

# GREEN BUILDING OPERATIONS AND MAINTENANCE

WITH ALTERNATIVE COMPLIANCE PATHS FOR  
INDIA

LEED Reference Guide for Green Building Operations and Maintenance  
For the Operations and Maintenance of Commercial and  
Institutional Buildings  
2009 Edition





# 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 13,000 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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## LEED 2009 FOR EXISTING BUILDINGS: OPERATIONS & MAINTENANCE

100 base points; 6 possible innovation in Design and 4 Regional Priority points

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

\*Credit not applicable to all Rating systems, please refer to the credit for more details.

# INTRODUCTION

## I. WHY MAKE YOUR BUILDING GREEN?

The environmental impacts of the building design, construction, and operations industry are enormous. The consumption of electricity by buildings in India has increased at a rate of about 13.2% over the last decade as population continues to grow.<sup>1</sup> According to India's Bureau of Energy Efficiency (BEE), by 2021 India's urban population is estimated to increase to 473 million, compared to 285 million in 2001.<sup>2</sup> This population shift will contribute to an increasing trend to consume more natural resources and goods per capita. Additionally, rising incomes in India have contributed to a widening gap between supply and demand for resources like water and energy.<sup>3</sup>

Green building practices can substantially reduce or eliminate negative environmental impacts through high performance, market leading design, construction, and operations practices. In preparation for pursuing LEED 2009 Green Building Operations and Maintenance certification, building owners and operators in India should consider policy and regulatory actions in advance of registration for certification. Knowledge of these can better prepare the project team to pursue LEED certification and decrease technical challenges associated with the certification process.

The Companies Act (2013) encourages corporate social responsibility and environmentally responsible investment. Companies that implement corporate social responsibility initiatives, including those related to environmental sustainability will be better positioned to pursue LEED 2009 for Existing Buildings: Operations and Maintenance certification.

Project teams in India should also familiarize themselves with codes related to the building industry such as the National Building Code of India 2005 (NBC 2005) and important bureaus and agencies such as the Central Pollution Control Board, Ministry of Environment & Forests (MoEF), The Ministry of New and Renewable Energy and the Bureau of Energy Efficiency (BEE.) Knowledge of the regulatory framework in India will provide a solid foundation for pursuing LEED 2009 Operations and Maintenance certification. See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional information related to this section of the Introduction.

## II. LEED® GREEN BUILDING RATING SYSTEM

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## III. OVERVIEW AND PROCESS

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance related to the Overview and Process section.

1. Hamburg Institute of International Economics. "India Urban Building Sector: CDM Potential through Energy Efficiency in Electricity Consumption." <http://www.econstor.eu/bitstream/10419/19261/1/289.pdf> (Accessed March 2014.)
2. Business Wire India. "BEE Launches Endorsement Labels for Notebooks, Laptops." <http://businesswireindia.com/news/news-details/bee-launches-endorsement-labels-notebooks-laptops/26359> (Accessed March 2014.)
3. GRIHA. "GRIHA for Large Developments." <http://www.grihaindia.org/>. (Accessed March 2014.)

### **When to Use LEED 2009 Alternative Compliance Paths**

Alternative compliance paths (ACPs) to LEED credits provide additional options or approaches that address unique circumstances and accommodate advancements in science and technology. ACPs allow LEED to be more flexible and applicable to a wider range of projects. Global ACPs and Regional ACPs for India are integrated into this guidance document. The LEED 2009 EB: O&M ACPs for India were developed for sustainable ongoing operations of existing commercial and institutional buildings specifically for projects in India. Global ACPs apply to all projects regardless of location, although some are available only for projects outside the U.S., as indicated in the credit language. ACPs can be applied at the discretion of the project team, based on applicability; they are not mandatory for any project. Projects may choose to use none, some or all of the LEED 2009 Global ACPs or Regional ACPs for India and do not need to apply them consistently across credits unless noted in the credit language. Each credit category's Overview section includes a table identifying which credits have either a Global ACP or an India ACP.

For specific guidance on which rating system to use, see the LEED 2009 Green Building Operations and Maintenance Reference Guide.

## **IV. CERTIFICATION STRATEGY**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **V. INITIAL CERTIFICATION VS. RECERTIFICATION**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **VI. PERFORMANCE PERIOD**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **VII. LEED ONLINE DOCUMENTATION REQUIREMENTS**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **VIII. MULTITENANT BUILDINGS**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **IX. FACILITY ALTERATIONS AND ADDITIONS**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.



## **X. EXEMPLARY PERFORMANCE STRATEGIES**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **XI. REGIONAL PRIORITY CREDITS**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **XII. POLICY MODEL**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **XIII. TOOLS FOR REGISTERED PROJECTS**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for this section of the Introduction.

## **XIV. HOW TO USE THIS REFERENCE GUIDE**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance.

The LEED 2009 EB: O&M Alternative Compliance Path for India Reference Guide Supplement is a supporting document to the LEED Global ACPs and India ACPs. This guide helps project teams understand the criteria, the reasons behind them, strategies for implementation, and documentation requirements. It includes examples of strategies that can be used in each category and additional resources. It does not provide an exhaustive list of strategies for meeting the criteria or all the information that a project team needs to determine the applicability of a credit to the project.

The LEED 2009 EB: O&M Alternative Compliance Path for India Reference Guide Supplement should be consulted in conjunction with the LEED 2009 Green Building Operations and Maintenance Reference Guide. Information in the reference guide is not repeated in this supplement, which focuses instead on the following:

- Information specific to considerations for projects outside the U.S.
- Information specific to considerations for projects in India.
- New information for existing credits with new Alternative Compliance Paths

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.



### OVERVIEW

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance.

Building operators outside the U.S. face many of the same challenges as their American counterparts. However, some of the Sustainable Sites credits in LEED focused on U.S. solutions to these challenges. The Global Alternative Compliance Paths for certain Sustainable Sites credits allow project teams to use solutions that may be more applicable abroad. The ACPs for India in the Sustainable Sites credit category address regional priorities for India such as stormwater control and light pollution reduction.

#### Global ACPs




A new option for SS Credit 4 (Alternative Commuting Transportation) allows project teams to include additional vehicle types when calculating alternative transportation use for building occupants. The new option for SS Credit 6 (Stormwater Quantity Control) allows project teams to calculate stormwater runoff reduction using a method that may be more appropriate in areas where it is difficult to calculate the 1- and 2-year 24-hour design storm.

#### India ACPs

SS Credit 6 (Stormwater Quantity Control) is expanded to include appropriate sources for rainfall data specific to India and resources for stormwater management.

SS Credit 8 (Light Pollution Reduction) clarifies that projects achieving certification under LEED 2011 for India CS or LEED 2011 for India NC and that and earn SSc8: Light Pollution Reduction can earn points under Option 1 in LEED 2009 for Existing Buildings: Operations & Maintenance.

 **Table 1.** SS Credits with Alternative Compliance Paths

Credit	Title	ACP
<b>SS Credit 1</b>	LEED Certified Design and Construction	
<b>SS Credit 2</b>	Building Exterior and Hardscape Management Plan	
<b>SS Credit 3</b>	Integrated Pest Management, Erosion Control, and Landscape Management Plan	
<b>SS Credit 4</b>	Alternative Commuting Transportation	
<b>SS Credit 5</b>	Site Development—Protect or Restore Open Habitat	
<b>SS Credit 6</b>	Stormwater Quantity Control	
<b>SS Credit 7.1</b>	Heat Island Reduction—Nonroof	
<b>SS Credit 7.2</b>	Heat Island Reduction—Roof	
<b>SS Credit 8</b>	Light Pollution Reduction	

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## ALTERNATIVE COMMUTING TRANSPORTATION

## SS CREDIT 4

EB: O&M	
Credit	SS Credit 4
Points	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; rideshare options<sup>1</sup> human-powered conveyances; carpools; vanpools; and low-emitting, fuel-efficient<sup>2</sup> or alternative-fuel vehicles; walking or bicycling.

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

- Rideshare is a transit service that involves sharing a single vehicle with multiple people, excluding large-scale vehicles such as buses and trains. The rideshare transit facility must include a signed stop and a clearly defined waiting area. Additionally, the rideshare must include an enclosed passenger seating area, fixed route service, fixed fare structure, continuous daily operation, and the ability to pick up and drop off multiple riders.
- 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.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this credit.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example of an office that uses a compressed workweek to reduce its commuting transportation impact.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this prerequisite/credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

**Rideshare** is a transit service that involves sharing a single vehicle with multiple people, excluding large-scale vehicles such as buses and trains. The rideshare transit facility must include a signed stop and a clearly defined waiting area. Additionally, the rideshare must include an enclosed passenger seating area, fixed route service, fixed fare structure, continuous daily operation, and the ability to pick up and drop off multiple riders. Rideshare vehicles must hold 4 or more passengers, except for human-powered conveyances, which must hold 2 or more passengers.

## STORMWATER QUANTITY CONTROL

## SS CREDIT 6

EB: O&M	
Credit	SS Credit 6
Points	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

#### OPTION 1

During the performance period, implement a stormwater management plan that infiltrates, collects and reuses runoff or evapotranspires 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.

OR

#### OPTION 2

Use Low Impact Development (LID)<sup>1</sup> practices to capture and treat water from 25% of the impervious surfaces for the 95th percentile of regional or local rainfall events.

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.

<sup>1</sup> Low impact development (LID) is an approach to managing stormwater runoff that emphasizes on-site natural features to protect water quality by replicating the natural land cover hydrologic regime of watersheds and addressing runoff close to its source. Examples include better site design principles such as minimizing land disturbance, preserving vegetation, minimizing impervious cover, and design practices like rain gardens, vegetated swales and buffers, permeable pavement, rainwater harvesting, and soil amendments. These are engineered practices that may require specialized design assistance.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## 1. Benefits and Issues to Consider

Stormwater is a major source of pollution for all types of water bodies in India. Impervious surfaces, such as roads and parking lots produce stormwater runoff that contains sediment and other contaminants, including atmospheric deposition, pesticides, fertilizers, vehicle fuel leaks and mechanical equipment waste. Increased stormwater runoff can overload pipes and sewers and damage water quality, affecting navigation and recreation. Furthermore, municipal systems that convey and treat runoff require significant infrastructure and maintenance are frequently lacking in India. Effective on site management practices will prevent water logging and serious flooding during monsoons and storm events in India.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

### Stormwater Management for Federal Facilities under Section 438 of the Energy Independence and Security Act (USA)

<http://www.epa.gov/owow/NPS/lid/section438/>

Stormwater runoff in urban areas is one of the leading sources of water pollution. Section 438 of the U.S. Energy Independence and Security Act sets guidelines for restoring project sites to their predevelopment hydrology. U.S. EPA's technical guidance for Section 438 provides background information, definitions, and case studies. See the website for additional information and resources.

## 4. Implementation

If Option 1 is selected, see the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance.

### OPTION 2

Projects should obtain local rainfall data for at least the past 5 years, if available. This information may be obtained from various sources:

- Aquastat
- Indian Meteorological Department
- local airports
- universities
- water treatment plants
- other facilities whose monitoring stations record time and total precipitation depth during each time interval

With the rainfall data, calculate the 95th percentile of regional or local storm events using the methodology in Section E of the Technical Guidance on Implementing Stormwater Runoff Requirements from the referenced standard. Determine the volume of rainwater runoff for the project site. Based on the developed project site conditions, identify areas with potential to produce runoff (areas where rainwater will not infiltrate completely into the ground). For these developed site conditions, manage the runoff by using Low-Impact Development (LID) strategies.



If rainfall data are not available for the project's region, natural land cover maps may be used. Determine the natural land cover conditions of the project site and use these conditions to assign runoff curve numbers. Calculate the volume of rainfall using the method described in the LEED 2009 Green Building Operations and Maintenance Reference Guide.

Design the site to retain and treat rainwater from 25% of the impervious surfaces during a 95th percentile storm event. Size the treatment facilities to hold this much water and to be LID. Consult U.S. EPA for a list of potential LIDs. Consider the following:

- A project site can use one or multiple facilities
- Locate facilities strategically to best mimic natural site hydrology (direction of flow, etc.)
- Facilities may have different infiltration rates and storage capacity.
- The contaminant removal potential of the facilities

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

Instructions for calculating percentile storm events can be found in Section E of the Technical Guidance on Implementing Stormwater Runoff Requirements from the referenced standard. .

Calculate the runoff volume based on the project's developed conditions; refer to the LEED 2009 Green Building Operations and Maintenance Reference Guide. Size the LID facility based on the projected volume of runoff water for the percentile storm event. All calculated runoff from the percentile storm events must be managed.

Alternatively, if using natural land cover condition maps, refer to the LEED 2009 Green Building Operations and Maintenance Reference Guide and manage the runoff for the developed site conditions.

## 7. Documentation Guidance

As a first step in preparing to complete the LEED Online documentation requirements, work through the following measures. Refer to LEED Online for the complete descriptions of all required documentation.

- Gather rainfall event data over at least 5 years and document the source of that information.
- Show the calculations for the 85th or 95th percentile and for volume of runoff based on the developed site area.
- Describe the proposed stormwater management practices used on site, explain what qualifies them as LID or green infrastructure, and show how the design replicates natural site hydrology.

## 8. Examples

See the Technical Guidance on Implementing Stormwater Runoff Requirements from the referenced standard for examples of how to implement LID and green infrastructure practices to manage runoff for the percentile storm event.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

SS

EB: O&M

Credit 6

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

Websites

### Aquastat

<http://www.fao.org/nr/water/aquastat/main/index.stm>

This international resource for precipitation data is maintained by the Food and Agriculture Organization of the United Nations.

### Indian Metrological Department

<http://www.imd.gov.in/>

The Indian Metrological Department provides statistics and data related to water resources management including rainfall information.

### Central Pollution Control Board

<http://cpcb.nic.in/>

Project teams in India can reference the Central Pollution Control Board and the Pollution Control Acts for additional information related to Stormwater Management in India.

### U.S. EPA, Low-Impact Development, Stormwater Management, Section 438

<http://www.epa.gov/owow/NPS/lid/section438/>

This website provides valuable information, including technical guidance and fact sheets, on low-impact development strategies that can be used to mitigate stormwater runoff.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this credit.

## 12. Definitions

**Low-Impact Development (LID)** is an approach to managing stormwater runoff that emphasizes onsite natural features to protect water quality by replicating the natural land cover hydrologic regime of watersheds and addressing runoff close to its source. Examples include better site design principles, such as minimizing land disturbance, preserving vegetation, and minimizing impervious cover, and design practices like rain gardens, vegetated swales and buffers, permeable pavement, rainwater harvesting, and soil amendments. These engineered practices may require specialized design assistance.

## LIGHT POLLUTION REDUCTION

## SS CREDIT 8

EB: O&M	
Credit	SS Credit 8
Points	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.

#### FOR 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.

#### FOR 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.

<sup>1</sup> The requirement to use ASHRAE Addenda is unique to this credit and does not obligate Project teams to use ASHRAE approved addenda for other credits.

<sup>2</sup> To be LZ4, the area must be so designated by an organizations with local jurisdiction, such as the local zoning authority.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## SS CREDIT 8

OR

### OPTION 3

Measure the night illumination levels at regularly spaced points around the perimeter of the property, taking the 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 (30 meters), 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.

## 1. Benefits and Issues to Consider

### Economic Issues

The benefits realized through achieving this credit under LEED 2009 Building Design and Construction certification can be recognized in LEED 2009 for Existing Buildings: Operations & Maintenance certification. This efficiency can reduce infrastructure costs and energy use when compared with common-practice solutions. Energy and maintenance savings over the lifetime of the project can be substantial.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

There are no standards referenced for this credit.

## 4. Implementation

### Exterior and Site Lighting

#### OPTION 1.

Existing LEED projects that earned points for SS8 Light Pollution Reduction under LEED 2011 India for New Construction certification can achieve this credit by verifying that associated exterior lighting strategies are still in place.

Projects certified under LEED 2011 India for Core & Shell Development with 75% of the floor area and are also LEED for Commercial Interiors certified can achieve this credit by showing that SS Credit 8: Light Pollution Reduction was earned for both systems.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

There are no additional calculations associated with this credit. See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

There are no examples for this credit.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations Section of the LEED 2009 rating system.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## 10. Regional Variations

There are no regional variations associated with this credit.

## 11. Resources

Websites

### India National Lighting Code

<https://ia601007.us.archive.org/9/items/gov.in.is.sp.72.2010/is.sp.72.2010.pdf>

This code includes guidance on good engineering practices to follow for the design, selection, installation and maintenance of lighting systems for indoor and outdoor areas and guidelines for energy management and energy conservation in lighting installations.

### Energy Conservation Building Code (ECBC)

<http://www.eco3.org/ecbc/>

This Indian code includes lighting efficiency requirements that can be used as guidance for efficient lighting design strategies that might help to implement this credit.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms identified in this credit.

# WATER EFFICIENCY

## WE OVERVIEW

### OVERVIEW

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance.



Clean water is a precious resource that is in constant demand. As human development spreads and the world's population continues to increase, it is imperative that water resources be preserved. Building managers outside the U.S. may encounter seasonal and technological differences when trying to manage the water use of an existing building. The ACPs in the WE credit category address technological and seasonal differences from a global perspective and consider regional specificities for projects in India.

#### Global ACPs

The language in WE Credit 3 (Water-Efficient Landscaping) has been revised to accommodate projects in locations where the month with the highest irrigation demand may not be in summer. Project teams can now more accurately determine a baseline for irrigation water usage.

Because evaporative condensers are more common than cooling towers in some areas outside the U.S., WE Credits 4.1 and 4.2 (Cooling Tower Water Management) have been revised to allow project teams whose buildings are equipped with evaporative condensers to take credit for their water management strategies.

 **Table 1.** WE Credits with Alternative Compliance Paths

Credit	Title	ACP
<b>WE Prerequisite 1</b>	Minimum Indoor Plumbing Fixture and Fitting Efficiency	
<b>WE Credit 1</b>	Water Performance Measurement	
<b>WE Credit 2</b>	Additional Indoor Plumbing Fixture and Fitting Efficiency	
<b>WE Credit 3</b>	Water Efficient Landscaping	
<b>WE Credit 4.1-4.2</b>	Cooling Tower Water Management	

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.





## WATER EFFICIENT LANDSCAPING

## WE CREDIT 3

EB: O&M	
Credit	WE Credit 3
Points	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 baseline irrigation water use by determining the water use that would result from using an irrigation system typical for the region using the mid-summer baseline case or the month with the highest irrigation demand 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.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## WE CREDIT 3

OR

### OPTION 2

Calculate the estimated irrigation water use using the mid-summer baseline case or the month with the highest irrigation demand 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, provincial, state, territorial or national sources, use such tools to demonstrate reductions in potable water or other natural surface or subsurface resource for irrigation purposes.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

There are no standards referenced for this credit.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit. The following should replace the first bullet under Standard Assumptions and Variables:

- All calculations are based on irrigation during the month with the highest irrigation demand. The evapotranspiration rate (ET<sub>o</sub>) for the month with the greatest irrigation demand should be determined by the project's landscape designer based on local climate data; project teams may also refer to the International Water Management Institute (<http://www.iwmi.cgiar.org/WAtlas/Default.aspx>) or the EPA Water Budget Data Finder in determining the peak watering month with the greatest irrigation demand ([http://www.epa.gov/WaterSense/new\\_homes/wb\\_data\\_finder.html](http://www.epa.gov/WaterSense/new_homes/wb_data_finder.html)).

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for examples detailing landscape irrigation reduction strategies.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

Much of the world is faced with increasing demands on existing water supplies, making it important to landscape sites appropriately for the climate. Landscaping should fit the site's climate and microclimate, sun exposure, soil type, drainage, and topography.

In hot, dry climates, emphasize drought-tolerant plants and xeriscape designs. Reducing or eliminating turf grass will lessen the demand on potable water; rocks and stone can be

WE

EB: O&M

Credit 3

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

WE	
EB: O&M	Credit 3

incorporated into the landscape instead. If turf grass is desired, select a species that can endure drought.

In hot, humid, and temperate climates, use native plants combined with rain or moisture sensors to avoid unnecessary watering in the wet seasons. The use of captured rainwater can help eliminate the use of potable water for irrigation.

In cold climates, install hardy, native hardy plants that will survive the winter months. Rain or moisture sensors will help prevent excessive watering.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

### Websites

#### **EPA Water Budget Data Finder**

[http://www.epa.gov/WaterSense/new\\_homes/wb\\_data\\_finder.html](http://www.epa.gov/WaterSense/new_homes/wb_data_finder.html)

U.S. EPA provides guidance in determining the peak watering month with the greatest irrigation demand.

#### **International Water Management Institute**

<http://www.iwmi.cgiar.org/WAtlas/Default.aspx>

This organization provides monthly evapotranspiration and rainfall data worldwide.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this credit.

## 12. Definitions

Month with the highest irrigation demand is the maximum monthly delta between evapotranspiration rate (ET<sub>o</sub>) and mean monthly rainfall.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of other terms used in this credit.

## COOLING TOWER WATER MANAGEMENT

## WE CREDIT 4.1-4.2

EB: O&M	
Credit	WE Credit 4.1-4.2
Points	1-2 points

### Intent

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

### Requirements

#### WE Credit 4.1 (1 point): Chemical Management

Develop and implement a water management plan for the cooling tower or evaporative condenser 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.

#### AND/OR

#### WE Credit 4.2 (1 point): Nonpotable Water Source Use

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.

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

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

WE	
EB: O&M	Credit 4.1-4.2

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

There are no standards referenced for this credit.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

There are no calculations required for this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

There are no examples for this credit.

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance on exemplary performance for this credit.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

# ENERGY AND ATMOSPHERE

## EA OVERVIEW

### Overview

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance.

Buildings are a major consumer of energy and electricity across the globe and lowering energy consumption in buildings is a significant goal of LEED. In particular, cities and urban areas in India are challenged by energy shortages, and many residents in both urban and rural locales lack access to reliable electric power. <sup>1</sup>As a result, there is a growing importance for energy-efficient design and management practices in India to curb this shortage and a need to incentivize the use of renewable energy. The ACPs in the EA credit category allow for the use of local equivalents and International Organization for Standards (ISO) reporting guidelines to make energy reduction an attainable goal for projects in India.

#### Global ACPs

Energy consumption rates in buildings vary greatly in areas outside the U.S., some project teams may find that a local benchmarking tool is more appropriate than CBECS as a baseline for determining building energy performance under EA Prerequisite 2 (Minimum Energy Efficiency Performance) and EA Credit 1 (Optimize Energy Efficiency Performance).





Additionally, project teams outside the U.S. may use strategies that meet International Organization for Standards (ISO) reporting guidelines for EA Credit 6 (Emissions Reduction Reporting). Teams can now report emissions through any program that uses ISO protocols.

#### India ACPs



In EA Prerequisite 1 (Energy Efficiency Best Management Practices—Planning, Documentation and Opportunity Assessment) and EA Credit 2.1 (Existing Building Commissioning—Investigation and Analysis) appropriate resources are referenced to locate energy auditors in India.

EA Credit 4 (On-site and Off-site Renewable Energy) is expanded to define acceptable Green-e equivalent electricity programs in India.

 **Table 1.** EA Credits with Alternative Compliance Paths

Credit	Title	ACP
<b>EA Prerequisite 1</b>	Energy Efficiency Best Management Practices—Planning, Documentation, and Opportunity Assessment	
<b>EA Prerequisite 2</b>	Minimum Energy Efficiency Performance	
<b>EA Prerequisite 3</b>	Fundamental Refrigerant Management	
<b>EA Credit 1</b>	Optimize Energy Efficiency Performance	
<b>EA Credit 2.1</b>	Existing Building Commissioning—Investigation and Analysis	
<b>EA Credit 2.2</b>	Existing Building Commissioning—Implementation	
<b>EA Credit 2.3</b>	Existing Building Commissioning—Ongoing Commissioning	
<b>EA Credit 3.1</b>	Performance Measurement—Building Automation System	

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

<b>EA Credit 3.2</b>	Performance Measurement—System-Level Metering	
<b>EA Credit 4</b>	On-site and Off-site Renewable Energy	
<b>EA Credit 5</b>	Enhanced Refrigerant Management	
<b>EA Credit 6</b>	Emissions Reduction Reporting	



## ENERGY EFFICIENCY BEST MANAGEMENT PRACTICES - PLANNING, DOCUMENTATION AND OPPORTUNITY ASSESSMENT

### EA PREREQUISITE 1

EB: O&M	
Prerequisite	EA Prerequisite 1
Points	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.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this prerequisite.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this prerequisite.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this prerequisite.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this prerequisite.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this prerequisite.

The project team should choose a qualified auditor or energy engineer to complete an ASHRAE level I Walk-Through Analysis. Projects in India are not required to use the Bureau of Energy Efficiency (BEE) certified Energy Auditors, but BEE's website provides a directory to locate energy auditors in India, which can be helpful for project teams. An energy audit that meets the guidelines of an ASHRAE Level I Walk-Through Analysis (preferably conducted during the performance period) is still required of this prerequisite.

## 6. Calculations

There are no additional calculations associated with this credit. See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this prerequisite.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this prerequisite.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example detailing an ASHRAE level I Walk-through analysis for this prerequisite.

## 9. Exemplary Performance

This prerequisite is not eligible for exemplary performance under the Innovation in Operations Section of the LEED 2009 rating system.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this prerequisite.

## 11. Resources

### Websites

#### **Bureau of Energy Efficiency (BEE): Energy Managers and Auditors**

[http://www.beeindia.in/content.php?page=energy\\_managers\\_auditors/ema.php?id=1](http://www.beeindia.in/content.php?page=energy_managers_auditors/ema.php?id=1)

Project teams in India can use BEE's directory of energy managers and auditors to locate a professional to conduct an ASHRAE Level I Walk-Through Analysis.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this prerequisite.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms identified in this prerequisite.

### EA

EB: O&M

Prerequisite 1

IMPORTANT! This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.



## MINIMUM ENERGY EFFICIENCY PERFORMANCE

EB: O&M	
Prerequisite	EA Prerequisite 2
Points	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 the LEED project building(s). 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 with a primary space type not eligible to receive an energy performance rating using Portfolio Manager, comply with 1 of the following:

##### OPTION 1. Adjusted Benchmark Score

Demonstrate energy efficiency performance that is better than 69% of similar buildings (69<sup>th</sup> percentile or better) by benchmarking against national source energy data provided in the Portfolio Manager tool as an alternative to energy performance ratings. Projects outside the U.S. may use a local benchmark based on source energy from their country's national or regional energy agency. Follow the detailed instructions in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

OR

##### OPTION 2. Alternative Score

Demonstrate energy efficiency performance by determining an alternative rating score using the Portfolio Manager tool to report the building's energy use data from the performance period. Follow the detailed instructions in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

## EA PREREQUISITE 2

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## EA PREREQUISITE 2

### OPTION 2a. Streamlined Baseline (EAp2 only – 0 points)

Enter energy use data during the performance period for at least 1 year into Portfolio Manager to determine the “weather-normalized source energy intensity”. Use this value in the offline calculator to determine the percent reduction from the streamlined baseline.

### OPTION 2b. Energy Baseline Including Historical Data (up to 9 points in EAc1)

Enter at least 3 consecutive years of historical energy use data into Portfolio Manager in addition to the current year’s data to determine the “weather-normalized source energy intensity” for each year. Use these values in the offline calculator to determine a baseline using the historical energy use data of the project building.

### OPTION 2c. Energy Baseline Including Historical Data plus Comparable Buildings (up to 18 points in EAc1)

In addition to the historical data used in Option 2b, provide energy use data for at least 3 other buildings with similar uses over at least a 2-year period to determine the “average energy performance of a similar building” in Portfolio Manager. Enter this data into the offline calculator.

#### 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.

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>

## 1. Benefits and Issues to Consider

Refer to the Benefits and Issues section of EA Credit 1 in this supplement.

## 2. Related Credits

See the Related Credits section in EA Credit 1 in this supplement.

## 3. Summary of Referenced Standards

There are no standards referenced for this prerequisite.

## 4. Implementation

Refer to the Implementation section in EA Credit 1 in this supplement.

## 5. Timeline and Team

Refer to the Timeline and Team section in EA Credit 1 in this supplement.

## 6. Calculations

Refer to the Calculations section in EA Credit 1 in this supplement.

## 7. Documentation Guidance

Refer to the Documentation Guidance section in EA Credit 1 in this supplement.

## 8. Examples

Refer to the Examples section in EA Credit 1 in this supplement.

## 9. Exemplary Performance

This prerequisite is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

Refer to the Regional Variations section in EA Credit 1 in this supplement.

## 11. Resources

See EA Credit 1 in the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources.

## 12. Definitions

Refer to the definitions section EA Credit 1 in this supplement.

EA	
EB: O&M	Prerequisite 2

IMPORTANT! This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.





## OPTIMIZE ENERGY EFFICIENCY PERFORMANCE

## EA CREDIT 1

EB: O&M	
Credit	EA Credit 1
Points	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.

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

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

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 the LEED project. A full 12 months of continuous measured energy data is required.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## EA CREDIT 1

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 with a primary space type not eligible to receive an energy performance rating using Portfolio Manager, comply with 1 of the following:

#### OPTION 1

Demonstrate energy efficiency performance that is better than 71% of similar buildings (71st percentile or better) by benchmarking against national source energy data provided in the Portfolio Manager tool as an alternative to energy performance ratings. Projects outside the U.S. may use a local benchmark based on source energy from their country's national or regional energy agency. 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, Demonstrate energy efficiency performance by determining an alternative rating score using the Portfolio Manager tool to report the building's energy use data from the performance period. Follow the detailed instructions in the LEED Reference Guide for Green Building Operations & Maintenance, 2009 Edition.

##### OPTION 2a. Streamlined Baseline (EAp2 only – 0 points)

This option is only available through EAp2. Enter energy use data during the performance period for at least 1 year into Portfolio Manager to determine the "weather-normalized source energy intensity". Use this value in the offline calculator to determine the percent reduction from the streamlined baseline.

##### OPTION 2b. Energy Baseline Including Historical Data (up to 9 points)

Enter at least 3 consecutive years of historical energy use data into Portfolio Manager in addition to the current year's data to determine the "weather-normalized source energy intensity" for each year. Use these values in the offline calculator to determine a baseline using the historical energy use data of the project building.

##### OPTION 2c. Energy Baseline Including Historical Data plus Comparable Buildings (up to 18 points)

In addition to the historical data used in Option 2b, provide energy use data for at least 3 other buildings with similar uses over at least a 2-year period to determine the "average energy performance of a similar building" in Portfolio Manager. Enter this data into the offline calculator.

AND

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

## EA CREDIT 1

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>.

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

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

EA	
EB: O&M	Credit 1

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this credit.

## 4. Implementation

Project teams using Case 2, Option 1, that wish to use a local benchmark based on source energy from their country's national or regional energy agency must submit proof that the local benchmark represents a statistically significant sample of the building type being referenced and that the benchmarking process is repeatable. The benchmark should include at least 30 buildings of the project's building type, and the data should be weather normalized and account for internal and external loads. To determine whether a local baseline is equivalent to CBECS, review the regressions and models used in CBECS, at [http://www.eia.gov/emeu/cbecs/tech\\_end\\_use.html](http://www.eia.gov/emeu/cbecs/tech_end_use.html).

The local benchmarking tool should be managed by a reputable source, such as a local government agency or regulatory body. Demonstrate that the project building has an energy performance that is better than 71% of similar buildings. Additional information on the technical background of the CBECS baseline for project teams using an alternative baseline can be found at [http://www.eia.gov/emeu/cbecs/technical\\_information.html](http://www.eia.gov/emeu/cbecs/technical_information.html).

Projects are encouraged to submit a Credit Interpretation Request (CIR) prior to referencing a local benchmarking tool in place of CBECS to ensure acceptability of the local baseline.

If no local benchmarking tool is available, project teams may continue to use CBECS to establish a baseline for this option.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example detailing an ENERGY STAR statement of energy performance based on the CBECS benchmark. Local benchmarking tools should include a similar statement that compares the project building's performance with that of similar buildings in the country or region.

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance on exemplary performance for this credit.

## 10. Regional Variations

To use ENERGY STAR to establish a baseline for energy consumption outside the United States, identify the closest world city in the ENERGY STAR Portfolio Manager. Benchmarking tools more appropriate to the project may be available outside the United States, however. Any local alternative should benchmark on source energy from a national or regional energy agency. See the Implementation section for additional guidance on selecting a baseline.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

EA	
EB: O&M	Credit 1

IMPORTANT! This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## EXISTING BUILDING COMMISSIONING - INVESTIGATION AND ANALYSIS

EB: O&M	
Credit	EA Credit 2.1
Points	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.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this credit.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

The project team should choose qualified auditors or energy engineers to complete the ASHRAE level II Energy Audit. Projects in India are not required to use the Bureau of Energy Efficiency (BEE) certified Energy Auditors, but BEE's website provides a directory of energy auditors in India which can be helpful for project teams. An energy audit that meets the guidelines of an ASHRAE Level II Energy Audit is still required of this credit.

## 6. Calculations

There are no additional calculations associated with this credit. See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example detailing an ASHRAE level II Walk-through analysis for this credit.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations Section of the LEED 2009 rating system.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

EA	
EB: O&M	Credit 2.1

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

EA	
EB: O&M	Credit 2.1

## 11. Resources

### Websites

#### **Bureau of Energy Efficiency (BEE): Energy Managers and Auditors**

[http://www.beeindia.in/content.php?page=energy\\_managers\\_auditors/ema.php?id=1](http://www.beeindia.in/content.php?page=energy_managers_auditors/ema.php?id=1)

Project teams in India can use BEE's directory of energy managers and auditors to locate a professional to conduct an ASHRAE Level II Energy Audit.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms identified in this credit.



## ON-SITE AND OFF-SITE RENEWABLE ENERGY

## EA CREDIT 4

EB: O&M	
Credit	EA Credit 4
Points	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 Energycertified 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

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## 1. Benefits and Issues to Consider

### Environmental Issues

While acknowledging the difficulty of identifying the exact source of renewable energy sources in every region, this credit requires that the off-site-generated renewable energy used for the building and its site be certified by the Green-e program or equivalent for electricity, and Green-e Climate or equivalent for other energy consumption.

The India REC mechanism is a market based instrument to promote renewable energy and to facilitate the purchase of Renewable Purchase Obligations (RPOs) and voluntary purchases in India. Renewable Energy Certificates (RECs) are available on approved power exchanges and are sold by eligible generating companies. The purchase of RECs in India are an acceptable equivalent to the Green-e program for electricity if additional requirements are met with regards to hydropower and facility online dates and if the RECs are sold on power exchange markets that operate with the approval of the India Central Electricity Regulatory Commission (CERC). An eligible generating company must obtain the valid accreditation certificate through a state agency designated by the respective State Electricity Regulatory Commission (SERC) and the valid registration granted by the Central Agency designated by the CERC.

Prior to issuing RECs to eligible generating companies, the electricity is certified as renewable by the SERC.

The National Load Dispatch Centre (NLDC) controls the registration and issuance of certificates, as well as the maintenance of accounts and settlements of RECs via the REC Registry. The REC Registry is the Indian national level operating framework that facilitates and tracks the exchange of RECs.

Information available to the renewable energy purchaser via the REC Registry includes but may not be limited to:

- Information of eligible renewable energy generators, such as entity names, locations, energy source, capacity (MW), date of registration and accreditation.
- Statistic reports of REC inventory, state and source accreditation and registration status, REC issuance and redemption.
- REC Unique Number.

RECs have no inherent price except for the price given to RECs by the supply and demand market and are the carrier of electricity attributes.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this credit.

## 4. Implementation

### Off-site Renewable Energy Compliance Mechanisms in India

Projects in India may purchase RECs sold on power exchanges that operate REC trading with approval from the India Central Electricity Regulatory Commission (CERC). Eligible renewable energy sources for compliance with this credit are solar, wind, and hydropower with additional requirements listed below.

### Renewable Electricity Consumption via RECs in India

Projects in India may purchase RECs for electricity through CERC approved power exchanges if the following additional requirements are also met:

- If the renewable energy source is hydropower, the hydropower facility consists of a turbine in a pipeline or a turbine in an irrigation canal.
- Renewable electricity purchases support new renewable electricity projects in India. The purchase of RECs in India must come from facilities built within the last 15 years from the date of sale. For RECs purchased in 2014, power must come from facilities built later than or in the year 2000. This date will advance by one year after 2014.

As a renewable energy purchaser, ensure that the supplier appropriately surrenders the REC to the REC Registry and provides the purchaser with proof of REC purchase. The Power Exchange India Limited and India Energy Exchange can help locate suppliers issuing RECs.

To comply with this credit, purchases of renewable energy must be voluntary. Consumers of renewable energy whom purchase RECs to satisfy a Renewable Purchase Obligation (RPO) must purchase additional RECs beyond the specifications of the RPO.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

There are no additional calculations associated with this credit. See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

Upload REC documentation, including as applicable:

- Proof of voluntary REC purchase
- Facility online date.
- Proof of REC redemption or cancellation
- If the energy source of purchased RECs is hydropower, provide verification that the hydropower facility consists of a turbine in a pipeline or a turbine in an irrigation canal.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional documentation guidance related to this credit.

EA	
EB: O&M	Credit 4

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## 8.Examples

There are no examples for this credit.

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information about Exemplary Performance related to this credit.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

Websites

### Central Electricity Regulatory Commission

<http://www.cercind.gov.in/>

The Central Electricity Regulatory Commission (CERC) is the agency that regulates the REC Framework in India. The CERC controls associated functions of REC regulation including: eligibility, registration, denomination, issuance, pricing, validity and expiration of RECs.

**Central Electricity Regulatory Commission: Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation, Regulations, 2010 & its first amendment (2010) and second amendment (2013)**

**No. L-1/12/2010-CERC**

[http://www.cercind.gov.in/Current\\_reg.html](http://www.cercind.gov.in/Current_reg.html)

This regulation along with its amendments regulates the general framework of RECs in India by providing definitions and interpretations related to RECs.

### India Energy Exchange

<http://www.iexindia.com/products/rec/overview.aspx>

The India Energy Exchange (IEX) is one of the power exchanges approved by the Central Electricity Regulatory Commission (CERC) of India to conduct REC trading activities. IEX also provides resources on the India REC framework, REC trading steps, trading timeline, REC pricing and voluntary REC purchases.

### Renewable Energy Certificate Registry of India

<https://www.recregistryindia.nic.in/index.php/general/publics/index>

National Load Dispatch Center (NLDC) is the central agency designated by CERC to function as the REC Registry. Main functions of REC Registry include: registration of eligible renewable energy (RE) generators for issuing RECs, issuance of RECs to RE generators, accounting of RECs, tracking of RECs, extinction of RECs after sale, and providing information to compliance auditors.

### Revised Detailed Procedures for REC Implementation

**Order in L-1/12/2010-CERC**

**Date of order: February 17, 2014**

[https://www.recregistryindia.nic.in/pdf/Procedure\\_REC/L12.pdf](https://www.recregistryindia.nic.in/pdf/Procedure_REC/L12.pdf)

The Revised Detailed Procedures for REC Implementation describes detailed procedures, timelines and requirements as well as roles and responsibilities of entities for every REC implementation step. The revised detailed procedure was approved by the Central Electricity Regulatory Commission (CERC) and posted publicly on the website of the Central Agency

(National Load Dispatch Center) with direction from CERC.

### **Power Exchange India Limited**

<http://www.powerexindia.com/PXIL/rec.aspx>

Power Exchange India Limited (PXIL) is one of the power exchanges approved by the Central Electricity Regulatory Commission (CERC) of India to conduct REC trading activities.

### **Ministry of New and Renewable Energy (MNRE)**

<http://mnre.gov.in/schemes/grid-connected/>

MNRE defines renewable energy sources. Generating companies that are eligible to issue RECs should generate electricity from renewable energy sources recognized or approved by MNRE.

## **12. Definitions**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms identified in this credit.

EA	
EB: O&M	Credit 4

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or Europe ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.



## EMISSIONS REDUCTION REPORTING

## EA CREDIT 6

EB: O&M	
Credit	EA Credit 6
Points	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 or carbon offsets.

Report emissions reductions using one of the following:

- A third-party voluntary reporting or certification program such as U.S. Environmental Protection Agency (EPA) Climate Leaders, ENERGY STAR, the Carbon Disclosure Project or World Resources Institute / World Business Council for Sustainable Development (WRI/WBCSD) protocols.
- International Organization for Standards (ISO) 14064-1:2006 Greenhouse gases, Part 1, Specification, with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or Europe ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

EA	
EB: O&M	Credit 6

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

### ISO Standard 14064-1:2006 Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

<http://www.iso.org/>

Climate change will challenge governments, businesses, and private citizens over future decades. ISO Standard 14064-1:2006 details principles and requirements for designing, developing, managing, and reporting organization- or company-level GHG inventories. This standard is the basis for many emissions reporting tools, including those identified in this credit.

## 4. Implementation

If using ISO Standard 14064-1:2006 to report emissions, calculate the emissions from building energy use and collect annual utility data and energy consumption data from any on-site operations that generate emissions. These activities would include only on-site fuel use and electricity consumption at the site; disregard any emissions due to transmission and distribution. Energy consumption by fuel type should then be converted to GHG emissions based on the profiles of different GHG emissions for various fuels. For electricity, GHG emissions depend on the makeup of the regional power pool or grid. Specific emissions factors corresponding to the regional grid serving the project building must be employed. Include in the calculations all energy consumption recorded by the building systems and occupants: all electricity produced and used on-site, space heating and cooling, ventilation, water heating, and process loads, including both direct emissions (e.g., burning natural gas to heat water) and indirect emissions (e.g., electricity purchased from the grid).

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example of a statement of energy performance from ENERGY STAR. This statement identifies the emissions related to the project site and is consistent with ISO 14064-1:2006 emissions-reporting protocols.



## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

EA	
EB: O&M	Credit 6

## 10. Regional Variations

Because the production, distribution, and transmission of electricity vary by country, it may be difficult to relate the emissions from a building's energy consumption to the source of that energy. Some countries, including the United States, have a complex mix of electricity sources; others use one or two primary types of energy production, distribution, and transmission. Research the electricity production, distribution, and transmission in the project country to determine the appropriate energy mix.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

### Websites

#### Carbon Disclosure Project

<https://www.cdproject.net/en-US/Pages/HomePage.aspx>

The Carbon Disclosure Project is an independent, not-for-profit organization offering carbon reporting services and holds the world's largest database of primary corporate climate change information.

#### International Organization for Standardization (ISO)

<http://www.iso.org>

ISO 14064-1:2006 specifies principles and requirements at the organization level for quantification and reporting of greenhouse gas emissions and removals. It includes requirements for the design, development, management, reporting, and verification of an organization's GHG inventory.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

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# MATERIALS AND RESOURCES

### OVERVIEW

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance.

The responsible harvest or extraction of materials used in building products is of universal importance, as is the way they are transported to the project site. Projects in India often experience challenges when using MR credits since reference standards are based off U.S. policy and practice. ACPs in the MR credit category address this challenge by allowing alternative calculations in the regional materials section of MR credits and the use of local equivalents for projects.

#### Global ACPs

Because some transportation methods cause significantly less environmental harm than others, a new option has been added to the regional materials sections of MR Credits 1, 2.2, and 3 (Sustainable Purchasing) to allow for items that are shipped long distances via rail and water. The option involves calculating a weighted total distance rather than using a simple 500-mile (800-kilometer) radius.

Additionally, local equivalent standards are now available in place of U.S. standards in certain credits. MR Credit 2.1 (Sustainable Purchasing—Electric-Powered Equipment) allows project teams to use a local equivalent to Energy Star products. For renovation projects, MR Credit 3 (Sustainable Purchasing—Facility Alterations and Additions) accommodates products that meet widely used VOC testing requirements. Finally, food purchases that meet the European standard for organic production will now qualify for MR Credit 5 (Sustainable Purchasing—Food).

#### India ACPs

There are no India specific ACPs for the Materials and Resources credit category.

 **Table 1.** MR Credits with Alternative Compliance Paths

Credit	Title	ACP
<b>MR Prerequisite 1</b>	Sustainable Purchasing Policy	
<b>MR Prerequisite 2</b>	Solid Waste Management Policy	
<b>MR Credit 1</b>	Sustainable Purchasing—Ongoing Consumables	
<b>MR Credit 2.1</b>	Sustainable Purchasing—Electric Powered Equipment	
<b>MR Credit 2.2</b>	Sustainable Purchasing—Furniture	
<b>MR Credit 3</b>	Sustainable Purchasing—Facility Alterations and Additions	
<b>MR Credit 4</b>	Sustainable Purchasing—Reduced Mercury in Lamps	
<b>MR Credit 5</b>	Sustainable Purchasing—Food	
<b>MR Credit 6</b>	Solid Waste Management—Waste Stream Audit	
<b>MR Credit 7</b>	Solid Waste Management—Ongoing Consumables	
<b>MR Credit 8</b>	Solid Waste Management—Durable Goods	
<b>MR Credit 9</b>	Solid Waste Management—Facility Alterations and Additions	

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## SUSTAINABLE PURCHASING—ONGOING CONSUMABLES

## MR CREDIT 1

EB: O&M	
Credit	MR Credit 1
Points	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 Credits 2.1 and 2.2), the project team is free to decide which category to put them in as long as consistency is maintained with MR Credits 2.1 and 2.2, 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 LEED-Online 3 as a credit submittal. 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 a 500 mile (800 kilometer) radius of the project. Building materials or products shipped by rail or water have been extracted, harvested or recovered, as well as manufactured within a 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula:  

$$\frac{(\text{Distance by rail}/3) + (\text{Distance by inland waterway}/2) + (\text{Distance by sea}/15) + (\text{Distance by all other means})}{4} \leq 500 \text{ miles [800 kilometers]}$$
- 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 (800 kilometers) 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.

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MR	
EB: O&M	Credit 1

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

There are no standards referenced for this credit.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations relating to purchasing recycled materials, rapidly renewable materials, FSC-certified products, and batteries.

For regional materials, this credit uses a formula to determine the distance that materials have traveled by rail or water, from extraction or harvest through manufacturing to delivery at the project site. The project team must determine the means of transportation for each leg of that journey.

Calculate the weighted average of materials transported to the project site according to the following equation:

$$\text{Total weighted distance} = (\text{DR}/3) + (\text{DI}/2) + (\text{DS}/15) + \text{DO}$$

where

DR= distance by rail

DI = distance by inland waterway

DS= distance by sea

DO= distance by other transportation modes

If the result is 500 miles (800 kilometers) or less, the material qualifies as a regional product.

## 7. Documentation Guidance

If the project is using the total weighted distance formula for regional materials, work through the following measures as a first step in preparing to complete the LEED Online documentation requirements.

- Compile a list of product purchases manufactured, extracted, or harvested regionally.
- Record manufacturers' names and product costs for all applicable materials used at the project.
- Record distances and transportation modes for each product, from extraction or harvest through fabrication to delivery to the project site.

- Where appropriate, retain cutsheets that document materials' origin and manufacture within a 500-mile (800-kilometer) total weighted distance of the project site.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional documentation guidance related to this credit.

MR	
EB: O&M	Credit 1

## 8. Examples

Building managers in Berlin want to purchase printer paper produced regionally, as specified in the building's sustainable purchasing policy. During the performance period, the building purchased paper worth US\$250. The paper was milled from wood grown in a forest outside Harestua, Norway, and transported by truck to Oslo, where it was placed on a ship bound for Germany. Upon arriving at port in Kiel, Germany, the wood was loaded onto a train to Leipzig, where it was milled. The finished paper product was transported by truck to the project site in Berlin.

First, the team determines the travel distances for each leg of the trip (Figure 1).

**Figure 1.** Example transport of wood from harvest to project site (generated using Google® Maps)



Then the team divides each distance by the divisors in the total weighted distance equation (see Calculations), as shown in Table 1. Transport by truck falls under “other” and thus has no divisor.

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MR	
EB: O&M	Credit 1

**Table 1.** Example determination of weighted distance for paper products

Mode	Leg	Actual distance	Calculation	Weighted distance
Truck	Harestua to Oslo	41 km (25 miles)	41 (25)	41 km (25 miles)
Ship	Oslo to Kiel	682 km (424 miles)	682/15 (424/15)	45 km (28 miles)
Rail	Kiel to Leipzig	454 km (285 miles)	454/3 (285/3)	151 km (95 miles)
Truck	Leipzig to Berlin (project)	190 km (118 miles)	190 (118)	190 km (118 miles)
Total				427 km (266 miles)

Because the total weighted distance traveled is less than 500 miles (800 km), the paper qualifies as a regional material.

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance on exemplary performance for this credit.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

An **inland waterway** is a navigable body of water, such as a river, canal, or lake, that is deep, wide, and slow enough for a vessel to pass.



## SUSTAINABLE PURCHASING

## MR CREDIT 2.1-2.2

EB: O&M	
Credit	MR Credit 2.1-2.2
Points	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.

#### MR Credit 2.1 (1 point): Electric-Powered Equipment

Achieve sustainable purchases of at least 40% of total purchases of electric-powered equipment (by cost) during the performance period. Examples of electric-powered equipment include, but are not limited to, office equipment (computers, monitors, copiers, printers, scanners, fax machines), appliances (refrigerators, dishwashers, water coolers), external power adapters, and televisions and other audiovisual equipment. Sustainable purchases are those that meet one of the following criteria:

- The equipment is ENERGY STAR® qualified (for product categories with developed specifications).
- The equipment (either battery or corded) replaces conventional gas-powered equipment<sup>1</sup>.
- Projects outside the U.S. may demonstrate the equipment is equal to or more stringent than ENERGY STAR® qualified through use of local equivalencies.

AND/OR

#### MR Credit 2.2 (1 point): Furniture

Achieve sustainable purchases of at least 40% of total purchases of furniture (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 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.

<sup>1</sup> Gas-powered equipment include at a minimum, maintenance equipment and vehicles, landscaping equipment and cleaning equipment.

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## MR CREDIT 2.1-2.2

- 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 a 500 mile (800 kilometer) radius of the project. Building materials or products shipped by rail or water have been extracted, harvested or recovered, as well as manufactured within a 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula:

$$\frac{(\text{Distance by rail}/3) + (\text{Distance by inland waterway}/2) + (\text{Distance by sea}/15) + (\text{Distance by all other means})}{500 \text{ miles [800 kilometers]}}$$

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 (800 kilometers) 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.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

MR

EB: O&M

Credit 2.1-2.2

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit. If a local equivalent has been selected for ENERGY STAR, substitute that standard.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this credit.

## 4. Implementation

Demonstrate that equipment purchases conform to standards at least as stringent as ENERGY STAR by substituting appropriate benchmarks and metrics that use a local standard for establishing a baseline, and measure performance relative to that baseline. Additional information on the ENERGY STAR labeling program can be found at [http://www.energystar.gov/index.cfm?c=products.pr\\_how\\_earn](http://www.energystar.gov/index.cfm?c=products.pr_how_earn).

The following areas must be addressed to demonstrate equivalency with ENERGY STAR:

Appliances	Other Commercial Equipment	Computers and Electronics
Modified energy factor	Idle energy rate	Power supply efficiency
Water factor	Energy efficiency rate	Efficiency and performance
Product capacity	Potable water use limit	Total energy consumption
Energy factor	Cooking energy efficiency rate	Active power
Standby power	Maximum daily energy consumption	Idle state
Volume of water per cycle	Energy use limit	Operational mode efficiency
Energy use per year	Harvest rate	Digital front-end efficiency
Energy efficiency ratio	Testing protocols	Testing protocols
Testing protocols		

The following equipment is included in the scope and must be accounted for in the credit calculation:

Appliances	Other Commercial Equipment	Computers and Electronics
Clothes washers	Vending machines	Audiovisual equipment
Dishwashers	Commercial food service equipment, including fryers, griddles, hot food holding cabinets, ice machines, kitchen packages, and steam cookers	Battery chargers
Freezers		Computers
Refrigerators		Displays
Water coolers		Enterprise servers
		External power adapters
		Imaging equipment
		Televisions

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

Project teams wishing to use a local benchmark should contact USGBC early in the design phase to

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ensure that the alternative standard is acceptable.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations relating to purchasing furniture.

For regional materials, this credit uses a formula to determine the total weighted distance that products have traveled by rail or water, from extraction or harvest through manufacturing to final delivery at the project. The project team must determine the means of transportation for each leg of that journey.

Calculate the weighted average of products transported to the project site according to the following equation:

$$\text{Total weighted distance} = (\text{DR}/3) + (\text{DI}/2) + (\text{DS}/15) + \text{DO}$$

where

DR= distance by rail

DI = distance by inland waterway

DS= distance by sea

DO= distance by other transportation modes

If the result is 500 miles (800 kilometers) or less, the product qualifies as regional.

## 7. Documentation Guidance

If the project is using the weighted distance formula for local materials, work through the following measures as a first step in preparing to complete the LEED Online documentation requirements.

- Compile a list of product purchases manufactured, extracted, or harvested regionally.
- Record manufacturers' names and product costs for all applicable materials used at the site.
- Record distances and transportation modes for each product, from extraction or harvest through fabrication to delivery to the project site.
- Where appropriate, retain cutsheets that document material origin and manufacture within a 500-mile (800-kilometer) total weighted distance of the project site.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional documentation guidance related to this credit.

## 8. Examples

See the example in MR Credit 1, Sustainable Purchasing—Ongoing Consumables, in this supplement for an example of how to calculate the weighted distance for regional materials transported by different modes.

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance on how to achieve exemplary performance in this credit.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/projecttools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

MR	
EB: O&M	Credit 2.1-2.2

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## SUSTAINABLE PURCHASING—FACILITY ALTERATIONS AND ADDITIONS

## MR CREDIT 3

EB: O&M	
Credit	MR Credit 3
Points	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 calculation 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 a 500 miles (800 kilometers) radius of the project. Building materials or products shipped by rail or water have been extracted, harvested or recovered, as well as manufactured within a 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula:
 
$$\frac{(\text{Distance by rail}/3) + (\text{Distance by inland waterway}/2) + (\text{Distance by sea}/15)}{(\text{Distance by all other means})} \leq 500 \text{ miles [800 kilometers]}$$
- 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.

<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.

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## MR CREDIT 3

- Noncarpet finished flooring meets one of the following requirements and constitutes a minimum of 25% of the finished floor area:
  - Is FloorScore-certified.
  - Maximum VOC concentrations are less than or equal to those specified in the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda, using the office scenario as defined in Table 7.5 within the practice.
  - Maximum VOC concentrations meet the California requirements specified above based on the following:
    - California Department of Public Health (CDPH) Standard Method V1.1-2010 using test results obtained at the 14 day time point.
    - Projects outside the U.S. may use the German AgBB/DIBt testing method and all testing methods based on AgBB/DIBt method (GUT, EMICODE, Blue Angel) using test results obtained at the 3 day or 7 day or 14 day time point. For caprolactam, if test results obtained at the 3 day or 7 day time point is used, the emission concentration must be less than 1/2 of the concentration limit specified above because the emission may not have peaked at the measured time points.

If a European testing method (AgBB/DIBt GUT, EMICODE, Blue Angel) had used parameters for calculating test results different from those specified in the referenced California method, then the European test results for carpets or floorings need to be converted into California air concentrations by multiplication with 0.7.
- Carpet meets one of the following requirements:
  - Meets CRI Green Label Plus Carpet Testing Program.
  - Maximum VOC concentrations are less than or equal to those specified in the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda, using the office scenario as defined in Table 7.5 within the practice. The additional VOC concentration limits listed in Section 9.1a must also be met.
  - Maximum VOC concentrations meet the California requirements specified above based on the following:
    - California Department of Public Health (CDPH) Standard Method V1.1-2010 using test results obtained at the 14 day time point.
    - Projects outside the U.S. may use the German AgBB/DIBt testing method and all testing methods based on AgBB/DIBt method (GUT, EMICODE, Blue Angel) using test results obtained at the 3 day or 7 day or 14 day time point. For caprolactam, if test results obtained at the 3 day or 7 day time point is used, the emission concentration must be less than 1/2 of the concentration limit specified above because the emission may not have peaked at the measured time points.



## MR CREDIT 3

If a European testing method (AgBB/DIBt GUT, EMICODE, Blue Angel) had used parameters for calculating test results different from those specified in the referenced California method, then the European test results for carpets or floorings need to be converted into California air concentrations by multiplication with 0.7.

- Carpet cushion meets the requirements of the CRI Green Label Testing Program.
- Composite panels and agrifiber<sup>1</sup> products contain no added urea-formaldehyde resins.

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 (800 kilometers) 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.

<sup>1</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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MR	
EB: O&M	Credit 3

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

### AgBB: Health-Related Evaluation of Emissions of Volatile Organic Compounds (VOC and SVOC) from Building Products

Umwelt Bundes Amt

<http://www.umweltbundesamt.de/produkte-e/bauprodukte/agbb.htm>

This is the German method for VOC testing and evaluation. The evaluation scheme sets quality standards relevant to health for future manufacture of building products for use indoors and fosters the development of products with particularly low emissions. It is not aimed at subsequent evaluation of products already installed.

### California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers

<http://www.cal-iaq.org/>

This is the emissions-testing standard for California. The practice applies to any material belonging to a product category generally used in an enclosed indoor environment. Examples include paints, other architectural coatings, sealants, adhesives, wall coverings, floor coverings, wood paneling, and furniture components, whether used in public and commercial office buildings, schools, medical buildings, residences, or other building types.

### California Department of Public Health (CDPH) Standard Method V1.1-2010

<http://www.cdph.ca.gov/>

This is the emissions-testing and evaluation standard for California Specification Section 01350. The standard is applicable to the full range of building products, including paints and adhesives that can be tested in small-scale chambers.

## 4. Implementation

If the German AgBB/DIBt testing method or a testing method based on AgBB/DIBt method (GUT, EMICODE, Blue Angel) is used for carpet or noncarpet finished flooring, use test results from the three-day, seven-day, or 14-day time point.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for further implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations relating to the costs of materials purchased for facility alterations and additions.

This credit uses a formula to determine the total weighted distance that materials have traveled by rail or water, from extraction or harvest through manufacturing to final delivery at the project. The project team must determine the means of transportation for each leg of that journey.

Calculate the weighted average of materials transported to the project site according to the following equation:

$$\text{Total weighted distance} = (\text{DR}/3) + (\text{DI}/2) + (\text{DS}/15) + \text{DO}$$

where

DR= distance by rail

DI = distance by inland waterway

DS= distance by sea

DO= distance by other transportation modes

If the result is 500 miles (800 kilometers) or less, the material qualifies as a regional product.

MR	
EB: O&M	Credit 3

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

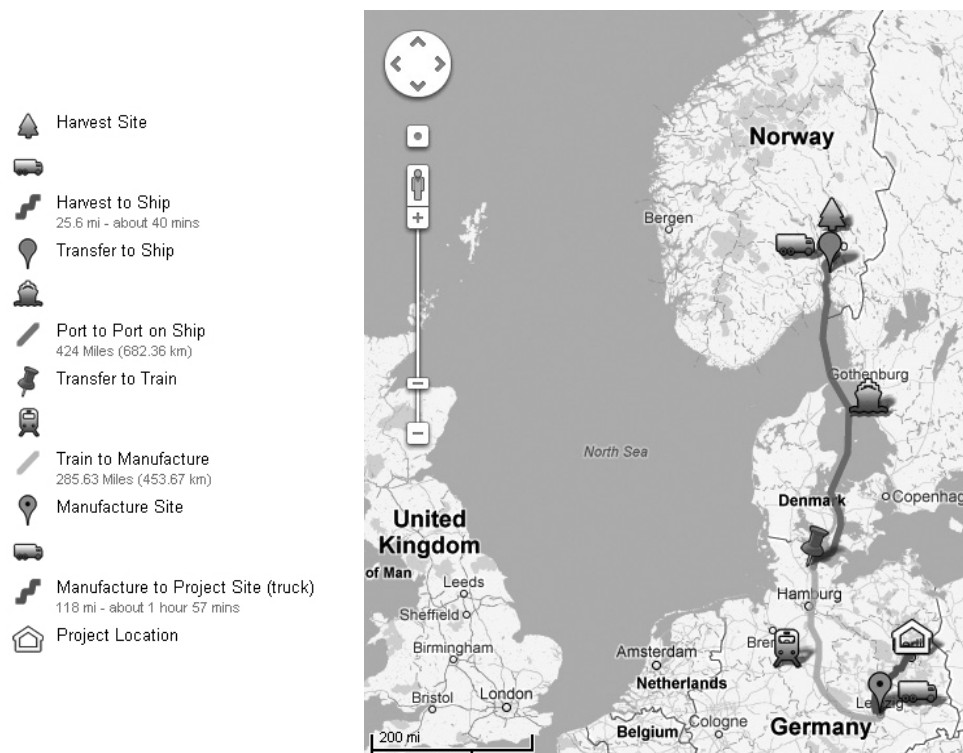
## 8. Examples

### Example 1

A project in Berlin has imported wood from Norway for a facility addition. The wood was harvested in a forest outside Harestua and transported by truck to Oslo, where it was placed on a ship bound for Germany. Upon arriving at port in Kiel, Germany, the wood was loaded onto a train to Leipzig, where it was milled for use on the project. The finished wood product was transported by truck to the project site in Berlin.

First, the team determines the travel distances for each leg of the trip (Figure 1).

**Figure 1.** Example transport of wood from harvest to project site (generated using Google® Maps)



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MR	
EB: O&M	Credit 3

Then the team divides each distance by the divisors in the total weighted distance equation (see Calculations), as shown in Table 1. Transport by truck falls under “other” and thus has no divisor.







**Table 1.** Example determination of weighted distance for wood products


Mode	Leg	Actual distance	Calculation	Weighted distance
Truck	Harestua to Oslo	41 km (25 miles)	41 (25)	41 km (25 miles)
Ship	Oslo to Kiel	682 km (424 miles)	682/15 (424/15)	45 km (28 miles)
Rail	Kiel to Leipzig	454 km (285 miles)	454/3 (285/3)	151 km (95 miles)
Truck	Leipzig to Berlin (project)	190 km (118 miles)	190 (118)	190 km (118 miles)
Total				427 km (266 miles)

### Example 2

A project team in Paris wants to use a linoleum flooring product that is marked with both the Blue Angel and the GUT logos. The team compares the product data sheet with the testing standards identified in the credit. The product meets the AgBB/DIBt VOC testing standards and therefore qualifies for credit.

**Figure 1.** Example product data sheet on emissions

LINOLEUM			
Produktbeschreibung nach EN 548		Marmorette 2.5mm	Marmorette 3.2mm
Belagsart		Linoleum mit LPX Finish	Linoleum mit LPX Finish
Konstruktion	Musterung	marmoriert	marmoriert
	Gesamtdicke	2,5 mm	3,2 mm
	Unterschicht	Jutegewebe	Jutegewebe
	Klassifizierung	Klasse 23/34/42	Klasse 23/34/42
	Rollenbreite	200 cm	200 cm
	Rollenlänge	20–31 m	20–31 m
Sicherheit	Gesamtgewicht	2900 g / m <sup>2</sup>	3800 g / m <sup>2</sup>
	Brandverhalten	EN 13501-1  Cfl – s1 *	Cfl – s1 *
	Rutschsicherheit Arbeitsbereich	BGR 181 R 9	R 9
	Rutschhemmung BFU	bfu Reglement GS 1 Klasse	
	Gleitwiderstand	EN 13893  DS (> 0,30)	DS (> 0,30)
	Blauer Engel	RAL-UZ 38 Ja	Ja
REACH		enthält keine Stoffe die in der SVHC-Liste enthalten sind	enthält keine Stoffe die in der SVHC-Liste enthalten sind
Allgemein Bauaufsichtliche Zulassung		Z-156.604-376 geeignet für die Verwendung in Aufenthaltsräumen	geeignet für die Verwendung in Aufenthaltsräumen
Funktion	Trittschallverbesserungsmaß	ISO 140-8 4 dB	6 dB
	Resteindruck	EN 433 ≤ 0,15 mm	≤ 0,15 mm
	Farbechtheit	ISO 105-B02 Stufe ≥ 6	Stufe ≥ 6
	Durchgangswiderstand	EN 1081 –	–
	Standortisolation	VDE 0100 > 200 kOhm	> 200 kOhm
	Aufladungsspannung Begehtest	EN 1815 ca. 2,0 kV	ca. 2,0 kV
	Wärmedurchlasswiderstand	EN 12667 0,015 m <sup>2</sup> K / W	0,018 m <sup>2</sup> K / W
	Wärmeableitung	EN 12524 0,17 W / mK	0,17 W / mK
	Chemikalienbeständigkeit	EN 423  Mineralöl- und Fettbeständigkeit und kurzzeitig beständig gegen verdünnte Säuren	Mineralöl- und Fettbeständigkeit und kurzzeitig beständig gegen verdünnte Säuren
	Stuhlrollen	EN 425  geeignet (Typ W)	geeignet (Typ W)
	Biegsamkeit	EN 435-A Ø 40 mm	Ø 50 mm
	Einwirkung von Bakterien	JIS Z 2801 DLW Linoleum hat antibakterielle Eigenschaften	DLW Linoleum hat antibakterielle Eigenschaften
	Beständigkeit gegen brennende Zigaretten	EN 1399  geeignet	geeignet
	Warmwasser-Fußbodenheizung	 geeignet (max. 28°C)	geeignet (max. 28°C)






Hergestellt von:

Marmorette 2.5mm

EN 14041 : 2004  
05  
1658-CPD-1003

Marmorette 3.2mm

EN 14041 : 2004  
05  
1658-CPD-1003

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance on exemplary performance for this credit.

MR	
EB: O&M	Credit 3

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

Websites

### Blue Angel

[http://www.blauer-engel.de/en/blauer\\_engel/index.php](http://www.blauer-engel.de/en/blauer_engel/index.php)

### California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers

<http://www.cal-iaq.org/>

### California Department of Public Health

<http://www.cdph.ca.gov/>

### EMICODE

<http://www.emicode.com/index.php?id=1&L=1>

### GUT

<http://www.pro-dis.info/gut.html>

### Umwelt Bundes Amt

<http://http://www.umweltbundesamt.de>

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

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## SUSTAINABLE PURCHASING—FOOD

## MR CREDIT 5

EB: O&M	
Credit	MR Credit 5
Points	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, Marine Stewardship Council's Blue Eco-Label or are labeled with the European Community Organic Production logo in accordance with Regulations (EC) No 834/2007 and (EC) No 889/2008.
- Purchases are produced within a 100-mile (160 kilometers) 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 (160 kilometers) 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.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

MR	
EB: O&M	Credit 5

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

### European Community (EC) Standards 834/2007 and 889/2008

[http://ec.europa.eu/agriculture/organic/eu-policy/legislation\\_en](http://ec.europa.eu/agriculture/organic/eu-policy/legislation_en)

These are the standards for organic food production in the European Union. Any food product labeled with the European Community's Organic Production logo as outlined in the regulations of these standards is considered compliant for the purpose of this credit.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of additional standards referenced in this credit.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

There are no additional calculations associated with this credit. See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example of a building with a nonparticipating tenant.

## 9. Exemplary Performance

Project teams can earn an additional point if sustainable food and beverage purchases account for 50% or more of the total cost over the performance period.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/projecttools>) for additional resources and technical information.



## Websites

### European Commission Organic Food Production

[http://ec.europa.eu/agriculture/organic/home\\_en](http://ec.europa.eu/agriculture/organic/home_en)

MR	
EB: O&M	Credit 5

## 12. Definitions

The **EU organic farming logo** is the European Community's certification for products that meet EU regulations for organically produced food products.

IMPORTANT! This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

**Overview**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional guidance.

Approaches to indoor environmental quality issues often vary by country. Because of differences in climate, ventilation systems, and environmental standards, many of the prescribed approaches in the Indoor Environmental Quality section have been difficult to apply outside the United States. New language allows for local equivalents to many of the standards referenced in IEQ credits.

**Global ACPs**

IEQ Prerequisite 1 (Indoor Air Quality Performance) and its associated credits now have multiple alternatives to help project teams outside the United States earn points while maintaining the technical rigor and stringency of the requirements. Many teams will be able to use CEN standards in place of the ASHRAE requirements; others may choose a local equivalent to ASHRAE. CEN standards and local equivalents are also available for IEQ Credit 2.3 (Occupant Comfort—Thermal Comfort Monitoring).









Project teams outside the U.S. can now use local equivalent standards for air filtration during facility alterations and additions and during daily operations when seeking to achieve IEQ Credits 1.4 and 1.5 (Indoor Air Quality Best Management Practices.)

Finally, local equivalent standards can be used for IEQ Prerequisite 2 (Environmental Tobacco Smoke Control) and IEQ Credit 3.3 (Green Cleaning—Purchase of Sustainable Cleaning Products and Materials).

**India ACPs**

There are no India specific ACPs for the Indoor Environmental Quality credit category.

 **Table 1.** IEQ Credits with Alternative Compliance Paths

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

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## MINIMUM INDOOR AIR QUALITY PERFORMANCE

## IEQ PREREQUISITE 1

EB: O&M	
Prerequisite	IEQ Prerequisite 1
Points	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 Standard

##### OPTION 1. ASHRAE Standard 62.1-2007 or Non-U.S. Equivalent

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. Projects outside the U.S. may use a local equivalent to ASHRAE Standard 62.1-2007 for breathing zone minimum ventilation rates.

OR

##### OPTION 2. CEN Standard EN 15251: 2007

Projects outside the U.S. may 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 Annex B of Comité Européen de Normalisation (CEN) Standard EN 15251: 2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics.

#### CASE 2. Projects Unable to Meet the Standard

If meeting the ventilation rates required of the above standards 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) (5 liters per second) 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 the above standards 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 the above standards and others cannot, those that can must do so. Buildings must provide at least 10 cfm (5 liters per second) per person of outside air at each air-handling unit under all normal operating conditions to earn this prerequisite.

<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.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## IEQ PREREQUISITE 1

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>).

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this prerequisite.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this prerequisite.

## 3. Summary of Referenced Standards

**CEN Standard EN15251: 2007, Annex B, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics**

Comité Européen de Normalisation

<http://www.cen.eu>

This standard outlines the parameters used in many EU countries to design and assess energy performance of buildings. Annex B of the standard is considered equivalent to ASHRAE 62.1-2007 for the purposes of this prerequisite.

## 4. Implementation

Projects Able to Meet Standard

### OPTION 1

Local standards for projects outside the United States will be compared with ASHRAE 62.1-2007 in terms of scope, metrics, and thresholds. Project teams that wish to ensure acceptance of a proposed equivalent to ASHRAE 62.1-2007 prior to submission for review may choose to submit a Formal Inquiry for a Credit Interpretation Ruling for a single project, or a LEED Interpretation for multi-project use.

In order to demonstrate equivalency using a local standard, the local standard must address all of the critical outdoor air ventilation requirements of ASHRAE 62.1-2007.

**Design Outdoor Air Rate requirements** (ASHRAE 62.1-2007, Section 6.2):

This section outlines the minimum outdoor air intake rates required for all occupied spaces and the Ventilation Rate Procedure (VRP), which is used to calculate these rates. The VRP is a prescriptive procedure in which the design outdoor air intake flows are determined based on space type/application, occupancy level, floor area, and system type. The procedure calculates the outdoor airflow required in the breathing zone, for the zone, and at the system level.

The procedure accounts for zone air distribution effectiveness (ASHRAE 62.1-2007, Section 6.2.2.2) based on the supply air delivery method and the supply air temperature for the space under consideration.

The procedure accounts for system ventilation effectiveness (ASHRAE 62.1-2007, Section 6.2.3 – 6.2.5) based on the various air-handling units supplying outdoor air to the building or a combination of spaces. Specific requirements are included for multiple zone recirculating systems (ASHRAE 62.1-2007, Section 6.2.5) to account for the mixture of re-circulated air and outdoor air to more than one zone/space.

IEQ	
EB: O&M	Prerequisite 1

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**Indoor Air Quality Procedure** (ASHRAE 62.1-2007, Section 6.3)

To use the IAQ Procedure or claim equivalency with the IAQ Procedure, follow the Pilot Credit language from Pilot Credit 68, available in the LEED Pilot Credit library on the website at [www.usgbc.org/pilotcredits](http://www.usgbc.org/pilotcredits).

**OPTION 2**

Annex B of CEN Standard EN 15251:2007 identifies multiple components for determining the recommended outdoor air ventilation rate of a mechanically ventilated building.

To determine the appropriate amount of outdoor air needed in a building, EN 15251:2007 uses a calculation based on recommended ventilation rates for diluting emissions from people and building materials.

To determine the ventilation rate: Use Table B.1 in Annex B of CEN Standard EN 15251:2007 to find the appropriate percentage of dissatisfied building occupants and select Category I, II, or III based on the building design and applicable local codes. Then, determine the appropriate building emissions level corresponding to the materials used in the building. Table B.2 provides recommended ventilation rates for various space types.

See the 2009 Green Building Design and Construction Reference Guide for further implementation guidance.

**5. Timeline and Team**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this prerequisite. Project teams wishing to use a local equivalent should contact USGBC early in the design phase to ensure that the alternative standard is acceptable.

**6. Calculations**

To show compliance in mechanically ventilated spaces, use the calculations in the selected standard's user manual and the IEQ calculators for this prerequisite, located in Credit Resources on LEED Online.

**7. Documentation Guidance**

As a first step in preparing to complete the LEED Online documentation requirements, work through the following measures. Refer to LEED Online for the complete descriptions of all required documentation.

- For projects using Case 1, Option 1,
  - Demonstrate that the local standard is equivalent to the breathing zone minimum ventilation rates of ASHRAE 62.1-2007, by addressing each of the critical requirements identified in Implementation.
    - If the local standard contains deviations or omissions for sections specified under Implementation, provide relevant information to justify the omissions or deviations, or explain that the project will follow the ASHRAE standard for the specific requirement.
    - Requirements not relevant to the proposed building type do not need to be included in the equivalency review.
  - Demonstrate compliance with the applicable sections of the local standard.
- For projects using Case 1, Option 2, demonstrate compliance with the applicable sections of CEN Standard EN 15251: 2007.



- Track building HVAC system maintenance.

IEQ	
EB: O&M	Prerequisite 1

## 8. Examples

There are no examples for this prerequisite.

## 9. Exemplary Performance

This prerequisite is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

There are no regional variations associated with this prerequisite.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

### Websites

#### Comité Européen de Normalisation

<http://www.cen.eu>

CEN seeks to foster the European economy in global trading, the welfare of European citizens, and the environment by removing trade barriers for European industry and consumers. It provides a platform for the development of European standards and other technical specifications. To purchase CEN standards, visit the Products section on the CEN website.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this prerequisite.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this prerequisite.

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## ENVIRONMENTAL TOBACCO SMOKE (ETS) CONTROL

## IEQ PREREQUISITE 2

EB: O&M	
Prerequisite	IEQ Prerequisite 2
Points	Required

### Intent

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

### Requirements

#### OPTION 1

- Prohibit smoking in the building.
- Prohibit on-property smoking within 25 feet (8 meters) of entries, outdoor air intakes and operable windows.

OR

#### OPTION 2

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

- 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 (8 meters) 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. The smoking room must be operated at a negative pressure (compared with the surrounding spaces) of at least an average of 5 Pascals (Pa) (0.02 inch water gauge) and a minimum of 1 Pa (0.004 inch water gauge) when the doors 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 (8 meters) of building entries, outdoor air intakes and operable windows opening to common areas.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## IEQ PREREQUISITE 2

- 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 air leakage into the hallway.<sup>1</sup>
- 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. Projects outside the U.S. may use a local equivalent to ANSI/ASTM-E779-03, Standard Test Method for Determining Air Leakage Rate By Fan Pressurization.
- 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. Projects outside the U.S. may use a local sampling methodology, whichever is more stringent. Residential units must demonstrate less than 1.25 square inches of leakage area per 100 square feet (8 square centimeters of leakage area per 10 square meters) of enclosure area (i.e., the sum of all wall, ceiling and floor areas).

<sup>1</sup> If the common hallways are pressurized with respect to the residential units then doors in the residential units leading to the common hallways need not be weatherstripped provided that the positive differential pressure is demonstrated as in Option 2, Case 1 above, considering the residential unit as the smoking room.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this prerequisite.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this prerequisite.

## 3. Summary of Referenced Standards

No new standards are referenced; see the LEED 2009 Green Building Operations and Maintenance Reference Guide for a summary of the standards referenced in this prerequisite. If a local equivalent to ANSI/ASTM-E779-03 has been selected, substitute that standard for the listed standard.

## 4. Implementation

Local standards for projects outside the United States will be compared with ANSI/ASTM-E779-03 in terms of scope, metrics, and thresholds. Project teams that wish to ensure acceptance of a proposed equivalent to ANSI/ASTM-E779-03 prior to submission for review may choose to submit a Formal Inquiry for a Credit Interpretation Ruling for a single project, or a LEED Interpretation for multi-project use.

Any local alternative standard to ANSI/ASTM-E779-03 must provide at least the following information:

- Air-change rate
- Air-leakage rate
- Test pressure difference

See the 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance related to this prerequisite.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this prerequisite. Project teams wishing to use a local equivalent should contact USGBC early in the design phase to ensure that the alternative standard is acceptable.

## 6. Calculations

There are no calculations required for this prerequisite.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this prerequisite.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example on installing a compliant smoking room.

## 9. Exemplary Performance

This prerequisite is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

### IEQ

EB: O&M

Prerequisite 2

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IEQ	
EB: O&M	Prerequisite 2

## 10. Regional Variations

Smoking laws vary. Some countries ban smoking within certain building types, for example, and cities, municipalities, or towns may have their own laws on smoking. Consult local laws before establishing a smoking policy for the project building.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this prerequisite.

## 12. Definitions

**Air-change rate** is the air-leakage rate in volume per hour divided by the building space volume, expressed in identical volume units.

**Air-leakage rate** is the volume of air movement across the building envelope over a unit of time.

**Test pressure difference** is the measured pressure difference across the building envelope.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of other terms used in this prerequisite.

## INDOOR AIR QUALITY BEST MANAGEMENT PRACTICES—OUTDOOR AIR DELIVERY MONITORING

## IEQ CREDIT 1.2

EB: O&M	
Credit	IEQ Credit 1.2
Points	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 (between 1 and 2 meters) 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

<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.

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IEQ	
EB: O&M	Credit 1.2

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>1</sup>) (see IEQ Prerequisite 1: Energy Efficiency Best Management Practices).

CO<sub>2</sub> sensors may be used for demand-controlled ventilation provided the control strategy complies with ASHRAE Standard 62.1-2007 ventilation rate procedure (see IEQ Prerequisite 1: Minimum Indoor Air Quality Performance, 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 floor area of all space served by natural ventilation systems is less than 5% of total occupied floor area, the project is exempt from the requirements of this section. Rooms smaller than 150 square feet (14 square meters) are also exempt.

<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.



## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

**CEN Standard EN15251: 2007, Annex B, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics**

Comité Européen de Normalisation

<http://www.cen.eu>

This standard outlines the parameters used in many EU countries to design and assess energy performance of buildings. Annex B of the standard is considered equivalent to ASHRAE 62.1–2007 for the purposes of this credit.

## 4. Implementation

Local standards for projects outside the United States will be compared with ASHRAE 62.1–2007 in terms of scope, metrics, and thresholds. Project teams that wish to ensure acceptance of a proposed equivalent to ASHRAE 62.1–2007 prior to submission for review may choose to submit a Formal Inquiry for a Credit Interpretation Ruling for a single project, or a LEED Interpretation for multi-project use.

If a local equivalent to ASHRAE 62.1 – 2007 was selected in IEQ Prerequisite 1 to determine the design minimum outdoor air rate, ensure that the same equivalent standard is used in this credit.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example describing where to place CO<sub>2</sub> sensors.

### IEQ

EB: O&M

Credit 1.2

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IEQ	
EB: O&M	Credit 1.2

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

### Websites

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See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

## INDOOR AIR QUALITY BEST MANAGEMENT PRACTICES— INCREASED VENTILATION

## IEQ CREDIT 1.3

EB: O&M	
Credit	IEQ Credit 1.3
Points	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

##### OPTION 1. ASHRAE Standard 62.1-2007 or Non-U.S. Equivalent

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>) as determined by IEQ Prerequisite 1: Minimum Indoor Air Quality Performance. Projects outside the U.S. may use a local equivalent to ASHRAE Standard 62.1-2007 if used in IEQ Prerequisite 1: Minimum Indoor Air Quality Performance.

##### OPTION 2. CEN Standard EN 15251: 2007

Projects outside the U.S. may increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by Annex B of Comité Européen de Normalisation (CEN) Standard EN 15251: 2007, Indoor environmental input parameters for design and assessment of energy performance of buildings, addressing indoor air quality, thermal environment, lighting and acoustics, determined by IEQ Prerequisite 1, Minimum Indoor Air Quality Performance.

#### CASE 2. Naturally Ventilated Spaces

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. CIBSE or Non-U.S. Equivalent

Show that the natural ventilation systems design meets the recommendations set forth in the CIBSE manuals appropriate to the project space.

##### PATH 1

CIBSE Applications Manual 10: 2005, Natural Ventilation in Non-domestic Buildings. Projects outside the U.S. may use a local equivalent.

<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.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

## IEQ CREDIT 1.3

OR

### PATH 2

CIBSE AM 13:2000, Mixed Mode Ventilation. Projects outside the U.S. may use a local equivalent.

OR

### OPTION 2. Airflow Model

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 section 6 (with errata but without addenda), at least 90% of occupied spaces. Projects outside the U.S. may use Annex B of Comité Européen de Normalisation (CEN) Standard EN 15251: 2007 or a local equivalent to section 6 of ASHRAE Standard 62.1-2007 to define the minimum ventilation rates.

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

**CEN Standard EN15251: 2007, Annex B, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics**

Comité Européen de Normalisation

<http://www.cen.eu>

This standard outlines the parameters used in many EU countries to design and assess energy performance of buildings. Annex B of the standard is considered equivalent to ASHRAE 62.1-2007 for the purposes of this credit.

## 4. Implementation

### Mechanically Ventilated Spaces

Local standards for projects outside the United States will be compared with ASHRAE 62.1-2007 in terms of scope, metrics, and thresholds. Project teams that wish to ensure acceptance of a proposed equivalent to ASHRAE 62.1-2007 prior to submission for review may choose to submit a Formal Inquiry for a Credit Interpretation Ruling for a single project, or a LEED Interpretation for multi-project use.

If a local equivalent to ASHRAE 62.1 – 2007 was selected in IEQ Prerequisite 1 to determine the design minimum outdoor air rate, ensure that the same equivalent standard is used in this credit.

### Naturally Ventilated Spaces

Local standards for projects outside the United States will be compared with the CIBSE Applications Manual 10: 2005 in terms of scope, metrics, and thresholds. Project teams that wish to ensure acceptance of a proposed equivalent to the CIBSE Applications Manual 10:2005 prior to submission for review may choose to submit a Formal Inquiry for a Credit Interpretation Ruling for a single project, or a LEED Interpretation for multi-project use.

Project teams may achieve compliance in either of two ways:

- Use a local equivalent to the compliance path in the CIBSE Applications Manual 10: 2005 (AM10), Chapter 2, which specifies the opening sizes for operable windows, trickle vents, and louvers.
- Demonstrate, via a macroscopic, multizone analytic model, that room-by-room airflow rates meet the minimum ventilation rates required by CEN Standard EN 15251: 2007, Annex B, or a local equivalent to ASHRAE Standard 62.1-2007, Section 6.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit. Project teams wishing to use a local equivalent should contact USGBC early in the design phase to ensure that the alternative standard is acceptable.

### IEQ

EB: O&M

Credit 1.3

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

IEQ	
EB: O&M	Credit 1.3

## 6. Calculations

### Mechanically Ventilated Spaces

Use the calculations in the selected standard's user manual and the IEQ Prerequisite 1 calculators, available on the LEED Resources & Tools page of the USGBC website. The same calculations are used to document IEQ Prerequisite 1.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example of a computational fluid dynamic model showing airflow velocity.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

### Websites

#### Comité Européen de Normalisation

<http://www.cen.eu>

CEN seeks to foster the European economy in global trading, the welfare of European citizens, and the environment by removing trade barriers for European industry and consumers. It provides a platform for the development of European standards and other technical specifications. To purchase CEN standards, visit the Products section on the CEN website.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

## INDOOR AIR QUALITY BEST MANAGEMENT PRACTICES—REDUCE PARTICULATES IN AIR DISTRIBUTION

### IEQ CREDIT 1.4

EB: O&M	
Credit	IEQ Credit 1.4
Points	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

In mechanically ventilated buildings, each ventilation system that supplies outdoor air shall comply with the following during the performance period:

- Particle filters or air cleaning devices shall clean the outdoor air at any location prior to its introduction to occupied spaces.
- These filters or devices shall meet one of the following criteria for all outside air intakes and inside air recirculation returns:
  - Filtration Media is rated a minimum efficiency reporting value (MERV) of 13 in accordance with ASHRAE Standard 52.2 or greater.
  - Filtration media is Class F7 or higher, as defined by CEN Standard EN 779: 2002, Particulate air filters for general ventilation, Determination of the filtration performance.
  - Filtration media has a minimum dust spot efficiency of 80% or higher and greater than 98% arrestance on a particle size of 3–10 µg.
- Establish and follow a regular schedule for maintenance and replacement of these filtration media according to the manufacturer's recommended interval.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

IEQ	
EB: O&M	Credit 1.4

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

### CEN Standard EN 779: 2002, Particulate air filters for general ventilation, Determination of the filtration performance

Comité Européen de Normalisation

<http://www.cen.eu>

This standard outlines the parameters used in many EU countries for determining filter class for all filtration media.

## 4. Implementation

Install filtration media that are Class F7 or higher or have a minimum dust spot efficiency of 80% and at least 98% arrestance on a particle size of 3–10 µg.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

There are no calculations required for this credit.

## 7. Documentation Guidance

As a first step in preparing to complete the LEED Online documentation requirements, work through the following measures. Refer to LEED Online for the complete descriptions of all required documentation.

- Maintain product literature for filters, showing compliance with the requirements.
- Create a maintenance schedule and log for filter replacement.

## 8. Examples

There are no examples for this credit.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

There are no regional variations for this credit.



## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

Websites

**Comité Européen de Normalisation**

<http://www.cen.eu>

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

### IEQ

EB: O&M

Credit 1.4

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.



## INDOOR AIR QUALITY BEST MANAGEMENT PRACTICES—INDOOR AIR QUALITY MANAGEMENT FOR FACILITY ALTERATIONS AND ADDITIONS

## IEQ CREDIT 1.5

EB: O&M	
Credit	IEQ Credit 1.5
Points	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 (4,500 cubic meters per square meter) of floor area while maintaining an internal temperature of at least 60°F (15°C) 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 (1,000 cubic meters of outdoor air per square meter) of floor area and the space has been ventilated at a minimum rate of 0.3 cubic foot of outdoor air per minute per square foot (0.1 cubic meter of outdoor air per minute per square meter) 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 of outdoor air per square foot (4,500 cubic meters of outdoor air per square meter) 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 must be used at each return air grille and must meet one of the following criteria below. Replace all filtration media immediately prior to occupancy.
  - Filtration media has a minimum efficiency reporting value (MERV) of 8, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda).
  - Equivalent filtration media Class F5 or higher, as defined by CEN Standard EN 779-2002, Particulate air filters for general ventilation, Determination of the filtration performance.
  - Equivalent filtration media with a minimum dust spot efficiency of 30% and greater than 90% arrestance on a particle size of 3–10 µg.
- Upon the completion of construction, HVAC and lighting systems must be returned to the designed or modified sequence of operations.

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

IEQ	
EB: O&M	Credit 1.5

## 1. Benefits and Issues to Consider

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

### CEN Standard EN 779: 2002, Particulate air filters for general ventilation, Determination of the filtration performance

Comité Européen de Normalisation

<http://www.cen.eu>

This standard outlines the parameters used in many EU countries for determining filter class for all filtration media.

## 4. Implementation

### HVAC Protection

All filtration media must be Class F5 or higher or have a minimum dust spot efficiency of 30% and at least 90% arrestance on a particle size of 3–10 µg. If an unducted plenum over the construction zone must be used, isolate it by having all ceiling tiles in place. Check for leaks in the return ducts and air handlers and make needed repairs promptly. The contractor should avoid using the mechanical rooms for construction storage.

See the 2009 Green Building Operations and Maintenance Reference Guide for additional implementation guidance.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for flush-out calculations.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example of an indoor air quality management plan. Ensure that the plan includes HVAC protection and specifies filters that are Class F5 or higher or have a minimum dust spot efficiency of 30% and at least 90% arrestance on a particle size of 3–10 µg.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

There are no regional variations applicable to this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

### IEQ

EB: O&M

Credit 1.5

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## OCCUPANT COMFORT—THERMAL COMFORT MONITORING

## IEQ CREDIT 2.3

EB: O&M	
Credit	IEQ Credit 2.3
Points	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 by one of the following standards:

#### OPTION 1. ASHRAE Standard 55-2004 or Non-U.S. Equivalent

ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy (with errata but without addenda). Projects outside the U.S. may use a local equivalent to ASHRAE Standard 55-2004 Thermal Comfort Conditions for Human Occupancy.

#### OPTION 2. ISO 7730: 2005 & CEN Standard EN 15251: 2007

Projects outside the U.S. may earn this credit by meeting the requirements of International Organization for Standardization (ISO) 7730, Ergonomics of the thermal environment, Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria; and CEN Standard EN 15251: 2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics.

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.

For projects outside the U.S., any Type 1 eco-labeling program as defined by ISO 14024: 1999 developed by a member of the Global Ecolabelling Network may be used in lieu of Green Seal or Environmental Choice standards.

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

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

**ADDITIONAL GUIDANCE FOR THIS CREDIT IS FORTHCOMING****1. Benefits and Issues to Consider**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for information on environmental and economic issues related to this credit.

**2. Related Credits**

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

**3. Summary of Referenced Standards**

**CEN Standard EN15251: 2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics**

Comité Européen de Normalisation

<http://www.cen.eu>

This standard outlines the parameters used in many EU countries to design and assess energy performance of buildings. Used in conjunction with ISO standard 7730: 2005, it is considered equivalent to ASHRAE 55-2004 for the purposes of this credit.

**ISO Standard 7730: 2005, Ergonomics of the thermal environment, Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria**

International Organization for Standardization

<http://www.iso.org>

This standard “presents methods for predicting the general thermal sensation and degree of discomfort (thermal dissatisfaction) of people exposed to moderate thermal environments” and should be used in conjunction with CEN standard EN 15251: 2007.

**4. Implementation**

Local standards for projects outside the United States will be compared with ASHRAE 55-2004 in terms of scope, metrics, and thresholds. Project teams that wish to ensure acceptance of a proposed equivalent to ASHRAE 55-2004 prior to submission for review may choose to submit a Formal Inquiry for a Credit Interpretation Ruling for a single project, or a LEED Interpretation for multi-project use.

In order to demonstrate equivalency using a local standard, the local standard must address all of the critical requirements of ASHRAE 55-2004, identified below.

**Factors Affecting Thermal Comfort (ASHRAE 55-2004, Section 5.1):**

There are six primary factors for defining conditions for thermal comfort for occupants. The six factors are metabolic (MET) rate, clothing insulation, air temperature, radiant temperature, air speed, and humidity.

In order to demonstrate equivalency, the local standard shall:

- Define acceptable thermal comfort conditions.
- Include a well-defined procedure to determine thermal comfort conditions.
  - The procedure shall define an acceptable thermal comfort zone.
    - At least 80% of occupants must be satisfied within the zone.
  - The procedure shall include the following parameters in the calculation:
    - Operative Temperature or a combination of air temperature and radiant temperature.



-Humidity

-Air Speed

1. Require a maximum air speed threshold for supply air systems (40 fpm [0.203 meters per second] is recommended but variances are allowed up to 10%).

-Local Thermal Discomfort

1. Address temperature variations due to draft, vertical temperature differences, and radiant asymmetry. Thresholds for these may differ from ASHRAE 55-2004 within an acceptable range

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for further implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

There are no calculations associated with this credit.

## 7. Documentation Guidance

As a first step in preparing to complete the LEED Online documentation requirements, work through the following measures. Refer to LEED Online for the complete descriptions of all required documentation.

- For projects using a local equivalent in Option 1, the local standard shall address all the issues identified under Implementation.

If the selected equivalent standard contains deviations or omissions for sections specified under Implementation, provide relevant data to justify the omissions or deviations.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example detailing an underfloor air distribution system with individual controls.

## 9. Exemplary Performance

This credit is not eligible for exemplary performance under the Innovation in Operations section of the LEED 2009 rating system.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

### IEQ

EB: O&M

Credit 2.3

**IMPORTANT!** This reference guide supplement contains only the reference guide sections that pertain to projects using the LEED 2009 Global ACPs or India ACPs. Use this supplement alongside the LEED Reference Guide for Green Building Operations and Maintenance for complete credit information. For the omitted sections, refer to the main reference guide.

IEQ	
EB: O&M	Credit 2.3

### 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

## GREEN CLEANING—PURCHASE OF SUSTAINABLE CLEANING PRODUCTS AND MATERIALS

## IEQ CREDIT 3.3

EB: O&M	
Credit	IEQ Credit 3.3
Points	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 (or local equivalent for projects outside of the U.S.) for Janitorial Paper and Plastic Trash Can Liners.
  - Green Seal GS-09, for paper towels and napkins.
  - Green Seal GS-01, for tissue paper.

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## IEQ CREDIT 3.3

- Environmental Choice CCD-082, for toilet tissue.
- Environmental Choice CCD-086, for hand towels.
- 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.

For projects outside the U.S., any Type 1 eco-labeling program as defined by ISO 14024: 1999 developed by a member of the Global Ecolabelling Network may be used in lieu of Green Seal or Environmental Choice standards.

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

IEQ	
EB: O&M	Credit 3.3

## 1. Benefits and Issues to Consider

The Global Ecolabelling Network (GEN) is a non-profit association of Type-1 ecolabelling organizations as defined by the ISO 14024 standard. Type-1 programs are voluntary; their standards address multiple environmental criteria across the life cycle of the product or service and are transparent in their development process by employing independent, third-party verification.

Products certified by member organizations of GEN have a lower environmental burden and impact than comparable products and services. Ecolabeled products within GEN meet certain sustainability criteria and are proven to be cost effective over the product's lifetime.

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for additional information on environmental and economic issues related to this credit.

## 2. Related Credits

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for a list of credits related to this credit.

## 3. Summary of Referenced Standards

**ISO Standard 14024:1999 Environmental labels and declarations – Type I environmental labeling – Principles and procedures**

<http://www.iso.org/>

This International Standard establishes the principles and procedures for developing Type I environmental labeling programs. This International Standard also establishes the certification procedures for awarding the label.

## 4. Implementation

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for implementation guidance related to this credit.

## 5. Timeline and Team

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance related to this credit.

## 6. Calculations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for calculations associated with this credit.

## 7. Documentation Guidance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for documentation guidance related to this credit.

## 8. Examples

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for an example detailing a sample estimate for a nonparticipating tenant.

## 9. Exemplary Performance

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for guidance on exemplary performance for this credit.

## 10. Regional Variations

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for regional

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IEQ	
EB: O&M	Credit 3.3

variations associated with this credit.

## 11. Resources

See USGBC's LEED Resources & Tools (<http://www.usgbc.org/leed/tools>) for additional resources and technical information.

### Websites

#### Global Ecolabelling Network

<http://www.globalecolabelling.net>

The Global Ecolabelling Network is a type-1 Ecolabelling organization as defined by ISO 14024:1999. Type-1 programs are voluntary, transparent in development, employ third party verification, and address environmental impact criteria across life cycles of products and services.

#### Global Ecolabelling Network Product List

[http://www.globalecolabelling.net/categories\\_7\\_criteria/list\\_by\\_program/index.htm](http://www.globalecolabelling.net/categories_7_criteria/list_by_program/index.htm)

This website lists product categories and matrixes them to respective country programs.

#### International Organization for Standards

<http://www.iso.org>

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for resources related to this credit.

## 12. Definitions

See the LEED 2009 Green Building Operations and Maintenance Reference Guide for definitions of terms used in this credit.

**Air-change rate** is the air-leakage rate in volume per hour divided by the building space volume, expressed in identical volume units.

**Air-leakage rate** is the volume of air movement across the building envelope over a unit of time.

The EU organic farming logo is the European Community's certification for products that meet EU regulations for organically produced food products.

An **Inland waterway** is a navigable body of water, such as a river, canal or lake that is deep, wide and slow enough for a vessel to pass.

**Low-Impact Development (LID)** is an approach to managing stormwater runoff that emphasizes onsite natural features to protect water quality by replicating the natural land cover hydrologic regime of watersheds and addressing runoff close to its source. Examples include better site design principles, such as minimizing land disturbance, preserving vegetation, and minimizing impervious cover, and design practices like rain gardens, vegetated swales and buffers, permeable pavement, rainwater harvesting, and soil amendments. These engineered practices may require specialized design assistance.

**Month with the highest irrigation demand** is the maximum monthly delta between evapotranspiration rate (ET<sub>o</sub>) and mean monthly rainfall.

**Rideshare** is a transit service that involves sharing a single vehicle with multiple people, excluding large-scale vehicles such as buses and trains. The rideshare transit facility must include a signed stop and a clearly defined waiting area. Additionally, the rideshare must include an enclosed passenger seating area, fixed route service, fixed fare structure, continuous daily operation, and the ability to pick up and drop off multiple riders. Rideshare vehicles must hold 4 or more passengers, except for human-powered conveyances, which must hold 2 or more passengers.

**Test pressure difference** is the measured pressure difference across the building envelope.