur on the building and grounds:

- Maintenance equipment.
- Snow and ice removal.
- Cleaning of building exterior.
- Paints and sealants used on building exterior.
- Cleaning of sidewalks, pavement and other hardscape.

#### **Potential Technologies & Strategies**

During the performance period, have in place a low-impact site and green building exterior management plan that addresses overall site management, chemicals, snow and ice removal, and building exterior cleaning and maintenance. Include green cleaning and maintenance practices and materials that minimize environmental impacts. An outline of acceptable material for a low-impact plan is available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. Replace conventional gas-powered machinery with electric-powered equivalents (either battery or corded). Examples include, but are not limited to, maintenance equipment and vehicles, landscaping equipment, and cleaning equipment.

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## SS Credit 3: Integrated Pest Management, Erosion Control and Landscape Management Plan

### 1 point

#### Intent

To preserve ecological integrity, enhance natural diversity and protect wildlife while supporting high-performance building operations and integration into the surrounding landscape.

#### Requirements

Have an environmentally sensitive management plan in place for the site's natural components. The plan must employ best management practices that significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared with standard practices. The plan must address all of the following operational elements:

- Outdoor integrated pest management (IPM), defined as managing outdoor pests (plants, fungi, insects, and/or animals) in a way that protects human health and the surrounding environment and that improves economic returns through the most effective, least-risk option. IPM calls for the use of least toxic chemical pesticides, minimum use of the chemicals, use only in targeted locations, and use only for targeted species. IPM requires routine inspection and monitoring. The outdoor IPM plan must address all the specific IPM requirements listed in IEQ Credit 3.6: Green Cleaning: Indoor Integrated Pest Management, including preferred use of nonchemical methods, definition of emergency conditions and universal notification (advance notice of not less than 72 hours under normal conditions and 24 hours in emergencies before a pesticide, other than a least-toxic pesticide, is applied in a building or on surrounding grounds that the building management maintains). The outdoor IPM plan must also be integrated with any indoor IPM plan for the building, as appropriate.
- Erosion and sedimentation control for ongoing landscape operations (where applicable) and future construction activity. The plan must address both site soil and potential construction materials. The plan must also include measures that prevent erosion and sedimentation, prevent air pollution from dust or particulate matter and restore eroded areas.

Further, the plan must address the following operational elements, if applicable:

- Diversion of landscape waste from the waste stream via mulching, composting or other low-impact means.
- Chemical fertilizer use. The use of artificial chemicals can be minimized by the use of locally adapted plants that need no fertilizer, less-polluting alternatives to artificial chemicals, or other low-impact maintenance practices.

#### Potential Technologies & Strategies

During the performance period, have in place a low-impact site and green building exterior management plan that addresses overall site management, chemicals, fertilizers, landscape waste and pest management. Include such green landscape management practices as reducing the use of power equipment, improving stormwater control, using fertilizer only as needed, composting landscape waste, applying integrated pest management, creating wildlife habitat, removing or not installing invasive plants, protecting natural areas, and using plants to reduce heating and cooling needs. Use mulching mowers to significantly reduce yard waste generation, fertilizer needs and water consumption through retention of organic matter.

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## SS Credit 4: Alternative Commuting Transportation

### 3–15 points

#### Intent

To reduce pollution and land development impacts from automobile use for commuting.

#### Requirements

Reduce the number of commuting round trips made by regular building occupants using single occupant, conventionally powered and conventionally fueled vehicles. For the purposes of this credit, alternative transportation includes at a minimum, telecommuting; compressed workweeks; mass transit; walking; bicycles or other human-powered conveyances; carpools; vanpools; and low-emitting, fuel-efficient<sup>1</sup> or alternative-fuel vehicles.

Performance calculations are made relative to a baseline case that assumes all regular occupants commute alone in conventional automobiles. The calculations must account for seasonal variations in the use of alternative commuting methods and, where possible, indicate the distribution of commuting trips using each type of alternative transportation.

Points are earned for reductions in conventional commuting trips during the performance period according to the following schedule:

Demonstrated percentage reduction in conventional commuting trips	Points
10%	3
13.75%	4
17.50%	5
21.25%	6
25.00%	7
31.25%	8
37.50%	9
43.75%	10
50.00%	11
56.25%	12
62.50%	13
68.75%	14
75.00%	15

<sup>1</sup> Low-emitting vehicles and fuel-efficient vehicles are defined as vehicles that are classified as zero-emission vehicles (ZEVs) by the California Air Resources Board or that have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy annual vehicle-rating guide.

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### **Potential Technologies & Strategies**

When developing an alternative transportation program, consider the opportunities and limitations of different options, based on the building's location.

Provide space and infrastructure features, such as bicycle racks, changing facilities, preferred parking, access to mass transit or alternative-fuel refueling stations. Offer employees incentives for using alternative transportation, such as additional vacation days, cash rewards or pretax options. Distribute free or discounted public transportation passes, bicycling equipment or telecommuting equipment to individuals committed to using them.

Encourage the use of alternative commuting methods by guaranteeing free rides home for employees who must unexpectedly leave work early or late. Utilize organization resources to communicate with building occupants about alternative transportation options and benefits, and facilitating communication among building occupants for coordinating ride sharing.

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## SS Credit 5: Site Development—Protect or Restore Open Habitat

### 1 point

#### Intent

To conserve existing natural site areas and restore damaged site areas to provide habitat and promote biodiversity.

#### Requirements

During the performance period, have in place native<sup>1</sup> or adapted vegetation<sup>2</sup> covering a minimum of 25% of the total site area (excluding the building footprint) or 5% of the total site area (including the building footprint), whichever is greater.

Improving and/or maintaining off-site areas with native or adapted plants can contribute toward earning this credit provided the improvement and maintenance are documented in a contract with the owner of the off-site area. Every 2 square feet off-site can be counted as 1 square foot on-site.

Other ecologically appropriate features that contribute to this credit are natural site elements beyond vegetation that maintain or restore the ecological integrity of the site, including water bodies, exposed rock, unvegetated ground or other features that are part of the historic natural landscape within the region and provide habitat value.

#### Potential Technologies & Strategies

Perform a site survey to identify site elements and adopt a master plan for management of the building site. Activities may include removing excessive paved areas and replacing them with landscaped areas or replacing excessive turf grass area with natural landscape features. Work with local horticultural extension services or native plant societies to select and maintain indigenous plant species for site restoration and landscaping. Coordinate with activities, technologies and strategies under SS Credit 3: Integrated Pest Management, Erosion Control.

<sup>1</sup> Native plants are plants indigenous to a locality.

<sup>2</sup> Adapted plants are cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds.

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## **SS Credit 6: Stormwater Quantity Control**

### **1 point**

#### **Intent**

To limit disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from stormwater runoff and eliminating contaminants.

#### **Requirements**

During the performance period, implement a stormwater management plan that infiltrates, collects and reuses runoff or evapotranspirates runoff from at least 15% of the precipitation falling on the whole project site both for an average weather year and for the 2-year, 24-hour design storm.

Implement an annual inspection program of all stormwater management facilities to confirm continued performance. Maintain documentation of inspection, including identification of areas of erosion, maintenance needs and repairs. Perform all routine required maintenance, necessary repairs or stabilization within 60 days of inspection.

#### **Potential Technologies & Strategies**

Collect and reuse stormwater for nonpotable uses such as landscape irrigation, toilet and urinal flushing, and custodial uses. During facility or site alterations or additions, specify the use of alternative surfaces (e.g., vegetated roofs, pervious pavement or grid pavers) and nonstructural techniques (e.g., rain gardens, vegetated swales, disconnection of imperviousness, rainwater recycling) to improve perviousness, thereby restoring or maintaining natural stormwater flows. Incorporate stormwater management facilities into routine preventive and corrective maintenance programs.

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## SS Credit 7.1: Heat Island Reduction—Nonroof

### 1 point

#### Intent

To reduce heat islands<sup>1</sup> to minimize impacts on microclimates and human and wildlife habitats.

#### Requirements

Choose 1 of the following options:

##### OPTION 1

Use any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards and parking lots):

- Provide shade from the existing tree canopy or within 5 years of landscape installation; landscaping (trees) must be in place at the time of certification application.
- Provide shade from structures covered by solar panels that produce energy used to offset some nonrenewable resource use.
- Provide shade from architectural devices or structures that have a solar reflectance index (SRI)<sup>2</sup> of at least 29. Implement a maintenance program that ensures these surfaces are cleaned at least every 2 years to maintain good reflectance.
- Use hardscape materials with an SRI of at least 29 and implement a maintenance program that ensures these surfaces are cleaned at least every 2 years to maintain good reflectance.
- Use an open-grid pavement system (at least 50% pervious).

OR

##### OPTION 2

Place a minimum of 50% of parking spaces under cover<sup>3</sup>. Any roof used to shade or cover parking must have an SRI of at least 29, be a vegetated roof or be covered by solar panels that produce energy used to offset some nonrenewable resource use. Implement a maintenance program that ensures all SRI surfaces are cleaned at least every 2 years to maintain good reflectance. The top parking level of a multilevel parking structure is included in the total parking spaces calculation but is not considered a roof and is not required to be an SRI surface.

#### Potential Technologies & Strategies

Employ strategies, materials and landscaping techniques that reduce the heat absorption of exterior materials. Use shade (calculated on June 21, noon solar time) from native or adapted trees and large shrubs, vegetated trellises or

<sup>1</sup> Heat islands are defined as thermal gradient differences between developed and undeveloped areas.

<sup>2</sup> The solar reflectance index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black surface (reflectance 0.05, emittance 0.90) is 0 and a standard white surface (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918 or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

<sup>3</sup> For the purposes of this credit, under cover parking is defined as parking underground, under deck, under roof, or under a building.

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other exterior structures supporting vegetation. Consider using new coatings and integral colorants for asphalt to achieve light-colored surfaces instead of blacktop. Position photovoltaic cells to shade impervious surfaces.

Consider replacing constructed surfaces (e.g., roof, roads, sidewalks, etc.) with vegetated surfaces such as vegetated roofs and open grid paving or specify high-albedo materials, such as concrete, to reduce heat absorption.

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## SS Credit 7.2: Heat Island Reduction—Roof

1 point

### Intent

To reduce heat islands<sup>1</sup> to minimize impacts on microclimates and human and wildlife habitats.

### Requirements

#### OPTION 1

Use roofing materials with a solar reflectance index (SRI)<sup>2</sup> equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

Roofing materials having a lower SIR value than those listed below may be used if the weighted rooftop SRI average meets the following:

$$\frac{\text{Area Roof Meeting Minimum SRI}}{\text{Total Roof Area}} \times \frac{\text{SRI of Installed Roof}}{\text{Required SRI}} \geq 75\%$$

Implement a maintenance program that ensures all SRI surfaces are cleaned at least every 2 years to maintain good reflectance.

OR

#### OPTION 2

Install and maintain a vegetated roof that covers at least 50% of the roof area.

OR

#### OPTION 3

Install high-albedo and vegetated roof surfaces that, in combination, meet the following criteria:

$$\frac{\text{Area Roof Meeting Minimum SRI}}{0.75} + \frac{\text{Area of Vegetated Roof}}{0.5} \geq \text{Total Roof Area}$$

Roof Type	Slope	SRI
Low-sloped roof	≤ 2:12	78
Steep-sloped roof	> 2:12	29

<sup>1</sup> Heat islands are defined as thermal gradient differences between developed and undeveloped areas.

<sup>2</sup> The solar reflectance index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black surface (reflectance 0.05, emittance 0.90) is 0 and a standard white surface (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918 or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

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### **Potential Technologies & Strategies**

Consider installing high-albedo and vegetated roofs to reduce heat absorption.. Default values are available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. Product information is available from the Cool Roof Rating Council Web site at [www.coolroofs.org](http://www.coolroofs.org). Also visit the ENERGY STAR® Web site, at [www.energystar.gov](http://www.energystar.gov).

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## SS Credit 8: Light Pollution Reduction

### 1 point

#### Intent

To minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction and reduce development impact from lighting on nocturnal environments.

#### Requirements

Project teams must comply with the interior lighting requirement

AND

1 of the 3 options for exterior lighting.

#### INTERIOR LIGHTING

All nonemergency built-in luminaires with a direct line of sight to any openings in the envelope (translucent or transparent, wall or ceiling) must be automatically controlled to turn off during all after-hours periods during the performance period. The total duration of all programmed after-hours periods annually must equal or exceed 2,190 hours per year (50% of annual nighttime hours). Manual override capability may be provided for occasional after-hours use.

Implement a program to ensure that the lighting control system is being properly used to adjust lighting levels during all after-hours periods.

#### EXTERIOR LIGHTING

##### OPTION 1

If the project is certified under LEED for Schools or New Construction, show that SS Credit 8: Light Pollution Reduction was earned. If the project is certified under LEED for Core & Shell Development and 75% of the floor area is LEED for Commercial Interiors, show that SS Credit 8: Light Pollution Reduction was earned for both systems.

OR

##### OPTION 2

Partially<sup>1</sup> or fully shield<sup>2</sup> all exterior fixtures 50 watts and over so that they do not directly emit light to the night sky.

OR

##### OPTION 3

Measure the night illumination levels at regularly spaced points around the perimeter of the property, taking the

<sup>1</sup> Partially shielded means exterior light fixtures are shielded so that the lower edge of the shield is at or below the centerline of the light source or lamp such that light emission above the horizontal plane is minimized.

<sup>2</sup> Fully shielded means exterior light fixtures are shielded or constructed so that light rays emitted by the fixture are projected below the horizontal plane passing through the lowest point on the fixture from which light is emitted.

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measurements with the building's exterior and site lights both on and off. The building's interior lights must be in the same state during both measurements. At least 8 measurements are required at a maximum spacing of 100 feet apart, so as to be representative of the illumination levels at the perimeter of the property. The illumination level measured with the lights on must not be more than 20% above the level measured with the lights off. This requirement must be met for each measurement point; averaging of all points is prohibited.

### **Potential Technologies & Strategies**

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution.

Minimize site lighting where possible, and use computer software to model the site lighting. Technologies to reduce light pollution include full-cutoff luminaires, low-reflectance surfaces and low-angle spotlights.



# WATER EFFICIENCY

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## **WE Prerequisite 1: Minimum Indoor Plumbing Fixture and Fitting Efficiency**

### **Required**

#### **Intent**

To reduce indoor fixture and fitting water use within buildings to reduce the burdens on potable water<sup>1</sup> supply and wastewater systems.

#### **Requirements**

Reduce potable water use of indoor plumbing fixtures and fittings to a level equal to or below the LEED 2009 for Existing Buildings: Operations & Maintenance baseline, calculated assuming 100% of the building's indoor plumbing fixtures and fittings meet the plumbing code requirements as stated in the 2006 editions of the Uniform Plumbing Code (UPC) or International Plumbing Code (IPC) pertaining to fixture and fitting performance. Fixtures and fittings included in the calculations for this credit are water closets, urinals, showerheads, faucets, faucet replacement aerators and metering faucets.

The LEED 2009 for Existing Buildings: Operations & Maintenance water use baseline is set depending on the year of substantial completion of the building's indoor plumbing system. Substantial completion is defined as either initial building construction or the last plumbing renovation of all or part of the building that included 100% retrofit of all plumbing fixtures and fittings as part of the renovation. Set the baseline as follows:

- For a plumbing system substantially completed in 1993 or later throughout the building, the baseline is 120% of the water use that would result if all fixtures met the codes cited above.
- For a plumbing system substantially completed before 1993 throughout the building, the baseline is 160% of the water use that would result if all fixtures met the codes cited above.

If indoor plumbing systems were substantially completed at different times (because the plumbing renovations occurred at different times in different parts of the building), Set a whole-building average baseline by prorating between the above limits. Prorate based on the proportion of plumbing fixtures installed during the plumbing renovations in each date period, as explained in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. Pre-1993 buildings that have had only minor fixture retrofits (e.g., aerators, showerheads, flushing valves) but no plumbing renovations in or after 1993 may use the 160% baseline for the whole building.

Demonstrate fixture and fitting performance through calculations to compare the water use of the as-installed fixtures and fittings with the use of UPC- or IPC-compliant fixtures and fittings, as explained in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

Develop and implement a policy requiring economic assessment of conversion to high-performance plumbing fixtures and fittings as part of any future indoor plumbing renovation. The assessment must account for potential water supply and disposal cost savings and maintenance cost savings.

<sup>1</sup> Potable water is defined as water that is suitable for drinking and is supplied from wells or municipal water systems.

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**Potential Technologies & Strategies**

Reduce indoor plumbing fixture and fitting potable water usage through automatic water control systems. Install, where possible, water-conserving indoor plumbing fixtures and fittings that meet or exceed the UPC 2006 or IPC 2006 fixture and fitting requirements in combination with high-efficiency or dry fixture and control technologies.

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## WE Credit 1: Water Performance Measurement

### 1–2 points

#### Intent

To measure building and subsystem water performance over time to understand consumption patterns and identify opportunities for additional water savings.

#### Requirements

##### OPTION 1. (1 point)

Have in place permanently installed water metering that measures the total potable water<sup>1</sup> use for the entire building and associated grounds. Meter data must be recorded on a regular basis and compiled into monthly and annual summaries. Applicants are also encouraged to meter gray or reclaimed water supplied to the building.

OR

##### OPTION 2. (2 points)

Meet the requirements for Option 1 and have in place permanently installed metering for 1 or more of the following water subsystems:

- Irrigation. Meter water systems serving at least 80% of the irrigated landscape area on the grounds. The percentage of irrigated landscape area served must be calculated as the total metered irrigated landscape area divided by the total irrigated landscape area. All landscaping areas fully covered with xeriscaping or native vegetation that requires no routine irrigation must be excluded from the calculation entirely.
- Indoor plumbing fixtures and fittings. Meter water systems serving at least 80% of the indoor plumbing fixtures and fittings described in WE Prerequisite 1, either directly or by deducting all other measured water use from the measured total water consumption of the building and grounds.
- Cooling towers. Meter replacement water use of all cooling towers serving the facility.
- Domestic hot water. Meter water use of at least 80% of the installed domestic hot water heating capacity (including both tanks and on-demand heaters).
- Other process water. Meter at least 80% of expected daily water consumption for process-type end uses, such as humidification systems, dishwashers, clothes washers, pools and other systems using process water.

Meters must measure potable water use, but gray or reclaimed water use may also be measured to meet the requirements of this credit. Metering must be continuous and data-logged to allow for an analysis of time trends. The project must compile monthly and annual summaries of results for each subsystem metered.

Meters must be calibrated within the manufacturer's recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

<sup>1</sup> Potable water is defined as water that is suitable for drinking and is supplied from wells or municipal water systems

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**Potential Technologies & Strategies**

Install a building-level water meter to measure and track total potable water consumption in the facility. Install subsystem-level water metering to measure and track potable water consumption by specific building systems; prioritize metering for those systems that use the most potable water.

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## **WE Credit 2: Additional Indoor Plumbing Fixture and Fitting Efficiency**

### **1–5 points**

#### **Intent**

To maximize indoor plumbing fixture and fitting efficiency within buildings to reduce the use of potable water<sup>1</sup> and consequent burden on municipal water supply and wastewater systems.

#### **Requirements**

During the performance period, have in place strategies and systems that in aggregate produce a reduction in indoor plumbing fixture and fitting potable water use from the calculated baseline established in WE Prerequisite 1: Minimum Indoor Plumbing Fixture and Fitting Efficiency.

The minimum water reduction percentage for each point threshold is as follows:

<b>Percentage Reduction</b>	<b>Points</b>
10%	1
15%	2
20%	3
25%	4
30%	5

#### **Potential Technologies & Strategies**

Reduce indoor plumbing fixture and fitting water usage through automatic controls and other actions. Specify water-conserving indoor plumbing fixtures and fittings that exceed the Uniform Plumbing Codes 2006 or International Plumbing Codes 2006 fixture and fitting requirements, in combination with ultrahigh-efficiency or dry fixture and fitting and control technologies.

<sup>1</sup> Potable water is defined as water that is suitable for drinking and is supplied from wells or municipal water systems.

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## WE Credit 3: Water Efficient Landscaping

### 1–5 points

#### Intent

To limit or eliminate the use of potable water<sup>1</sup>, or other natural surface or subsurface resources available on or near the project site, for landscape irrigation.

#### Requirements

Reduce potable water or other natural surface or subsurface resource consumption for irrigation compared with conventional means of irrigation. If the building does not have separate water metering for irrigation systems, the water-use reduction achievements can be demonstrated through calculations. The minimum water savings percentage for each point threshold is as follows:

Percentage Reduction	Points
50%	1
62.5%	2
75%	3
87.5%	4
100%	5

For buildings without vegetation or other ecologically appropriate features on the grounds, points can be earned by reducing the use of potable water for watering any roof and/or courtyard garden space or outdoor planters, provided the planters and/or garden space cover at least 5% of the building site area (including building footprint, hardscape area, parking footprint, etc). If the planters and/or garden space cover less than 5% of the building site area, the project is ineligible for this credit.

Three options are available to demonstrate compliance with the above requirements. Project teams that do not separately meter their actual irrigation water use during the performance period must choose Option 2.

Choose 1 of the following options:

#### OPTION 1

Calculate the mid-summer baseline irrigation water use by determining the water use that would result from using an irrigation system typical for the region and compare this with the building's actual irrigation potable water use, which can be determined through submetering. Use the baseline and actual water use values to calculate the percentage reduction in potable water or other natural surface or subsurface resource use. More detail about completing this calculation is available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

<sup>1</sup> Potable water is defined as water that is suitable for drinking and is supplied from wells or municipal water systems.

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OR

OPTION 2

Calculate the estimated mid-summer irrigation water use by determining the landscape area for the project and sorting this area into the major vegetation types. Determine the reference evapotranspiration rate ( $ET_o$ ) for the region and determine the species factor ( $k_s$ ), density factor ( $k_d$ ) and microclimate factor ( $k_{mc}$ ) for each vegetation type. Use this information to calculate the landscape coefficient ( $K_L$ ) and irrigation water use for the design case. Calculate the baseline case irrigation water use by setting the above factors to average values representative of conventional equipment and design practices. Use the estimated and baseline case to determine the percentage reduction in potable water or other natural surface or subsurface resource use. Factor values and other resources for completing these calculations are available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

OR

OPTION 3

If independent irrigation performance and ranking tools are available from local, regional, state or national sources, use such tools to demonstrate reductions in potable water or other natural surface or subsurface resource for irrigation purposes.

**Potential Technologies & Strategies**

Specify water efficient, climate-tolerant native or adapted plantings. Implement or maintain high-efficiency irrigation technologies, such as microirrigation, moisture sensors or weather data-based controllers. Feed irrigation systems with captured rainwater, gray water (on-site or municipal), municipally reclaimed water or on-site treated wastewater. Consider not operating an irrigation system. Consider employing xeriscaping principles in arid climates.

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## WE Credit 4: Cooling Tower Water Management

### 1–2 points

#### Intent

To reduce potable water<sup>1</sup> consumption for cooling tower equipment through effective water management and/or use of nonpotable makeup water.

#### Requirements

##### OPTION 1. Chemical Management (1 point)

Develop and implement a water management plan for the cooling tower that addresses chemical treatment, bleed-off, biological control and staff training as it relates to cooling tower maintenance.

Improve water efficiency by installing and/or maintaining a conductivity meter and automatic controls to adjust the bleed rate and maintain proper concentration at all times.

OR

##### OPTION 2. Nonpotable Water Source Use (1 point)

Use makeup water that consists of at least 50% nonpotable water, such as harvested rainwater, harvested stormwater, air-conditioner condensate, swimming pool filter backwash water, cooling tower blowdown, pass-through (once-through) cooling water, recycled treated wastewater from toilet and urinal flushing, foundation drain water, municipally reclaimed water or any other appropriate on-site water source that is not naturally occurring groundwater or surface water.

Have a measurement program in place that verifies makeup water quantities used from nonpotable sources. Meters must be calibrated within the manufacturer's recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

OR

##### OPTION 3. (2 points)

Achieve both Options 1 and 2.

#### Potential Technologies & Strategies

Work with a water treatment specialist to develop a water management strategy addressing the appropriate chemical treatment and bleed-off to ensure proper concentration levels in the cooling tower. Also, develop a biocide treatment program to avoid biological contamination and the risk of *Legionella* in the building.

Identify nonpotable water sources that may be suitable for use in the cooling tower makeup water. Ensure that the water meets the cooling tower manufacturer's guidelines in terms of water purity and adjust the chemical treatment program accordingly.

<sup>1</sup> Potable water is defined as water that is suitable for drinking and is supplied from wells or municipal water systems.

# ENERGY & ATMOSPHERE

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## **EA Prerequisite 1: Energy Efficiency Best Management Practices—Planning, Documentation and Opportunity Assessment**

### **Required**

#### **Intent**

To promote continuity of information to ensure that energy-efficient operating strategies are maintained and provide a foundation for training and system analysis.

#### **Requirements**

Document the current sequence of operations for the building.

Develop a building operating plan that provides details on how the building is to be operated and maintained. The operating plan must include, at a minimum, an occupancy schedule, equipment run-time schedule, design set points for all HVAC equipment, and design lighting levels throughout the building. Identify any changes in schedules or set points for different seasons, days of the week and times of day. Validate that the operating plan has been met during the performance period.

Develop a systems narrative that briefly describes the mechanical and electrical systems and equipment in the building. The systems narrative must include all the systems used to meet the operating conditions stated in the operating plan, including at a minimum, heating, cooling, ventilation, lighting and any building controls systems.

Create a narrative of the preventive maintenance plan for equipment described in the systems narrative and document the preventive maintenance schedule during the performance period.

Conduct an energy audit that meets the requirements of the ASHRAE Level I walk-through assessment.

#### **Potential Technologies & Strategies**

Prepare a building operating plan that specifies the current operational needs of the building and identify building systems and other practices necessary to meet those needs. Outline the current sequence of operations to identify and eliminate any inefficiency.

Develop and implement a preventive maintenance program to regularly monitor and optimize the performance of mechanical equipment regulating indoor comfort and the conditions delivered in occupied spaces.

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## EA Prerequisite 2: Minimum Energy Efficiency Performance

### Required

#### Intent

To establish the minimum level of operating energy efficiency performance relative to typical buildings of similar type to reduce environmental and economic impacts associated with excessive energy use.

#### Requirements

##### CASE 1. Projects Eligible for Energy Star Rating

For buildings eligible to receive an energy performance rating using the EPA's ENERGY STAR® Portfolio Manager tool, achieve an energy performance rating of at least 69. If the building is eligible for an energy performance rating using Portfolio Manager, Option 1 must be used.

Have energy meters that measure all energy use throughout the performance period of all buildings to be certified. Each building's energy performance must be based on actual metered energy consumption for both the LEED project building(s) and all comparable buildings used for the benchmark. A full 12 months of continuous measured energy data is required.

Calibrate meters within the manufacturer's recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

##### CASE 2. Projects Not Eligible for Energy Star Rating

For buildings not eligible to receive an energy performance rating using Portfolio Manager, comply with 1 of the following:

##### OPTION 1

Demonstrate energy efficiency at least 19% better than the average for typical buildings of similar type by benchmarking against national average source energy data provided in the Portfolio Manager tool as an alternative to energy performance ratings. Follow the detailed instructions in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

OR

##### OPTION 2

Use the alternative method described in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

AND

Have energy meters that measure all energy use throughout the performance period of all buildings to be certified. Each building's energy performance must be based on actual metered energy consumption for both the LEED project building(s) and all comparable buildings used for the benchmark. A full 12 months of continuous measured energy data is required.

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Calibrate meters within the manufacturer's recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

Use the Portfolio Manager tool available on the ENERGY STAR website to benchmark the project even if it is not eligible for an EPA rating; <http://www.energystar.gov/benchmark>

### **Potential Technologies & Strategies**

Existing building commissioning and energy audits will help identify areas of building operations that are not efficient. Implement energy-efficient retrofits and energy-saving techniques to reduce the building's energy use. Energy-efficient equipment such as office equipment, maintenance equipment and appliances will aid in the reduction of energy waste. Employ the use of meters on major mechanical systems to effectively monitor the energy consumption of each.

In addition to efficiency improvements, consider renewable energy options as a way to minimize the building's environmental impact.

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## **EA Prerequisite 3: Fundamental Refrigerant Management**

### **Required**

#### **Intent**

To reduce stratospheric ozone depletion.

#### **Requirements**

Zero use of chlorofluorocarbon (CFC)-based refrigerants in heating, ventilating, air conditioning and refrigeration (HVAC&R) base building systems unless a third-party audit (as defined in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition) shows that system replacement or conversion is not economically feasible or it is demonstrated that a phase-out plan for CFC-based refrigerants is in place.

Required economic analysis: The replacement of a chiller is considered not economically feasible if the simple payback of the replacement is greater than 10 years. To determine the simple payback, divide the cost of implementing the replacement by the annual cost avoidance for energy that results from the replacement and any difference in maintenance costs. If CFC-based refrigerants are maintained in the building, reduce annual leakage to 5% or less using EPA Clean Air Act, Title VI, Rule 608 procedures governing refrigerant management and reporting, and reduce the total leakage over the remaining life of the unit to less than 30% of its refrigerant charge.

Small HVAC&R units (defined as containing less than 0.5 pounds of refrigerant), standard refrigerators, small water coolers and any other cooling equipment that contains less than 0.5 pounds of refrigerant are not considered part of the base building system and are exempt.

#### **Potential Technologies & Strategies**

Specify only non-CFC-based refrigerants in all new building HVAC&R systems. Identify all existing CFC-based refrigerant uses and upgrade the equipment if economically feasible and/or develop a phase-out plan that identifies a schedule for future replacement.

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## EA Credit 1: Optimize Energy Efficiency Performance

### 1–18 points

#### Intent

To achieve increasing levels of operating energy performance relative to typical buildings of similar type to reduce environmental and economic impacts associated with excessive energy use.

#### Requirements

##### CASE 1. Projects Eligible for Energy Star Rating

For buildings eligible to receive an energy performance rating using the EPA's ENERGY STAR's Portfolio Manager tool, achieve an energy performance rating of at least 71. If the building is eligible for an energy performance rating using Portfolio Manager, Option 1 must be used.

The minimum energy cost savings percentage for each ENERGY STAR threshold is as follows:

EPA ENERGY STAR Energy Performance Rating	Points
71	1
73	2
74	3
75	4
76	5
77	6
78	7
79	8
80	9
81	10
82	11
83	12
85	13
87	14
89	15
91	16
93	17
95	18

Achieve energy efficiency performance better than the minimum requirements listed above; points are awarded according to the table below.

Have energy meters that measure all energy use throughout the performance period of buildings to be certified. Each building's energy performance must be based on actual metered energy consumption for both the LEED project and all comparable buildings used for the benchmark. A full 12 months of continuous measured energy data is required.

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Calibrate meters within the manufacturer’s recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

## CASE 2. Projects Not Eligible for Energy Star Rating

For buildings not eligible to receive an energy performance rating using Portfolio Manager, comply with 1 of the following:

### OPTION 1

Demonstrate energy efficiency at least 21% better than the average for typical buildings of similar type by benchmarking against national average source energy data provided in the Portfolio Manager tool as an alternative to energy performance ratings. Follow the detailed instructions in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

OR

### OPTION 2

For buildings not suited for Case 2, Option 1, use the alternative method described in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

AND

Achieve energy efficiency performance better than the minimum requirements listed above; points are awarded according to the table below.

Have energy meters that measure all energy use throughout the performance period of all buildings to be certified. Each building’s energy performance must be based on actual metered energy consumption for both the LEED project and all comparable buildings used for the benchmark. A full 12 months of continuous measured energy data is required.

Calibrate meters within the manufacturer’s recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

Use the Portfolio Manager tool available on the ENERGY STAR website to benchmark the project even if it is not eligible for an EPA rating: <http://www.energystar.gov/benchmark>.

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Percentile level above the national median (for buildings not eligible for ENERGY STAR energy performance rating)	Points
21	1
23	2
24	3
25	4
26	5
27	6
28	7
29	8
30	9
31	10
32	11
33	12
35	13
37	14
39	15
41	16
43	17
45	18

### Potential Technologies & Strategies

Existing building commissioning and energy audits will help identify areas of building operations that are not efficient. Implement energy-efficient retrofits and energy-saving techniques to reduce the building's energy use. Energy-efficient equipment such as office equipment, maintenance equipment and appliances will aid in the reduction of energy waste. Employ the use of meters on major mechanical systems to effectively monitor the energy consumption of each.

In addition to efficiency improvements, consider renewable energy options as a way to minimize the building's environmental impact.

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## **EA Credit 2.1: Existing Building Commissioning—Investigation and Analysis**

### **2 points**

#### **Intent**

Through a systematic process, to develop an understanding of the operation of the building's major energy-using systems, options for optimizing energy performance and a plan to achieve energy savings.

#### **Requirements**

##### **OPTION 1. Commissioning Process**

- Develop a retrocommissioning, recommissioning or ongoing commissioning plan for the building's major energy-using systems.
- Conduct the investigation and analysis phase.
- Document the breakdown of energy use in the building.
- List the operating problems that affect occupants' comfort and energy use, and develop potential operational changes that will solve them.
- List the identified capital improvements that will provide cost-effective energy savings and document the cost-benefit analysis associated with each.

OR

##### **OPTION 2. ASHRAE Level II Energy Audit**

- Conduct an energy audit that meets the requirements of American Society of Heating, Refrigerating and Air-Conditioning Engineers (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, along with a discussion of any effect on operations and maintenance procedures.
- List the identified capital improvements that will provide cost-effective energy savings and document the cost-benefit analysis associated with each.

#### **Potential Technologies & Strategies**

Based on the building operating plan and systems narrative, confirm that all building systems and equipment are functioning as appropriate according to the equipment schedule. Conduct testing and analysis to ensure that building systems and equipment are functioning correctly. Identify opportunities to make no- or low-cost capital improvements to enhance building performance.

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## **EA Credit 2.2: Existing Building Commissioning—Implementation**

### **2 points**

#### **Intent**

To implement minor improvements and identify planned capital projects to ensure that the building's major energy-using systems are repaired, operated and maintained effectively to optimize energy performance.

#### **Requirements**

Implement no- or low-cost operational improvements and create a capital plan for major retrofits or upgrades.

Provide training for management staff that builds awareness and skills in a broad range of sustainable building operations topics. This could include energy efficiency and building, equipment and systems operations and maintenance.

Demonstrate the observed and/or anticipated financial costs and benefits of measures that have been implemented.

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.

#### **Potential Technologies & Strategies**

Implement no- and low-cost operational improvements that will immediately enhance building performance.

Develop a capital plan for the completion of any major retrofits identified through the investigation and analysis phase.

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## **EA Credit 2.3: Existing Building Commissioning—Ongoing Commissioning**

### **2 points**

#### **Intent**

To use commissioning to address changes in facility occupancy, use, maintenance and repair. Make periodic adjustments and reviews of building operating systems and procedures essential for optimal energy efficiency and service provision.

#### **Requirements**

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.

Create a written plan that summarizes the overall commissioning cycle for the building by equipment or building system group. The ongoing commissioning cycle must not exceed 24 months. This plan must include a building equipment list, performance measurement frequency for each equipment item and steps to respond to deviation from expected performance parameters.

Complete at least half of the scope of work in the first commissioning cycle (as indicated by the percentage of the plan's total budget) prior to the date of application for LEED 2009 for Existing Buildings: Operations & Maintenance. Only work completed within 2 years prior to application may be included to show progress in the ongoing commissioning cycle.

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.

#### **Potential Technologies & Strategies**

Develop an ongoing commissioning program that addresses the ongoing changes and maintenance needs in an existing building.

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## **EA Credit 3.1: Performance Measurement—Building Automation System**

**1 point**

### **Intent**

To provide information to support the ongoing accountability and optimization of building energy performance and identify opportunities for additional energy-saving investments.

### **Requirements**

Have in place a computer-based building automation system (BAS) that monitors and controls major building systems, including at a minimum, heating, cooling, ventilation and lighting. Have a preventive maintenance program in place that ensures BAS components are tested and repaired or replaced according to the manufacturer's recommended interval. Demonstrate that the BAS is being used to inform decisions regarding changes in building operations and energy-saving investments.

### **Potential Technologies & Strategies**

Install and/or maintain a BAS to automatically control key building systems. Ensure that relevant staff are adequately trained to use the system, analyze output, make necessary adjustments and identify investment opportunities to improve energy performance.

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## EA Credit 3.2: Performance Measurement—System-Level Metering

### 1–2 points

#### Intent

To provide accurate energy-use information to support energy management and identify opportunities for additional energy-saving improvements.

#### Requirements

Develop a breakdown of energy use in the building, either through EA Credits 2.1 and 2.2 or by using energy bills, spot metering or other metering to determine the energy consumption of major mechanical systems and other end-use applications. This analysis of major energy-use categories must have been conducted within 2 years prior to the date of application for LEED 2009 for Existing Buildings: Operations & Maintenance certification.

Based on the energy-use breakdown, employ system-level metering covering at least 40% or 80% of the total expected annual energy consumption of the building. Permanent metering and recording are required. All types of submetering are permitted.

Demonstrate that system-level metering is in place covering the percentage of total expected annual energy consumption of the building as outlined in the table below.

Demonstrate that the number of the largest energy-use categories from the breakdown report outlined in the table are covered by at least 80% (i.e., if energy use in the 2 or 3 largest categories is each 100 Btus/year, at least 80 Btu/year in 1 or 2 of them must be metered).

System Level Metering Requirements		
Percentage of Total Annual Energy Consumption to be Metered	Number of Largest Energy Use Categories to be Covered by 80% or more	Points
40%	1 of 2	1
80%	2 of 3	2

Metering must be continuous and data logged to allow for an analysis of time trends. The project team must compile monthly and annual summaries of results for each system covered. Meters must be calibrated within the manufacturer's recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.

#### Potential Technologies & Strategies

Identify, through an energy audit, building commissioning or some other means, how the building systems are consuming energy. Based on the energy-use profile, develop a metering plan to capture the most significant building loads. Use output from the meters to identify any changes in consumption and opportunities for energy-saving improvements. Have a plan for periodically inspecting the data.

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## EA Credit 4: On-site and Off-site Renewable Energy

### 1–6 points

#### Intent

To encourage and recognize increasing levels of on and off-site renewable energy to reduce environmental and economic impacts associated with fossil fuel energy use.

#### Requirements

During the performance period, meet some or all of the building’s total energy use with on-site or off-site renewable energy systems. Points are earned according to the following table, which shows the percentages of building energy use met by renewable energy during the performance period.

Off-site renewable energy sources are defined by the Center for Resource Solutions Green-e Energy program’s products certification requirements, or the equivalent. Green power may be procured from a Green-e Energy-certified power marketer or a Green-e Energy-accredited utility program, or through Green-e Energy-certified tradable renewable energy certificates (RECs) or the equivalent. For on-site renewable energy that is claimed for LEED 2009 for Existing Buildings: Operations & Maintenance credit, the associated environmental attributes must be retained or retired and cannot be sold.

If the green power is not Green-e Energy certified, equivalence must exist for both major Green-e Energy program criteria: 1) current green power performance standards, and 2) independent, third-party verification that those standards are being met by the green power supplier over time.

Up to the 6-point limit, any combinations of individual actions are awarded the sum of the points allocated to those individual actions. For example, 1 point would be awarded for implementing 3% of on-site renewable energy, and 3 additional points would be awarded for meeting 50% of the building’s energy load with renewable power or certificates during the performance period. Projects must submit proof of a contract to purchase RECs for a minimum of 2 years and must also make a commitment to purchase RECs on an ongoing basis beyond that.

On-site renewable energy		Off-site renewable energy certificates	Points
3%	or	25%	1
4.5%	or	37.5%	2
6%	or	50%	3
7.5%	or	62.5%	4
9%	or	75%	5
12%	or	100%	6

#### Potential Technologies & Strategies

Design and specify the use of on-site nonpolluting renewable technologies to contribute to the total energy requirements of the building. Consider and employ solar, geothermal, wind, biomass (other than unsustainably harvested wood) and biogas technologies.

Purchase renewable energy or tradable renewable energy certificates to meet some or all of the building’s energy requirements. Review the building’s electrical consumption trends. Research power providers in the area and select

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a provider that guarantees that a portion of its delivered electric power is derived from net nonpolluting renewable technologies. If the project is in an open-market state, investigate green power and power marketers licensed to provide power in that state. Grid power that qualifies for this credit originates from solar, wind, geothermal, biomass or low-impact hydro sources.

## EA Credit 5: Enhanced Refrigerant Management

1 point

### Intent

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to global climate change.

### Requirements

#### OPTION 1

Do not use refrigerants in base building heating, ventilating, air conditioning and refrigeration (HVAC&R) systems.

OR

#### OPTION 2

Select refrigerants and heating, ventilation, air conditioning and refrigeration HVAC&R equipment that minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change. The base building HVAC&R equipment must comply with the following formula, which sets a maximum threshold for the combined contributions to ozone depletion and global warming potential:

$$\text{LCGWP} + \text{LCODP} \times 10^5 \leq 100$$

#### Calculation definitions for $\text{LCGWP} + \text{LCODP} \times 10^5 \leq 100$

$\text{LCODP} = [\text{ODPr} \times (\text{Lr} \times \text{Life} + \text{Mr}) \times \text{Rc}] / \text{Life}$

$\text{LCGWP} = [\text{GWPr} \times (\text{Lr} \times \text{Life} + \text{Mr}) \times \text{Rc}] / \text{Life}$

LCODP: Lifecycle Ozone Depletion Potential (lbCFC11/Ton-Year)

LCGWP: Lifecycle Direct Global Warming Potential (lbCO<sub>2</sub>/Ton-Year)

GWPr: Global Warming Potential of Refrigerant (0 to 12,000 lbCO<sub>2</sub>/lbr)

ODPr: Ozone Depletion Potential of Refrigerant (0 to 0.2 lbCFC11/lbr)

Lr: Refrigerant Leakage Rate (0.5% to 2.0%; default of 2% unless otherwise demonstrated)

Mr: End-of-life Refrigerant Loss (2% to 10%; default of 10% unless otherwise demonstrated)

Rc: Refrigerant Charge (0.5 to 5.0 lbs of refrigerant per ton of gross ARI rated cooling capacity)

Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)

For multiple types of equipment, a weighted average of all base building HVAC&R equipment must be calculated using the following formula:

$$\frac{\sum (\text{LCGWP} + \text{LCODP} \times 10^5) \times \text{Qunit}}{\text{Qtotal}} \leq 100$$

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<b>Calculation definitions for <math>[\sum (LCGWP + LCODP \times 10^3) \times Q_{unit}] / Q_{total} \leq 100</math></b>
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Qunit = Gross ARI rated cooling capacity of an individual HVAC or refrigeration unit (tons)
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Qtotal = Total gross ARI rated cooling capacity of all HVAC or refrigeration
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Small HVAC units (defined as containing less than 0.5 pounds of refrigerant), and other equipment such as standard refrigerators, small water coolers and any other cooling equipment that contains less than 0.5 pounds of refrigerant are not considered part of the base building system and are not subject to the requirements of this credit.

Do not operate or install fire suppression systems that contain ozone-depleting substances — such as CFCs, hydrochlorofluorocarbons (HCFCs) or halons.

### **Potential Technologies & Strategies**

Operate the facility without mechanical cooling and refrigeration equipment. Where mechanical cooling is needed, use for the refrigeration cycle base building HVAC &R systems that minimize direct impact on ozone depletion and climate change. Select HVAC&R replacement equipment with reduced refrigerant charge and increased equipment life. Maintain equipment to prevent leakage of refrigerant to the atmosphere. Use fire-suppression systems that do not contain HCFCs or halons.

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## **EA Credit 6: Emissions Reduction Reporting**

### **1 point**

#### **Intent**

To document the emissions reduction benefits of building efficiency measures.

#### **Requirements**

Identify building performance parameters that reduce conventional energy use and emissions, quantify those reductions and report them to a formal tracking program:

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.

Report emissions reductions using a third-party voluntary reporting or certification program (e.g., U.S. Environmental Protection Agency (EPA) Climate Leaders, ENERGY STAR or World Resources Institute / World Business Council for Sustainable Development (WRI/WBCSD)) protocols).

#### **Potential Technologies & Strategies**

Address all of the significant types of pollutants reduced by energy efficiency. This is important because negative health effects and other environmental impacts result from many pollutants, including carbon dioxide (CO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), mercury (Hg), small particulate matter (PM<sub>2.5</sub>), large particulate matter (PM<sub>10</sub>) and volatile organic compounds (VOCs). Energy efficiency, renewable energy and other building emissions reduction measures make important contributions toward improving human and environmental health.



# MATERIALS & RESOURCES

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## MR Prerequisite 1: Sustainable Purchasing Policy

### Required

#### Intent

To reduce the environmental impacts of materials acquired for use in the operations, maintenance and upgrades of buildings.

#### Requirements

Have in place an Environmentally Preferable Purchasing (EPP) policy that includes, at a minimum, product purchasing policies for the building and site addressing the requirements of MR Credit 1: Sustainable Purchasing—Ongoing Consumables. This policy must adhere to the LEED 2009 for Existing Buildings: Operations & Maintenance policy model (see Introduction). At a minimum, the policy must cover those product purchases that are within the building and site management's control.

Additionally, extend the EPP policy to include product purchasing policies for the building and site addressing the requirements of at least 1 of the credits listed below. This extended policy must also adhere to the LEED 2009 for Existing Buildings: Operations & Maintenance policy model and specifically address the goal, scope and performance metric for the respective credit:

- MR Credit 2: Sustainable Purchasing—Durable Goods
- MR Credit 3: Sustainable Purchasing—Facility Alterations and Additions
- MR Credit 4: Sustainable Purchasing—Reduced Mercury in Lamps

This prerequisite requires only policies, not ongoing actual sustainable performance.

#### Potential Technologies & Strategies

Evaluate the items that are purchased for the building, identify more environmentally friendly alternatives and establish a policy to purchase these alternatives when economically feasible. Work with suppliers to identify environmentally preferable products that meet the needs of the building.

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## **MR Prerequisite 2: Solid Waste Management Policy**

### **Required**

#### **Intent**

To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills or incineration facilities.

#### **Requirements**

Have in place a solid waste management policy for the building and site addressing the requirements of the waste management credits listed below as well as recycling of all mercury-containing lamps. This policy must adhere to the LEED 2009 for Existing Buildings: Operations & Maintenance policy model (see Introduction). At a minimum, the policy must cover the waste streams that are within the building and site management's control.

- MR Credit 7: Solid Waste Management—Ongoing Consumables
- MR Credit 8: Solid Waste Management—Durable Goods
- MR Credit 9: Solid Waste Management—Facility Alterations and Additions

This prerequisite requires only policies, not ongoing actual sustainable performance.

#### **Potential Technologies & Strategies**

Evaluate the building's waste stream and establish policies to divert materials from disposal in landfills or incineration facilities by encouraging the reuse and recycling of items, where possible.

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## MR Credit 1: Sustainable Purchasing—Ongoing Consumables

### 1 Point

#### Intent

To reduce the environmental and air quality impacts of the materials acquired for use in the operations and maintenance of buildings.

#### Requirements

Maintain a sustainable purchasing program covering materials with a low cost per unit that are regularly used and replaced through the course of business. These materials include at a minimum, paper (printing or copy paper, notebooks, notepads, envelopes), toner cartridges, binders, batteries and desk accessories. Food and beverages are excluded from this credit but are covered under MR Credit 5. Sustainable Purchasing - Food. For materials that may be considered either ongoing consumables or durable goods (see MR Credit 2), the project team is free to decide which category to put them in as long as consistency is maintained with MR Credit 2, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credit 7.

A template calculator for MR Credit 1 is available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. One point is awarded to projects that achieve sustainable purchases of at least 60%, of total purchases (by cost) during the performance period. Sustainable purchases are those that meet one or more of the following criteria:

- Purchases contain at least 10% postconsumer and/or 20% postindustrial material.
- Purchases contain at least 50% rapidly renewable materials.
- Purchases contain at least 50% materials harvested and processed or extracted and processed within 500 miles of the project.
- Purchases consist of at least 50% Forest Stewardship Council (FSC)–certified paper products.
- Batteries are rechargeable.

Each purchase can receive credit for each sustainable criterion met (i.e., a \$100 purchase that contains both 10% postconsumer recycled content and 50% of content harvested within 500 miles of the project counts twice in the calculation, for a total of \$200 of sustainable purchasing).

Ongoing consumables must be purchased during the performance period to earn points in this credit.

#### Potential Technologies & Strategies

When purchasing materials, supplies or equipment, specify those that meet one or more of the criteria.

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## MR Credit 2: Sustainable Purchasing—Durable Goods

### 1–2 Points

#### Intent

To reduce the environmental and air quality impacts of the materials acquired for use in the operations and maintenance of buildings.

#### Requirements

Maintain a sustainable purchasing program covering items available at a higher cost per unit and durable goods that are replaced infrequently and/or may require capital program outlays to purchase. Materials that may be considered either ongoing consumables (see MR Credit 1: Sustainable Purchasing—Ongoing Consumables) or durable goods, can be counted under either category provided consistency is maintained with MR Credit 1, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credit 8: Solid Waste Management—Durable Goods.

#### OPTION 1. Electric-Powered Equipment (1 point)

Achieve sustainable purchases of at least 40% of total purchases of electric-powered equipment<sup>1</sup> (by cost) during the performance period. Sustainable purchases shall meet 1 of the following criteria:

- The equipment is ENERGY STAR<sup>®</sup> qualified (for product categories with developed specifications).
- The equipment (either battery or corded) replaces conventional gas-powered equipment<sup>2</sup>.

OR

#### OPTION 2. Furniture (1 point)

Achieve sustainable purchases of at least 40% of total purchases of furniture (by cost) during the performance period. Sustainable purchases shall meet 1 or more of the following criteria:

- Purchases contain at least 10% postconsumer and/or 20% postindustrial material.
- Purchases contain at least 70% material salvaged from off-site or outside the organization.
- Purchases contain at least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program.
- Purchases contain at least 50% rapidly renewable material.
- Purchases contain at least 50% Forest Stewardship Council (FSC)-certified wood.
- Purchases contain at least 50% material harvested and processed or extracted and processed within 500 miles of the project.

1 Electric-powered equipment include at a minimum, office equipment (computers, monitors, copiers, printers, scanners, fax machines), appliances (refrigerators, dishwashers, water coolers), external power adapters, and televisions and other audiovisual equipment.

2 Gas-powered equipment include at a minimum, maintenance equipment and vehicles, landscaping equipment and cleaning equipment.

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Each furniture purchase can receive credit for each sustainable criterion met (i.e., a \$100 purchase that contains both 10% postconsumer recycled content and 50% of content harvested within 500 miles of the project counts twice in the calculation, for a total of \$200 of sustainable purchasing).

Durable goods must be purchased during the performance period to earn points in this credit.

OR

OPTION 3. Combination (2 points)

Achieve the requirements of both Option 1 & Option 2.

**Potential Technologies & Strategies**

When purchasing materials, supplies or equipment, specify products that meet 1 or more of the criteria. This credit is eligible for exemplary performance if the project team uses Electronic Product Environmental Assessment Tools (EPEAT)-rated desktop computers, monitors and notebooks.

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## MR Credit 3: Sustainable Purchasing—Facility Alterations and Additions

### 1 Point

#### Intent

To reduce the environmental and air quality impacts of the materials acquired for use in the upgrade of buildings.

#### Requirements

Maintain a sustainable purchasing program covering materials for facility renovations, demolitions, refits and new construction additions. This applies only to base building elements<sup>1</sup> permanently or semipermanently attached to the building itself. Materials considered furniture, fixtures and equipment (FF&E) are not considered base building elements and are excluded from this credit. Mechanical, electrical and plumbing components and specialty items such as elevators are also excluded from this credit.

A sample calculator for this credit is available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. Achieve sustainable purchases of 50% of total purchases (by cost) during the performance period. Sustainable purchases shall meet 1 or more of the following criteria:

- Purchases contain at least 10% postconsumer and/or 20% postindustrial material.
- Purchases contain at least 70% material salvaged from off-site or outside the organization.
- Purchases contain at least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program.
- Purchases contain at least 50% rapidly renewable material.
- Purchases contain at least 50% Forest Stewardship Council certified wood.
- Purchases contain at least 50% material harvested and processed or extracted and processed within 500 miles of the project.
- Adhesives and sealants have a VOC content less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, or sealants used as fillers meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.
- Paints and coating have VOC emissions not exceeding the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.
- Noncarpet finished flooring is FloorScore-certified and constitutes a minimum of 25% of the finished floor area.
- Carpet meets the requirements of the CRI Green Label Plus Carpet Testing Program.
- Carpet cushion meets the requirements of the CRI Green Label Testing Program.
- Composite panels and agrifiber<sup>2</sup> products contain no added urea-formaldehyde resins.

<sup>1</sup> Base building elements include, at a minimum, building components and structures (wall studs, insulation, doors, windows), panels, attached finishings (drywall, trim, ceiling panels), carpet and other flooring material, adhesives, sealants, paints and coatings.

<sup>2</sup> Composite wood and agrifiber products are defined as particleboard, medium-density fiberboard (MDF), plywood, oriented-strand board (OSB), wheatboard, strawboard, panel substrates and door cores.

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Each purchase can receive credit for each sustainable criterion met (i.e., a \$100 purchase that contains both 10% postconsumer recycled content and 50% of content harvested within 500 miles of the project counts twice in the calculation, for a total of \$200 of sustainable purchasing).

Materials for alterations or additions must be purchased during the performance period to earn points in this credit.

### **Potential Technologies & Strategies**

When purchasing materials, supplies or equipment, specify products that meet one or more of the criteria.

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## MR Credit 4: Sustainable Purchasing—Reduced Mercury in Lamps

### 1 Point

#### Intent

To establish and maintain a toxic material source reduction program to reduce the amount of mercury brought onto the building site through purchases of lamps.

#### Requirements

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 fixtures, as well as both hard-wired and portable fixtures. The purchasing plan must specify a target for the overall average of mercury content in lamps of 90 picograms per lumen-hour or less. The plan must include lamps for both indoor and outdoor fixtures, as well as both hard-wired and portable fixtures. The plan must require that at least 90% of purchased lamps comply with the target (as measured by the number of lamps). Lamps containing no mercury may be counted toward plan compliance only if they have energy efficiency at least as good as their mercury-containing counterparts.

Implement the lighting purchasing plan during the performance period such that all purchased mercury-containing lamps comply with the plan. One point is awarded to projects for which at least 90% of all mercury-containing lamps purchased during the performance period (as measured by the number of lamps) comply with the purchasing plan and meet the following overall target for mercury content of 90 picograms per lumen-hour.

A template calculator to aid in documenting performance for this credit is available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

Exception: Screw-based, integral compact fluorescent lamps (CFLs) may be excluded from both the plan and the performance calculation if they comply with the voluntary industry guidelines for maximum mercury content published by the National Electrical Manufacturers Association (NEMA), as described in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. Screw-based, integral CFLs that do not comply with the NEMA guidelines must be included in the purchasing plan and the performance calculation.

Performance metrics for lamps — including mercury content (mg/lamp), mean light output (lumens) and rated life (hours) — must be derived according to industry standards, as described in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. Mercury values generated by toxicity characteristic leaching procedure (TCLP) tests do not provide the required mercury information for LEED 2009 for Existing Buildings: Operations & Maintenance and cannot be used in the calculation.

LEED 2009 for Existing Buildings: Operations & Maintenance addresses only the lamps purchased during the performance period, not the lamps installed in the building. Similarly, LEED 2009 for Existing Buildings: Operations & Maintenance does not require that each purchased lamp comply with the specified mercury limit; only the overall average of purchased lamps must comply.

Mercury-containing lamps (or their high-efficiency counterparts) must be purchased during the performance period to earn points in this credit.

#### Potential Technologies & Strategies

Establish and follow a lamp-purchasing program that sets a minimum level of mercury content and life for all mercury-containing lamp types. Work with suppliers to specify these requirements for all future purchases.

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## **MR Credit 5: Sustainable Purchasing—Food**

### **1 Point**

#### **Intent**

To reduce the environmental and transportation impacts associated with food production and distribution.

#### **Requirements**

Achieve sustainable purchases of at least 25% of total combined food and beverage purchases (by cost) during the performance period. Sustainable purchases are those that meet 1 or both of the following criteria:

- Purchases are labeled USDA Organic, Food Alliance Certified, Rainforest Alliance Certified, Protected Harvest Certified, Fair Trade or Marine Stewardship Council's Blue Eco-Label.
- Purchases are produced within a 100-mile radius of the site.

Each purchase can receive credit for each sustainable criterion met (i.e., a \$100 purchase that is both USDA Organic and is produced on a farm within 100 miles of the project counts twice in the calculation, for a total of \$200 of sustainable purchasing).

Food or beverages must be purchased during the performance period to earn points in this credit.

#### **Potential Technologies & Strategies**

When purchasing food and beverages, specify that the items meet 1 or both criteria in this credit. Consider using catering companies that purchase locally grown and/or organic foods.

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## **MR Credit 6: Solid Waste Management—Waste Stream Audit**

### **1 Point**

#### **Intent**

To facilitate the reduction of ongoing waste and toxins generated by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

#### **Requirements**

Conduct a waste stream audit of the building's entire ongoing consumables waste stream (not durable goods or construction waste for facility alterations and additions). Use the audit's results to establish a baseline that identifies the types of waste making up the waste stream and the amounts of each type by weight or volume. Identify opportunities for increased recycling and waste diversion. The audit must be conducted during the performance period.

#### **Potential Technologies and Strategies**

Understanding waste production patterns in a building is an important first step to waste reduction. Work with your waste hauler or service provider to collect and analyze information on the amounts and types of waste generated by the facility.

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## **MR Credit 7: Solid Waste Management—Ongoing Consumables**

### **1 Point**

#### **Intent**

To facilitate the reduction of waste and toxins generated from the use of ongoing consumable products by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

#### **Requirements**

Maintain a 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 at a minimum, paper, toner cartridges, glass, plastics, cardboard and old corrugated cardboard, food waste, and metals. Materials that may be considered either ongoing consumables or durable goods (see MR Credit 8: Solid Waste Management—Durable Goods) can be counted under either category provided consistency is maintained with MR Credit 8, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credits 1: Sustainable Purchasing—Ongoing Consumables and 5: Sustainable Purchasing—Food.

Reuse, recycle or compost 50% of the ongoing consumables waste stream (by weight or volume).

Have a battery recycling program in place that implements the battery recycling policy adopted in MR Prerequisite 2: Solid Waste Management Policy. The program must have a target of diverting at least 80% of discarded batteries from the trash, and actual diversion performance must be verified at least annually. The program must cover all portable dry-cell types of batteries, including single-use and/or rechargeables used in radios, phones, cameras, computers and other devices or equipment.

#### **Potential Technologies & Strategies**

Maintain a 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. Encourage a high level of recycling by building occupants.

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## MR Credit 8: Solid Waste Management—Durable Goods

### 1 Point

#### Intent

To facilitate the reduction of waste and toxins generated from the use of durable goods by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

#### Requirements

Maintain a waste reduction, reuse and recycling program that addresses durable goods (those that are replaced infrequently and/or may require capital program outlays to purchase). Durable goods include at a minimum, office equipment (computers, monitors, copiers, printers, scanners, fax machines), appliances (refrigerators, dishwashers, water coolers), external power adapters, televisions and other audiovisual equipment. Materials that may be considered either ongoing consumables (see MR Credit 7. Solid Waste Management—Ongoing Consumables) or durable goods can be counted under either category provided consistency is maintained with MR Credit 7, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credit 2: Sustainable Purchasing.

Reuse or recycle 75% of the durable goods waste stream<sup>1</sup> (by weight, volume or replacement value) during the performance period.

#### Potential Technologies & Strategies

Maintain a waste reduction, reuse and recycling program that addresses durable items that are replaced infrequently and/or may require capital program outlays to replace. Consider taking part in a leasing or donation program to help maintain waste reduction. In addition to any statewide electronic recycling efforts, consider using StEP (<http://www.step-initiative.org/>) for guidance in disposing of electronic waste or for manufacturer and provider takeback options.

<sup>1</sup> Durable goods waste stream is defined as durable goods leaving the project building, site and organization that have fully depreciated and reached the end of their useful lives for normal business operations. Durable goods that remain useful and functional and are moved to another floor or building, etc. do not qualify. Leased durable goods returned to their owner at the end of their useful lives for normal business operations do qualify.

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## **MR Credit 9: Solid Waste Management—Facility Alterations and Additions**

### **1 Point**

#### **Intent**

To divert construction and demolition debris from disposal to landfills and incineration facilities. Redirect recyclable recovered resources back to the manufacturing process and reusable materials to appropriate sites.

#### **Requirements**

Divert at least 70% of waste (by volume) generated by facility alterations and additions from disposal to landfills and incineration facilities. This applies only to base building elements permanently or semipermanently attached to the building itself that enter the waste stream during facility renovations, demolitions, refits and new construction additions. Base building elements include at a minimum, building components and structures (wall studs, insulation, doors, windows), panels, attached finishings (drywall, trim, ceiling panels), carpet and other flooring material, adhesives, sealants, paints and coatings. Furniture, fixtures and equipment (FF&E) are not considered base building elements and are excluded from this credit. Mechanical, electrical and plumbing components and specialty items such as elevators are also excluded.

#### **Potential Technologies & Strategies**

Maintain waste management policies applicable to any facility alterations and additions occurring on the site. Identify licensed haulers and processors of recyclable materials. Identify markets for salvaged materials. Employ deconstruction, salvage and recycling strategies and processes. Document the cost for recycling, salvaging and reusing materials. Make source reduction on the job site an integral part of the plan to reduce solid waste. Investigate salvaging or recycling lighting fixture pans when retrofitting.



# INDOOR ENVIRONMENTAL QUALITY

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## IEQ Prerequisite 1: Minimum Indoor Air Quality Performance

### Required

#### Intent

To establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the health and well-being of the occupants.

#### Requirements

##### CASE 1. Projects Able to Meet ASHRAE Standard 62.1–2007

Modify or maintain each outside air intake, supply air fan and/or ventilation distribution system to supply at least the outdoor air ventilation rate required by ASHRAE Standard 62.1–2007 Ventilation Rate Procedure (with errata but without addenda<sup>1</sup>) under all normal operating conditions.

##### CASE 2. Projects Unable to Meet ASHRAE Standard 62.1–2007

If meeting ASHRAE Standard 62.1–2007 ventilation rates (with errata but without addenda<sup>1</sup>) is infeasible because of the physical constraints of the existing ventilation system, modify or maintain the system to supply at least 10 cubic feet per minute (cfm) of outdoor air per person under all normal operating conditions. Demonstrate through design documentation, measurements or other evidence that the current system cannot provide the flow rates required by ASHRAE Standard 62.1–2007 under any operating condition even when functioning properly.

Each air-handling unit in the building must comply with either Case 1 or Case 2. If some air-handling units can provide the outside air flow required by ASHRAE Standard 62.1–2007 (with errata but without addenda<sup>1</sup>) and others cannot, those that can must do so. Buildings must provide at least 10 cfm per person of outside air at each air-handling unit under all normal operating conditions to earn this prerequisite.

#### AND

- Show compliance with the applicable requirement above (Case 1 or Case 2) through measurements taken at the system level (i.e., the air-handling unit). For variable air volume systems, the dampers, fan speeds, etc. must be set during the test to the worst-case system conditions (minimum outside air flow) expected during normal ventilation operations. Each air-handler must be measured; sampling or grouping of air-handlers is prohibited.
- Implement and maintain an HVAC system maintenance program to ensure the proper operations and maintenance of HVAC components as they relate to outdoor air introduction and exhaust.
- Test and maintain the operation of all building exhaust systems, including bathroom, shower, kitchen and parking exhaust systems.

Naturally ventilated buildings must comply with ASHRAE Standard 62.1–2007, paragraph 5.1 (with errata but without addenda<sup>1</sup>).

<sup>1</sup> Project teams wishing to use ASHRAE approved addenda for the purposes of this prerequisite may do so at their discretion. Addenda must be applied consistently across all LEED credits.

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### **Potential Technologies & Strategies**

Conduct a visual inspection of outside air vents and dampers and remove any outside air vent or louver obstructions that restrict full outside air capacity from entering the distribution system. Conduct airflow monitoring to document outside air cubic feet per minute (cfm). Compare measured flow with designed flow for each unit. Test the operation of each exhaust fan and verify that exhaust airflow meets design requirements or intentions. EPA's "Guidelines for HVAC System Maintenance" provides guidance on developing, implementing and maintaining an HVAC system maintenance program to ensure the proper operations and maintenance of HVAC components as they relate to IAQ.

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## IEQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

### Required

#### Intent

To prevent or minimize exposure of building occupants, indoor surfaces and systems to environmental tobacco smoke (ETS).

#### Requirements

##### CASE 1. Non-Residential Projects

###### OPTION 1

- Prohibit smoking in the building.
- Prohibit on-property smoking within 25 feet of entries, outdoor air intakes and operable windows.

OR

###### OPTION 2

- Prohibit smoking in the building except in designated smoking rooms and establish negative pressure in the rooms with smoking.
- Prohibit on-property smoking within 25 feet of building entries, outdoor air intakes and operable windows.
- Locate designated smoking room(s) to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room must be directly exhausted to the outdoors, away from air intakes and building entry paths, away from air intakes and building entry paths, with no recirculation of ETS-containing air to the nonsmoking area of the building; enclosed with impermeable deck-to-deck partitions. Operate exhaust sufficient to create a negative pressure differential with the surrounding spaces of at least an average of 5 Pascals (Pa) (0.02 inches water gauge) and a minimum of 1 Pa (0.004 inches water gauge) when the door(s) to the rooms are closed.
- Verify performance of the smoking room differential air pressures by conducting 15 minutes of measurement, with a minimum of 1 measurement every 10 seconds, of the differential pressure in the smoking room with respect to each adjacent area and in each adjacent vertical chase with the doors to the smoking room closed. Conduct the testing with each space configured for worst-case conditions for transport of air from the smoking room (with closed doors) to adjacent spaces.

##### CASE 2. Residential and Hospitality Projects

- Reduce air leakage between smoking and nonsmoking areas.
- Prohibit smoking in all common areas of the building.
- Prohibit on-property smoking within 25 feet of building entries, outdoor air intakes and operable windows opening to common areas.
- Minimize uncontrolled pathways for ETS transfer between individual residential units by sealing penetrations in walls, ceilings and floors in the residential units and by sealing adjacent vertical chases adjacent to the units.

- 
- Weather-strip all doors in the residential units leading to common hallways to minimize leakage from outdoors.

Demonstrate acceptable sealing of residential units by a blower door test conducted in accordance with ASTM-779-03, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization, AND use the progressive sampling methodology defined in Chapter 7 (Home Energy Rating Systems, HERS Required Verification and Diagnostic Testing) of the California Residential Alternative Calculation Method Approval Manual. Residential units must demonstrate less than 1.25 square inches of leakage area per 100 square feet of enclosure area (i.e., the sum of all wall, ceiling and floor areas).

### **Potential Technologies & Strategies**

Prohibit smoking in the building or provide negative-pressure smoking rooms. For residential buildings, a third option is to provide very tight construction to minimize the transfer of ETS among dwelling units.

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## IEQ Prerequisite 3: Green Cleaning Policy

### Required

#### Intent

To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.

#### Requirements

Have in place a green cleaning policy for the building and site addressing the following green cleaning credits and other requirements:

- Purchase sustainable cleaning and hard floor and carpet care products meeting the sustainability criteria outlined in IEQ Credit 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials.
- Purchase cleaning equipment meeting the sustainability criteria outlined in IEQ Credit 3.4: Green Cleaning—Sustainable Cleaning Equipment.
- Establish standard operating procedures addressing how an effective cleaning and hard floor and carpet maintenance system will be consistently utilized, managed and audited. Specifically address cleaning to protect vulnerable building occupants.
- Develop strategies for promoting and improving hand hygiene, including both hand washing and the use of alcohol-based waterless hand sanitizers.
- Develop guidelines addressing the safe handling and storage of cleaning chemicals used in the building, including a plan for managing hazardous spills or mishandling incidents.
- Develop requirements for staffing and training of maintenance personnel appropriate to the needs of the building. Specifically address the training of maintenance personnel in the hazards of use, disposal and recycling of cleaning chemicals, dispensing equipment and packaging.
- Provide for collecting occupant feedback and continuous improvement to evaluate new technologies, procedures and processes.

This policy must adhere to the LEED 2009 for Existing Buildings: Operations & Maintenance policy model (see Introduction). At a minimum, the policy must cover the green cleaning procedures and materials that are within the building and site management's control.

#### Potential Technologies & Strategies

During the performance period, establish a written green cleaning policy addressing SOPs, sustainable products and equipment, chemical handling and storage, and staff training.

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## **IEQ Credit 1.1: Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program**

**1 point**

### **Intent**

To enhance indoor air quality (IAQ) by optimizing practices to prevent the development of indoor air quality problems in buildings, correcting indoor air quality problems when they occur and maintaining the well-being of the occupants.

### **Requirements**

Develop and implement on an ongoing basis an IAQ management program based on the EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM), EPA Reference Number 402-C-01-001, December 2002, available at <http://www.epa.gov/iaq/largebdgs/i-beam/index.html>.

### **Potential Technologies & Strategies**

Operate a program to enhance IAQ by optimizing practices to prevent the development of IAQ in buildings and maintain the well-being of the occupants. Survey and evaluate building systems to identify potential IAQ problems and implement an ongoing program to prevent these problems from occurring and to maintain a high level of IAQ. Include in the program a plan for preventing moisture accumulation and mold in the building. For additional information, see the EPA Web site on IAQ, [www.epa.gov/iaq/largebdgs/baqtoc.html](http://www.epa.gov/iaq/largebdgs/baqtoc.html).

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## IEQ Credit 1.2: Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring

### 1 point

#### Intent

To provide capacity for ventilation system monitoring to help sustain occupant comfort and well-being.

#### Requirements

Install permanent, continuous monitoring systems that provide feedback on ventilation system performance to ensure that ventilation systems maintain minimum outdoor airflow rates under all operating conditions

AND

#### CASE 1. Mechanical Ventilation Systems

Provide an outdoor airflow measurement device capable of measuring (and, if necessary, controlling) the minimum outdoor airflow rate at all expected system operating conditions within 15% of the design minimum outdoor air rate. Monitoring must be performed for at least 80% of the building's total outdoor air intake flow serving occupied spaces.

The outdoor airflow measurement device(s) must take measurements at the system level (i.e., the air-handling unit). The device must be monitored by a control system that is configured to trend outdoor airflow in intervals no longer than 15 minutes for a period of no less than 6 months. The control system must be configured to generate an alarm visible to the system operator if the minimum outdoor air rate falls more than 15% below the design minimum rate.

All measurement devices must be calibrated within the manufacturer's recommended interval.

#### CASE 2. Mechanical Ventilation Systems that Predominantly Serve Densely Occupied Spaces<sup>1</sup>

Have a CO<sub>2</sub> sensor or sampling location for each densely occupied space and compare it with outdoor ambient CO<sub>2</sub> concentrations. Each sampling location must be between 3 and 6 feet above the floor.

Test and calibrate CO<sub>2</sub> sensors to have an accuracy of no less than 75 parts per million (ppm) or 5% of the reading, whichever is greater. Sensors must be tested and calibrated at least once every 5 years or per the manufacturer's recommendation, whichever is shorter.

Monitor CO<sub>2</sub> sensors with a system configured to trend CO<sub>2</sub> concentrations in intervals no longer than 30 minutes. The system must generate an alarm visible to the system operator and, if desired, to building occupants if the CO<sub>2</sub> concentration in any zone rises more than 15% above that corresponding to the minimum outdoor air rate required by ASHRAE Standard 62.1-2007 (with errata but without addenda<sup>2</sup>) (see IEQ Prerequisite 1: Energy Efficiency Best Management Practices).

<sup>1</sup> Densely occupied space is defined as an area with a design occupant density of 25 people or more per 1,000 square feet (40 square feet or less per person). If the total square footage of all dense space is less than 5% of total occupied square footage, the project is exempt from the requirements of this section. Rooms smaller than 150 square feet are also exempt.

<sup>2</sup> Project teams wishing to use ASHRAE approved addenda for the purposes of this prerequisite may do so at their discretion. Addenda must be applied consistently across all LEED credits.

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CO<sub>2</sub> sensors may be used for demand-controlled ventilation provided the control strategy complies with ASHRAE Standard 62.1-2007 (see IEQ Prerequisite 1: Energy Efficiency Best Management Practices, including maintaining the area-based component of the design ventilation rate).

### CASE 3. Natural Ventilation Systems

Locate CO<sub>2</sub> sensors in the breathing zone of every densely populated room and every natural ventilation zone.

CO<sub>2</sub> sensors must provide an audible or visual alarm to the occupants in the space and to the system operator if CO<sub>2</sub> conditions are greater than 530 ppm above outdoor CO<sub>2</sub> levels or 1,000 ppm absolute. The alarm signal must indicate that ventilation adjustments (e.g. opening windows) are required in the affected space.

All monitoring devices must be calibrated within the manufacturer's recommended interval.

Permanently open areas must meet the requirements of ASHRAE 62.1-2007, Section 5.1 (with errata but without addenda<sup>2</sup>).

Exemptions: If the total square footage of all space served by natural ventilation systems is less than 5% of total occupied square footage, the project is exempt from the requirements of this section. Rooms smaller than 150 square feet are also exempt.

### Potential Technologies & Strategies

Install and maintain permanent ventilation monitoring systems that provide feedback on system performance to ensure minimum ventilation rates.

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## **IEQ Credit 1.3: Indoor Air Quality Best Management Practices—Increased Ventilation**

### **1 point**

#### **Intent**

To provide additional outdoor air ventilation to improve indoor air quality (IAQ) for improved occupant comfort, well-being and productivity.

#### **Requirements**

##### **CASE 1. Mechanically Ventilated Spaces**

Increase outdoor air ventilation rates for all air-handling units serving occupied spaces by at least 30% above the minimum required by ASHRAE Standard 62.1-2007 (with errata but without addenda<sup>1</sup>).

##### **CASE 2. Naturally Ventilated Spaces**

Design natural ventilation systems for occupied spaces to meet the recommendations set forth in the Carbon Trust “Good Practice Guide 237” (1998). Determine whether natural ventilation is an effective strategy for the project by following the flow diagram process in Figure 2.8 of the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual 10: 2005, Natural Ventilation in Non-domestic Buildings

AND

##### **OPTION 1**

Use diagrams and calculations to show that the design of the natural ventilation systems meets the recommendations set forth in CIBSE Applications Manual 10: 2005, Natural Ventilation in Non-domestic Buildings

OR

##### **OPTION 2**

Use a macroscopic, multizone, analytic model to predict that room-by-room airflows will effectively naturally ventilate, defined as providing the minimum ventilation rates required by ASHRAE Standard 62.1-2007 Chapter 6 (with errata but without addenda), at least 90% of occupied spaces.

#### **Potential Technologies & Strategies**

For mechanically ventilated spaces, design ventilation systems to provide ventilation rates at least 30% above the minimum rates prescribed by the referenced standard. Ensure that the additional ventilation rate does not adversely affect building humidity control during all expected operating conditions.

<sup>1</sup> Project teams wishing to use ASHRAE approved addenda for the purposes of this prerequisite may do so at their discretion. Addenda must be applied consistently across all LEED credits.

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For naturally ventilated spaces, follow the 8 design steps described in the CIBSE Good Practice Guide 237:

- Develop design requirements.
- Plan airflow paths.
- Identify building uses and features that might require special attention.
- Determine ventilation requirements.
- Estimate external driving pressures.
- Select types of ventilation devices.
- Size ventilation devices.
- Analyze the design.

Use public domain software, such as NIST's CONTAM, Multizone Modeling Software, along with LoopDA, Natural Ventilation Sizing Tool, to analytically predict room-by-room airflows.

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## **IEQ Credit 1.4: Indoor Air Quality Best Management Practices—Reduce Particulates in Air Distribution**

**1 point**

### **Intent**

To reduce exposure of building occupants and maintenance personnel to potentially hazardous particulate contaminants, which adversely affect air quality, human health, building systems and the environment.

### **Requirements**

Have in place filtration media with a minimum efficiency reporting value (MERV) of 13 or greater for all outside air intakes and inside air recirculation returns during the performance period. Establish and follow a regular schedule for maintenance and replacement of these filtration media according to the manufacturer's recommended interval.

### **Potential Technologies & Strategies**

Install and maintain filtration media with a particle removal effectiveness of MERV 13 or greater for all outside air intakes and returns for the recirculation of inside air. Establish and follow a regular schedule for maintenance and replacement of these filters.

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## IEQ Credit 1.5: Indoor Air Quality Best Management Practices—Indoor Air Quality Management for Facility Alterations and Additions

### 1 point

#### Intent

To prevent indoor air quality (IAQ) problems resulting from any construction or renovation projects to help sustain the comfort and well-being of construction workers and building occupants.

#### Requirements

Develop and implement an IAQ management plan for the construction and occupancy phases:

- During construction, meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).
- If the building undergoes a tenant improvement, develop and implement an IAQ management plan for the preoccupancy phases. Perform a flush-out procedure as follows: After construction ends and all interior finishes have been installed, install new filtration media and flush out the affected space. The flush out must be done by supplying a total outdoor air volume of 14,000 cubic feet per square foot of floor area while maintaining an internal temperature of at least 60° F and maintaining a relative humidity no higher than 60% where cooling mechanisms are operated. The affected space may be occupied only after the delivery of at least 3,500 cubic feet of outdoor air per square foot of floor area and the space has been ventilated at a minimum rate of 0.30 cfm per square foot of outdoor air or the design minimum outside air rate (whichever is greater) for at least 3 hours prior to occupancy until the total of 14,000 cubic feet per square foot of outdoor air has been delivered to the space. The flush-out may continue during occupancy.
- Protect stored on-site or installed absorptive materials from moisture damage.
- If permanently installed air-handlers must be used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda<sup>1</sup>). Replace all filtration media immediately prior to occupancy.
- Upon the completion of construction, HVAC and lighting systems must be returned to the designed or modified sequence of operations.

#### Potential Technologies & Strategies

Specify containment control strategies that include protecting the HVAC system, controlling pollutant sources, interrupting pathways for contamination, enforcing proper housekeeping and coordinating schedules to minimize disruption.

Specify the construction sequencing to install absorptive materials after the prescribed dry or cure time of wet finishes to minimize adverse impacts on IAQ materials that are susceptible to microbial contamination and are

<sup>1</sup> Project teams wishing to use ASHRAE approved addenda for the purposes of this prerequisite may do so at their discretion. Addenda must be applied consistently across all LEED credits.

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directly exposed to moisture through precipitation, plumbing leaks or condensation from the HVAC system. Sequence the application of building materials such that any significant sources of contaminants (e.g., composite wood products, adhesives, paints and coatings, glazing) dissipate most emissions prior to the introduction of products that would absorb or trap contaminants (e.g., carpet and padding, fabric wall covering, acoustic tiles, upholstered furniture). Where protection cannot be provided by sequence of installation, protect absorbing surfaces with vapor barriers and provide air exchange through temporary or permanent ventilation systems.

Appoint an IAQ manager with owner's authority to inspect potential problems and require mitigation, as necessary.

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## **IEQ Credit 2.1: Occupant Comfort—Occupant Survey**

**1 point**

### **Intent**

To provide for the assessment of building occupants' comfort as it relates to thermal comfort, acoustics, indoor air quality (IAQ), lighting levels, building cleanliness and any other comfort issues.

### **Requirements**

- Implement an occupant comfort survey and complaint response system to collect anonymous responses about thermal comfort, acoustics, IAQ, lighting levels, building cleanliness and other occupant comfort issues. The survey must be collected from a representative sample of building occupants making up at least 30% of the total occupants, and it must include an assessment of overall satisfaction with building performance and identification of any comfort-related problems.
- Document survey results and corrective actions to address comfort issues identified through the surveys.
- Conduct at least 1 occupant survey during the performance period.

### **Potential Technologies & Strategies**

Conducting an occupant survey is a valuable tool for identifying and addressing occupants' comfort and building performance issues. Develop a plan for corrective action to address any identified problems or concerns. Alternative survey ideas are available in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

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## **IEQ Credit 2.2: Controllability of Systems—Lighting**

**1 point**

### **Intent**

To provide a high level of lighting system control by individual occupants or groups in multi-occupant spaces (e.g., classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

### **Requirements**

For at least 50% of building occupants, use lighting controls that enable adjustments to suit the task needs and preferences of individuals for at least 50% of individual workstations, and for groups sharing a multioccupant space or working area for at least 50% of multi-occupant space in the building.

### **Potential Technologies & Strategies**

Implement system and occupant control of ambient and task lighting to suit individual preferences and the needs of specific tasks.

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## IEQ Credit 2.3: Occupant Comfort—Thermal Comfort Monitoring

### 1 point

#### Intent

To support the appropriate operations and maintenance of buildings and building systems so that they continue to meet target building performance goals over the long term and provide a comfortable thermal environment that supports the productivity and well-being of building occupants.

#### Requirements

Have in place a system for continuous tracking and optimization of systems that regulate indoor comfort and conditions (air temperature, humidity, air speed and radiant temperature) in occupied spaces. Have a permanent monitoring system to ensure ongoing building performance to the desired comfort criteria as determined ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy (with errata but without addenda<sup>1</sup>).

The building must establish the following:

- Continuous monitoring of, at a minimum, air temperature and humidity in occupied spaces. The sampling interval cannot exceed 15 minutes.
- Periodic testing of air speed and radiant temperature in occupied spaces. Using handheld meters is permitted.
- Alarms for conditions that require system adjustment or repair. Submit a list of the sensors, zone set-points and limit values that would trigger an alarm.
- Procedures that deliver prompt adjustments or repairs in response to problems identified.

All monitoring devices must be calibrated within the manufacturer's recommended interval.

#### Potential Technologies & Strategies

Implement systematic monitoring of the actual performance of the building to the comfort criteria defined by ASHRAE Standard 55-2004 (with errata but without addenda<sup>1</sup>).

As appropriate, monitoring may include measurement and trending of temperatures, relative humidity, air speed and radiant temperatures at locations selected according to their variability and effect on occupants' comfort.

<sup>1</sup> Project teams wishing to use ASHRAE approved addenda for the purposes of this prerequisite may do so at their discretion. Addenda must be applied consistently across all LEED credits.

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## IEQ Credit 2.4: Daylight and Views

### 1 point

#### Intent

To provide building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

#### Requirements

Project teams must achieve the performance thresholds in either the daylight or views requirements below :

##### OPTION 1. Daylight

###### PATH 1. Simulation

Demonstrate through computer simulations that 50% or more of all regularly occupied spaces areas achieve daylight illuminance levels of a minimum of 25 footcandles (fc) and a maximum of 500 fc in a clear sky condition on September 21 at 9 a.m. and 3 p.m.; areas with illuminance levels below or above the range do not comply. However, designs that incorporate view-preserving automated shades for glare control may demonstrate compliance for only the minimum 25 fc illuminance level.

OR

###### PATH 2. Prescriptive

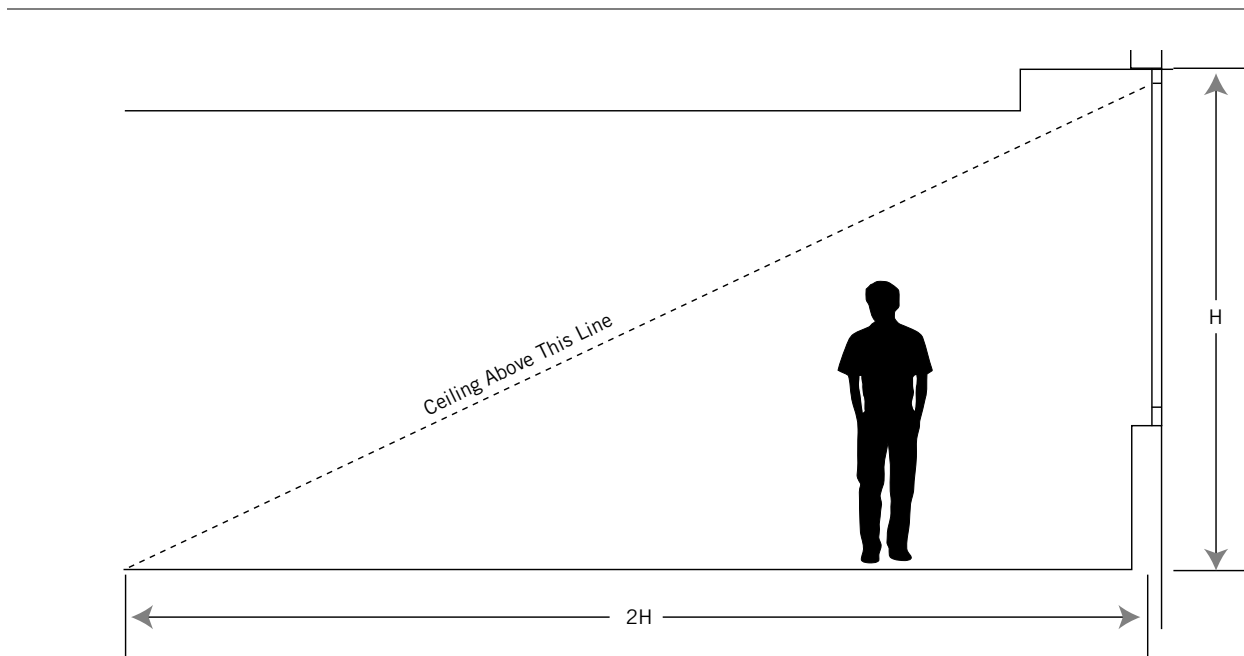
Use a combination of side-lighting and/or top-lighting to achieve a total daylighting zone (the floor area meeting the following requirements) that is at least 50% of all the regularly occupied spaces.

For the Sidelighting Daylight Zone (see diagram below):

- Achieve a value, calculated as the product of the visible light transmittance (VLT) and window-to-floor area ratio (WFR) of daylight zone, of between 0.150 and 0.180. The window area included in the calculation must be at least 30 inches above the floor.

$$0.150 < \text{VLT} \times \text{WFR} < 0.180$$

- The ceiling must not obstruct a line in section that:
  - Joins the window-head to a line on the floor that is parallel to the plane of the window ;
  - Is twice the height of the window-head above the floor in distance from the plane of the glass as measured perpendicular to the plane of the glass
- Provide sunlight redirection and/or glare control devices to ensure daylight effectiveness.



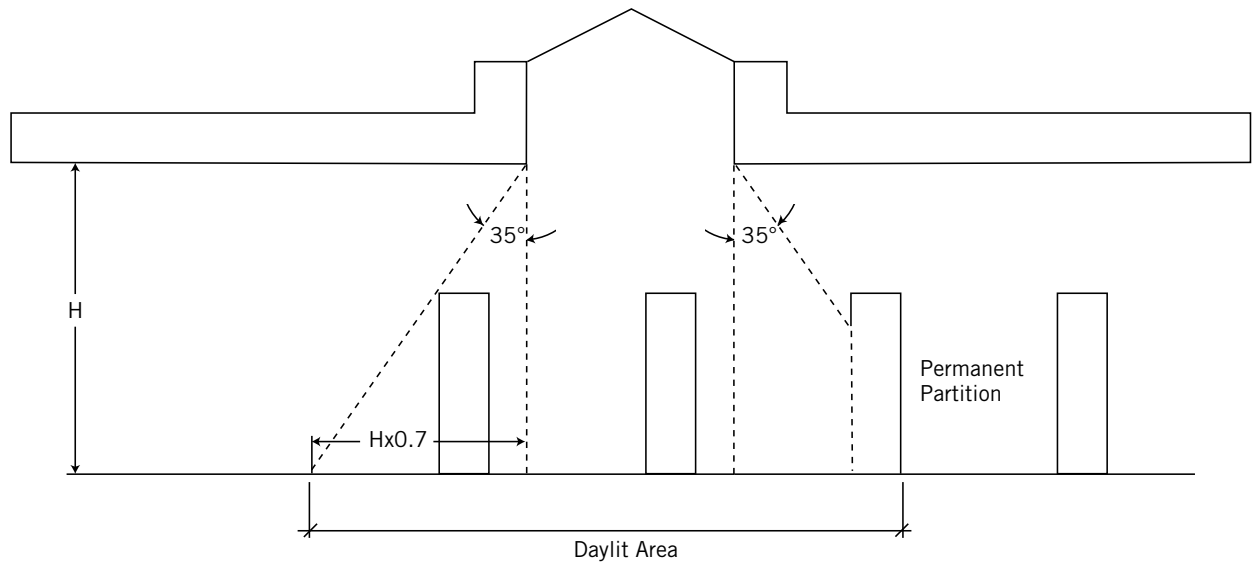
For Toplighting Daylight Zone (see diagram below):

- The daylight zone under a skylight is the outline of the opening beneath the skylight, plus in each direction the lesser of:
  - 70% of the ceiling height

OR

- 1/2 the distance to the edge of the nearest skylight, or the distance to any permanent opaque partition (if transparent show VLT) farther away than 70% of the distance between the top of the partition and the ceiling.
- Achieve skylight roof coverage between 3% and 6% of the roof area with a minimum 0.5 VLT for the skylights.
- The distance between the skylights must not be more than 1.4 times the ceiling height
- A skylight diffuser, if used, must have a measured haze value of greater than 90% when tested according to ASTM D1003. Avoid direct line of sight to the skylight diffuser.

Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.



OR

#### PATH 3. Measurement

Demonstrate through records of indoor light measurements that a minimum daylight illumination level of 25 fc has been achieved in at least 50% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

Only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements can be counted in the calculations.

For all projects pursuing this path, provide daylight redirection and/or glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by daylight will be considered on their merits.

OR

#### PATH 4. Combination

Any of the above calculation methods may be combined to document the minimum daylight illumination in at least 50% of all regularly occupied spaces. The different methods used in each space must be clearly recorded on all building plans.

In all cases, only the square footage associated with the portions of rooms or spaces meeting the requirements may be applied toward the 50% of total area calculation required to qualify for this credit.

In all cases, provide glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

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## OPTION 2. For Views

Achieve a direct line of sight to the outdoor environment via vision glazing between 30 inches and 90 inches above the finished floor for building occupants in 45% of all regularly occupied areas. Determine the area with direct line of sight by totaling the regularly occupied square footage that meets the following criteria:

- In plan view, the area is within sight lines drawn from perimeter vision glazing.
- In section view, a direct sight line can be drawn from the area to perimeter vision glazing.

The line of sight may be drawn through interior glazing. For private offices, the entire square footage of the office can be counted if 75% or more of the area has a direct line of sight to perimeter vision glazing. For multioccupant spaces, the actual square footage with a direct line of sight to perimeter vision glazing is counted.

### **Potential Technologies & Strategies**

Achieve a minimum daylight factor of 2% (excluding all direct sunlight penetration) in space occupied for visual tasks.

Design alterations or additions to maximize interior daylighting. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, exterior and interior permanent shading devices, high-performance glazing, and high ceiling reflectance values; additionally, automatic photocell-based controls can help reduce energy use. Predict daylight factors via manual calculations or model daylighting strategies with a physical or computer model to assess footcandle levels and daylight factors achieved.

Design alterations or additions to maximize daylighting and outdoor view opportunities. Strategies to consider include lower partition heights, interior shading devices, interior glazing and automatic photocell-based controls.

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## **IEQ Credit 3.1: Green Cleaning—High-Performance Cleaning Program**

### **1 point**

#### **Intent**

To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.

#### **Requirements**

Have in place during the performance period a high-performance cleaning program, supported by a green cleaning policy (IEQ Prerequisite 3: Green Cleaning Policy), that addresses the following:

- Provide an appropriate staffing plan.
- Implement a training of maintenance personnel in the hazards, use, maintenance, disposal and recycling of cleaning chemicals, dispensing equipment and packaging.
- Use chemical concentrates with appropriate dilution systems to minimize chemical use wherever possible.
- Use sustainable cleaning materials, products, equipment, janitorial paper products and trash bags (including microfiber tools and wipes).
- Use sustainable cleaning and hard floor and carpet care products meeting the sustainability criteria outlined in IEQ Credits 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials.
- Use cleaning equipment meeting the sustainability criteria outlined in IEQ Credit 3.4: Green Cleaning—Sustainable Cleaning Equipment.

#### **Potential Technologies & Strategies**

Have in place during the performance period a high-performance cleaning program, supported by policy, staffing plans, standard operating procedures and storage procedures that address sustainable and effective cleaning and hard floor maintenance.

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## **IEQ Credit 3.2: Green Cleaning—Custodial Effectiveness Assessment**

**1 point**

### **Intent**

To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment, by implementing, managing and auditing cleaning procedures and processes.

### **Requirements**

Conduct an audit in accordance with APPA Leadership in Educational Facilities' (APPA) "Custodial Staffing Guidelines" to determine the appearance level of the facility.

- The facility must score 3 or less.

More information about the audit procedures is provided in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

### **Potential Technologies & Strategies**

Designate an individual or team to conduct a walk-through inspection of a sample of rooms in the building to evaluate the effectiveness of the cleaning program. Identify areas that fall below the owner's expected standard and make improvements to the cleaning program accordingly.

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## IEQ Credit 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials

### 1 point

#### Intent

To reduce the environmental impacts of cleaning products, disposable janitorial paper products and trash bags.

#### Requirements

Implement sustainable purchasing for cleaning materials and products, disposable janitorial paper products and trash bags. Cleaning product and material purchases include items used by in-house staff or outsourced service providers. One point is awarded if 30% of the total annual purchases of these products (by cost) meet at least 1 of the following sustainability criteria:

- The cleaning products meet 1 or more of the following standards for the appropriate category:
  - Green Seal GS-37, for general-purpose, bathroom, glass and carpet cleaners used for industrial and institutional purposes.
  - Environmental Choice CCD-110, for cleaning and degreasing compounds.
  - Environmental Choice CCD-146, for hard surface cleaners.
  - Environmental Choice CCD-148, for carpet and upholstery care.
- Disinfectants, metal polish, floor finishes, strippers or other products not addressed by the above standards meet 1 or more of the following standards for the appropriate category:
  - Green Seal GS-40, for industrial and institutional floor care products.
  - Environmental Choice CCD-112, for digestion additives for cleaning and odor control.
  - Environmental Choice CCD-113, for drain or grease traps additives.
  - Environmental Choice CCD-115, for odor control additives.
  - Environmental Choice CCD-147, for hard floor care.
  - California Code of Regulations maximum allowable VOC levels for the specific product category.
- Disposable janitorial paper products and trash bags meet the minimum requirements of 1 or more of the following programs for the applicable product category:
  - Environmental Protection Agency (EPA) Comprehensive Procurement Guidelines for Janitorial Paper and Plastic Trash Can Liners.
  - Green Seal GS-09, for paper towels and napkins.
  - Green Seal GS-01, for tissue paper.
  - Environmental Choice CCD-082, for toilet tissue.
  - Environmental Choice CCD-086, for hand towels.

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- Janitorial paper products derived from rapidly renewable resources or made from tree-free fibers.
  - Hand soaps meet 1 or more of the following standards:
    - No antimicrobial agents (other than as a preservative) except where required by health codes and other regulations (e.g., food service and health care requirements).
    - Green Seal GS-41, for industrial and institutional hand cleaners.
    - Environmental Choice CCD-104, for hand cleaners and hand soaps.

The materials and products described above must be purchased during the performance period to count toward the credit.

### **Potential Technologies & Strategies**

When purchasing materials or supplies, specify that they meet 1 or more of the sustainability criteria.

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## IEQ Credit 3.4: Green Cleaning—Sustainable Cleaning Equipment

### 1 point

#### Intent

To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants that adversely affect air quality, human health, building finishes, building systems and the environment, from powered cleaning equipment.

#### Requirement

Implement a program for the use of janitorial equipment that reduces building contaminants and minimizes environmental impact. The cleaning equipment program must require the following:

- Vacuum cleaners are certified by the Carpet and Rug Institute “Green Label” Testing Program for vacuum cleaners and operate with a sound level of less than 70dBA.
- Carpet extraction equipment used for restorative deep cleaning is certified by the Carpet and Rug Institute’s “Seal of Approval” Testing Program for deep-cleaning extractors.
- Powered floor maintenance equipment, including electric and battery-powered floor buffers and burnishers, is equipped with vacuums, guards and/or other devices for capturing fine particulates and operates with a sound level of less than 70dBA.
- Propane-powered floor equipment has high-efficiency, low-emissions engines with catalytic converters and mufflers that meet the California Air Resources Board (CARB) or Environmental Protection Agency (EPA) standards for the specific engine size and operate with a sound level of less than 90dBA.
- Automated scrubbing machines are equipped with variable-speed feed pumps and on-board chemical metering to optimize the use of cleaning fluids. Alternatively, the scrubbing machines use only tap water with no added cleaning products.
- Battery-powered equipment is equipped with environmentally preferable gel batteries.
- Powered equipment is ergonomically designed to minimize vibration, noise and user fatigue.
- Equipment is designed with safeguards, such as rollers or rubber bumpers, to reduce potential damage to building surfaces.

Keep a log for all powered cleaning equipment to document the date of equipment purchase and all repair and maintenance activities and include vendor specification sheets for each type of equipment in use.

#### Potential Technologies & Strategies

Develop, implement and maintain a policy for the use of low-impact powered cleaning equipment. Evaluate the powered cleaning equipment currently being used and make a plan for upgrading to powered cleaning equipment that reduces building contaminants and minimizes environmental impact.

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## **IEQ Credit 3.5: Green Cleaning—Indoor Chemical and Pollutant Source Control**

### **1 point**

#### **Intent**

To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, that adversely affect air quality, human health, building finishes, building systems and the environment.

#### **Requirements**

Employ permanent entryway systems (grilles, grates, mats) at least 10 feet long in the primary direction of travel to capture dirt and particulates entering the building at all public entry points, and develop the associated cleaning strategies to maintain those entryway systems as well as exterior walkways. Public entryways that are not in use or serve only as emergency exits are excluded from the requirements, as are private offices.

Provide containment drains plumbed for appropriate disposal of hazardous liquid wastes in places where water and chemical concentrate mixing occurs for laboratory purposes.

#### **Potential Technologies & Strategies**

Use grills, grates or mats to catch and hold dirt particles and prevent contamination of the building interior. Design exterior stone, brick or concrete surfaces to drain away from regularly used building entrances.

At public building entrances, install low-maintenance vegetation within the landscape design and avoid plants, including trees and shrubs that produce fruit, flowers or leaves that are likely to be tracked into the building. Select plants based on an integrated pest management (IPM) approach to eliminate pesticide applications that could be tracked into the building.

Provide a water spigot and electrical outlet at each public building entrance for maintenance and cleaning.

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## IEQ Credit 3.6: Green Cleaning—Indoor Integrated Pest Management

### 1 point

#### Intent

To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants that adversely affect air quality, human health, building finishes, building systems and the environment.

#### Requirement

Develop, implement and maintain an indoor integrated pest management (IPM) plan, defined as managing indoor pests in a way that protects human health and the surrounding environment and that improves economic returns through the most effective, least-risk option. IPM calls for using least-toxic chemical pesticides, minimum use of chemicals, use only in targeted locations and use only for targeted species. IPM requires routine inspection and monitoring. The plan must include the following elements, integrated with any outdoor IPM plan used for the site as appropriate:

- Integrated methods, site or pest inspections, pest population monitoring, evaluation of the need for pest control and 1 or more pest control methods, including sanitation, structural repairs, mechanical and living biological controls, other nonchemical methods, and if nontoxic options are unreasonable and have been exhausted, a least-toxic pesticide.
- Specification of the circumstances under which an emergency application of pesticides in a building or on surrounding grounds being maintained by building management can be conducted without complying with the earlier provisions.
- A communications strategy directed to building occupants that addresses universal notification, which requires advance notice of not less than 72 hours before a pesticide under normal conditions and 24 hours after application of a pesticide in emergencies, other than a least-toxic pesticide, is applied in a building or on surrounding grounds that the building management maintains.

Any cleaning products included in the integrated pest management policy must meet the requirements for IEQ Credit 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials.

#### Potential Technologies & Strategies

Use IPM, a safer and usually less costly option for effective pest management. An IPM program employs commonsense strategies to reduce sources of food, water and shelter for pests in buildings and on the grounds and minimizes the use of pesticides.



# INNOVATION IN OPERATIONS

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## **IO Credit 1: Innovation in Operations**

### **1–4 points**

#### **Intent**

To provide building operations, maintenance and upgrade teams with the opportunity to achieve additional environmental benefits achieved beyond those already addressed by the LEED 2009 for Existing Buildings: Operations & Maintenance Rating System.

#### **Requirements**

Credit can be achieved through any combination of the Innovation in Operations and Exemplary Performance paths as described below:

#### **PATH 1. Innovation in Operations (1-4 points)**

Achieve significant, measurable environmental performance using an operations, maintenance or system upgrade strategy not addressed in the LEED 2009 for Existing Buildings: Operations & Maintenance Rating System.

One point is awarded for each innovation achieved. No more than 4 points under IDc1 may be earned through PATH 1—Innovation in Operations.

Identify following in writing:

- The intent of the proposed innovation credit
- The additional environmental benefits delivered
- The proposed requirements for compliance
- The proposed performance metrics to demonstrate compliance and the approaches (strategies) used to meet the requirements
- The proposed requirements met during the performance period

#### **PATH 2. Exemplary Performance (1-3 points)**

Achieve exemplary performance in an existing LEED 2009 for Existing Buildings: Operations & Maintenance prerequisite or credit that allows exemplary performance as specified in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition. An exemplary performance point may be earned for achieving double the credit requirements and/or achieving the next incremental percentage threshold of an existing credit in LEED.

One point is awarded for each exemplary performance achieved. No more than 3 points under IDc1 may be earned through PATH 2— Exemplary Performance.

#### **Potential Technologies & Strategies**

Implement and maintain during the performance period actions that provide added environmental benefits. These can be either actions that substantially exceed an existing LEED 2009 for Existing Buildings: Operations & Maintenance performance credit requirement or actions not addressed in LEED 2009 for Existing Buildings: Operations & Maintenance that provide substantial added environmental benefits.

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## **IO Credit 2: LEED® Accredited Professional**

**1 point**

### **Intent**

To support and encourage the operations, maintenance, upgrade and project team integration required by LEED to streamline the application and certification process.

### **Requirements**

At least 1 principal participant of the project team shall be a LEED Accredited Professional (AP).

### **Potential Technologies & Strategies**

Engage a LEED AP within the organization.

Have someone in your organization study the LEED 2009 for Existing Buildings: Operations & Maintenance Rating System and LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition and successfully complete the LEED Professional Accreditation exam.

Hire a LEED AP to support the project. Consider selecting a LEED AP experienced with sustainable best practices in the operations and maintenance of existing buildings.

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## **IO Credit 3: Documenting Sustainable Building Cost Impacts**

**1 point**

### **Intent**

To document sustainable building cost impacts.

### **Requirements**

Document overall building operating costs for the previous 5 years (or length of building occupancy, whichever is shorter) and track changes in overall building operating costs during the performance period. Document building operating costs and financial impacts of all aspects of LEED 2009 for Existing Buildings: Operations & Maintenance implementation on an ongoing basis.

Follow the detailed instructions in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

### **Potential Technologies & Strategies**

Track building operating costs to identify any positive impacts related to the sustainable performance improvements to the building and its operations.



# REGIONAL PRIORITY

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## **RP Credit 1: Regional Priority**

### **1–4 Points**

#### **Intent**

To provide an incentive for the achievement of credits that address geographically specific environmental priorities.

#### **Requirements**

Earn 1 of the 6 Regional Priority Credits (credits identified by the USGBC Regional Councils and Chapters as having additional regional environmental importance). A database of Regional Priority Credits and their geographic applicability is available on the USGBC Web site, [www.usgbc.org](http://www.usgbc.org).

One point is awarded for each Regional Priority credit achieved. No more than 4 credits identified as Regional Priority credits may be earned. Projects outside of the U.S. are not eligible for Regional Priority credits.

#### **Potential Technologies & Strategies**

Determine and pursue the prioritized credits for the project's location.

