

# Sustainable Sites

## SS Prerequisite 1: Construction Activity Pollution Prevention Required

### Intent

Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.

### Requirements

Create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local erosion and sedimentation control standards and codes, whichever is more stringent. The Plan shall describe the measures implemented to accomplish the following objectives:

- Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- Prevent sedimentation of storm sewer or receiving streams.
- Prevent polluting the air with dust and particulate matter.

The Construction General Permit (CGP) outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. While the CGP only applies to construction sites greater than 1 acre, the requirements are applied to all projects for the purposes of this prerequisite. Information on the EPA CGP is available at: <http://cfpub.epa.gov/npdes/stormwater/cgp.cfm>.

### Potential Technologies & Strategies

Create an Erosion and Sedimentation Control Plan during the design phase of the project. Consider employing strategies such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps and sediment basins.

## **SS Credit 4.2: Alternative Transportation: Bicycle Storage & Changing Rooms**

### **1 Point**

#### **Intent**

Reduce pollution and land development impacts from automobile use.

#### **Requirements**

For commercial or institutional buildings, provide secure bicycle racks and/or storage (within 200 yards of a building entrance) for 5% or more of all building users (measured at peak periods), AND, provide shower and changing facilities in the building, or within 200 yards of a building entrance, for 0.5% of Full-Time Equivalent (FTE) occupants.

OR

For residential buildings, provide covered storage facilities for securing bicycles for 15% or more of building occupants in lieu of changing/shower facilities.

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

Design the building with transportation amenities such as bicycle racks and showering/changing facilities.

## **SS Credit 6.1: Stormwater Design: Quantity Control**

### **1 Point**

#### **Intent**

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

#### **Requirements**

##### **CASE 1 — EXISTING IMPERVIOUSNESS IS LESS THAN OR EQUAL TO 50%**

Implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for the one- and two-year 24-hour design storms.

OR

Implement a stormwater management plan that protects receiving stream channels from excessive erosion by implementing a stream channel protection strategy and quantity control strategies.

OR

##### **CASE 2 — EXISTING IMPERVIOUSNESS IS GREATER THAN 50%**

Implement a stormwater management plan that results in a 25% decrease in the volume of stormwater runoff from the two-year 24-hour design storm.

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

Design the project site to maintain natural stormwater flows by promoting infiltration. Specify vegetated roofs, pervious paving, and other measures to minimize impervious surfaces. Reuse stormwater volumes generated for non-potable uses such as landscape irrigation, toilet and urinal flushing and custodial uses.

## SS Credit 6.2: Stormwater Design: Quality Control

### 1 Point

#### Intent

Limit disruption and pollution of natural water flows by managing stormwater runoff.

#### Requirements

Implement a stormwater management plan that reduces impervious cover, promotes infiltration, and captures and treats the stormwater runoff from 90% of the average annual rainfall<sup>1</sup> using acceptable best management practices (BMPs).

BMPs used to treat runoff must be capable of removing 80% of the average annual post development total suspended solids (TSS) load based on existing monitoring reports. BMPs are considered to meet these criteria if (1) they are designed in accordance with standards and specifications from a state or local program that has adopted these performance standards, or (2) there exists in-field performance monitoring data demonstrating compliance with the criteria. Data must conform to accepted protocol (e.g., Technology Acceptance Reciprocity Partnership [TARP], Washington State Department of Ecology) for BMP monitoring.

#### Potential Technologies & Strategies

Use alternative surfaces (e.g., vegetated roofs, pervious pavement or grid pavers) and nonstructural techniques (e.g., rain gardens, vegetated swales, disconnection of imperviousness, rainwater recycling) to reduce imperviousness and promote infiltration thereby reducing pollutant loadings.

Use sustainable design strategies (e.g., Low Impact Development, Environmentally Sensitive Design) to design integrated natural and mechanical treatment systems such as constructed wetlands, vegetated filters, and open channels to treat stormwater runoff.

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<sup>1</sup> In the United States, there are three distinct climates that influence the nature and amount of rainfall occurring on an annual basis. Humid watersheds are defined as those that receive at least 40 inches of rainfall each year, Semi-arid watersheds receive between 20 and 40 inches of rainfall per year, and Arid watersheds receive less than 20 inches of rainfall per year. For this credit, 90% of the average annual rainfall is equivalent to treating the runoff from:

- (a) Humid Watersheds – 1 inch of rainfall;
- (b) Semi-arid Watersheds – 0.75 inches of rainfall; and
- (c) Arid Watersheds – 0.5 inches of rainfall.

## SS Credit 7.2: Heat Island Effect: Roof

### 1 Point

#### Intent

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

#### Requirements

##### OPTION 1

Use roofing materials having a Solar Reflectance Index (SRI)<sup>3</sup> equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

OR

##### OPTION 2

Install a vegetated roof for at least 50% of the roof area.

OR

##### OPTION 3

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

$$(\text{Area of SRI Roof} / 0.75) + (\text{Area of vegetated roof} / 0.5) \geq \text{Total Roof Area}$$

Roof Type	Slope	SRI
Low-Sloped Roof	$\leq 2:12$	78
Steep-Sloped Roof	$> 2:12$	29

#### Potential Technologies & Strategies

Consider installing high-albedo and vegetated roofs to reduce heat absorption. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371. Default values will be available in the LEED-NC v2.2 Reference Guide. Product information is available from the Cool Roof Rating Council website, at [www.coolroofs.org](http://www.coolroofs.org).

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<sup>3</sup> The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

# Water Efficiency

## WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%

### 1 Point

#### Intent

Limit or eliminate the use of potable water, or other natural surface or subsurface water resources available on or near the project site, for landscape irrigation.

#### Requirements

Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case.

Reductions shall be attributed to any combination of the following items:

- Plant species factor
- Irrigation efficiency
- Use of captured rainwater
- Use of recycled wastewater
- Use of water treated and conveyed by a public agency specifically for non-potable uses

#### Potential Technologies & Strategies

Perform a soil/climate analysis to determine appropriate plant material and design the landscape with native or adapted plants to reduce or eliminate irrigation requirements. Where irrigation is required, use high-efficiency equipment and/or climate-based controllers.

# Energy & Atmosphere

## EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems Required

### Intent

Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents.

### Benefits of Commissioning

Benefits of commissioning include reduced energy use, lower operating costs, reduced contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner's project requirements.

### Requirements

The following commissioning process activities shall be completed by the commissioning team, in accordance with the LEED-NC 2.2 Reference Guide.

- 1) Designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the completion of the commissioning process activities.
  - a) The CxA shall have documented commissioning authority experience in at least two building projects.
  - b) The individual serving as the CxA shall be independent of the project's design and construction management, though they may be employees of the firms providing those services. The CxA may be a qualified employee or consultant of the Owner.
  - c) The CxA shall report results, findings and recommendations directly to the Owner.
  - d) For projects smaller than 50,000 gross square feet, the CxA may include qualified persons on the design or construction teams who have the required experience.
- 2) The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.
- 3) Develop and incorporate commissioning requirements into the construction documents.
- 4) Develop and implement a commissioning plan.
- 5) Verify the installation and performance of the systems to be commissioned.
- 6) Complete a summary commissioning report.

## **Commissioned Systems**

Commissioning process activities shall be completed for the following energy-related systems, at a minimum:

- Heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls
- Lighting and daylighting controls
- Domestic hot water systems
- Renewable energy systems (wind, solar etc.)

## **Potential Technologies & Strategies**

Owners are encouraged to seek out qualified individuals to lead the commissioning process. Qualified individuals are identified as those who possess a high level of experience in the following areas:

- Energy systems design, installation and operation
- Commissioning planning and process management
- Hands-on field experience with energy systems performance, interaction, start-up, balancing, testing, troubleshooting, operation, and maintenance procedures
- Energy systems automation control knowledge

Owners are encouraged to consider including water-using systems, building envelope systems, and other systems in the scope of the commissioning plan as appropriate. The building envelope is an important component of a facility which impacts energy consumption, occupant comfort and indoor air quality. While it is not required to be commissioned by LEED, an owner can receive significant financial savings and reduced risk of poor indoor air quality by including building envelope commissioning.

The LEED-NC 2.2 Reference Guide provides guidance on the rigor expected for this prerequisite for the following:

- Owner's project requirements
- Basis of design
- Commissioning plan
- Commissioning specification
- Performance verification documentation
- Commissioning report



# **Materials & Resources**

## **MR Prerequisite 1: Storage & Collection of Recyclables Required**

### **Intent**

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

### **Requirements**

Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals.

### **Potential Technologies & Strategies**

Coordinate the size and functionality of the recycling areas with the anticipated collection services for glass, plastic, office paper, newspaper, cardboard and organic wastes to maximize the effectiveness of the dedicated areas. Consider employing cardboard balers, aluminum can crushers, recycling chutes and collection bins at individual workstations to further enhance the recycling program.

## **MR Credit 1.1: Building Reuse: Maintain 75% of Existing Walls, Floors & Roof**

### **1 Point**

#### **Intent**

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

#### **Requirements**

Maintain at least 75% (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project scope shall be excluded from the calculation of the percentage maintained. If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.

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

Consider reuse of existing, previously occupied buildings, including structure, envelope and elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency such as windows, mechanical systems and plumbing fixtures.

## **MR Credit 1.2: Building Reuse – Maintain 95% of Existing Walls, Floors & Roof**

### **1 Point in addition to MR Credit 1.1**

#### **Intent**

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

#### **Requirements**

Maintain an additional 20% (95% total, based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project scope shall be excluded from the calculation of the percentage maintained. If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.

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

Consider reuse of existing buildings, including structure, envelope and elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency such as windows, mechanical systems and plumbing fixtures.

## **MR Credit 1.3: Building Reuse: Maintain 50% of Interior Non-Structural Elements**

### **1 Point**

#### **Intent**

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

#### **Requirements**

Use existing interior non-structural elements (interior walls, doors, floor coverings and ceiling systems) in at least 50% (by area) of the completed building (including additions). If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.

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

Consider reuse of existing buildings, including structure, envelope and interior non-structural elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency, such as mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

# Indoor Environmental Quality

## EQ Prerequisite 1: Minimum IAQ Performance Required

### Intent

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

### Requirements

Meet the minimum requirements of Sections 4 through 7 of ASHRAE 62.1-2004, Ventilation for Acceptable Indoor Air Quality. Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent.

Naturally ventilated buildings shall comply with ASHRAE 62.1-2004, paragraph 5.1.

### Potential Technologies & Strategies

Design ventilation systems to meet or exceed the minimum outdoor air ventilation rates as described in the ASHRAE standard. Balance the impacts of ventilation rates on energy use and indoor air quality to optimize for energy efficiency and occupant health. Use the ASHRAE 62 Users Manual for detailed guidance on meeting the referenced requirements.

## **EQ Credit 3.1: Construction IAQ Management Plan: During Construction**

### **1 Point**

#### **Intent**

Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.

#### **Requirements**

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- 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, 1995, Chapter 3.
- Protect stored on-site or installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

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

Adopt an IAQ management plan to protect the HVAC system during construction, control pollutant sources and interrupt contamination pathways. Sequence the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile and gypsum wallboard. Coordinate with Indoor Environmental Quality Credits 3.2 and 5 to determine the appropriate specifications and schedules for filtration media.

If possible, avoid using permanently installed air handlers for temporary heating/cooling during construction. Consult the LEED-NC v2.2 Reference Guide for more detailed information on how to ensure the well-being of construction workers and building occupants if permanently installed air handlers must be used during construction.

## EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants

### 1 Point

#### Intent

Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

#### Requirements

All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the following reference standards:

- Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168. VOC limits are listed in the table below and correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.

<b>Architectural Applications</b>	<b>VOC Limit [g/L less water]</b>	<b>Specialty Applications</b>	<b>VOC Limit [g/L less water]</b>
Indoor Carpet Adhesives	50	PVC Welding	510
Carpet Pad Adhesives	50	CPVC Welding	490
Wood Flooring Adhesives	100	ABS Welding	325
Rubber Floor Adhesives	60	Plastic Cement Welding	250
Subfloor Adhesives	50	Adhesive Primer for Plastic	550
Ceramic Tile Adhesives	65	Contact Adhesive	80
VCT & Asphalt Adhesives	50	Special Purpose Contact Adhesive	250
Drywall & Panel Adhesives	50	Structural Wood Member Adhesive	140
Cove Base Adhesives	50	Sheet Applied Rubber Lining Operations	850
Multipurpose Construction Adhesives	70	Top & Trim Adhesive	250
Structural Glazing Adhesives	100		
<b>Substrate Specific Applications</b>	<b>VOC Limit [g/L less water]</b>	<b>Sealants</b>	<b>VOC Limit [g/L less water]</b>
Metal to Metal	30	Architectural	250
Plastic Foams	50	Nonmembrane Roof	300
Porous Material (except wood)	50	Roadway	250
Wood	30	Single-Ply Roof Membrane	450
Fiberglass	80	Other	420
<b>Sealant Primers</b>	<b>VOC Limit [g/L less water]</b>		
Architectural Non Porous	250		
Architectural Porous	775		
Other	750		

- Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

## **EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings**

### **1 Point**

#### **Intent**

Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

#### **Requirements**

Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the following criteria:

- Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
  - Flats: 50 g/L
  - Non-Flats: 150 g/L
- Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
- Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements: Do not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
  - Clear wood finishes: varnish 350 g/L; lacquer 550 g/L
  - Floor coatings: 100 g/L
  - Sealers: waterproofing sealers 250 g/L; sanding sealers 275 g/L; all other sealers 200 g/L
  - Shellacs: Clear 730 g/L; pigmented 550 g/L
  - Stains: 250 g/L

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

Specify low-VOC paints and coatings in construction documents. Ensure that VOC limits are clearly stated in each section of the specifications where paints and coatings are addressed. Track the VOC content of all interior paints and coatings during construction.



## **EQ Credit 4.3: Low-Emitting Materials: Carpet Systems**

### **1 Point**

#### **Intent**

Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

#### **Requirements**

All carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.

All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program.

All carpet adhesive shall meet the requirements of EQ Credit 4.1: VOC limit of 50 g/L.

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

Clearly specify requirements for product testing and/or certification in the construction documents. Select products that are either certified under the Green Label Plus program or for which testing has been done by qualified independent laboratories in accordance with the appropriate requirements.

The Green Label Plus program for carpets and its associated VOC emission criteria in micrograms per square meter per hour, along with information on testing method and sample collection developed by the Carpet & Rug Institute (CRI) in coordination with California's Sustainable Building Task Force and the California Department of Health Services (DHS), are described in Section 9, Acceptable Emissions Testing for Carpet, DHS Standard Practice CA/DHS/EHLB/R-174, dated 07/15/04. This document is available at: [www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Section01350\\_7\\_15\\_2004\\_FINAL\\_PLUS\\_ADDENDUM-2004-01.pdf](http://www.dhs.ca.gov/ps/deodc/ehlb/iaq/VOCS/Section01350_7_15_2004_FINAL_PLUS_ADDENDUM-2004-01.pdf), (also published as Section 01350 Section 9 [dated 2004] by the Collaborative for High Performance Schools [[www.chps.net](http://www.chps.net)]).

## EQ Credit 8.1: Daylight & Views: Daylight 75% of Spaces

### 1 Point

#### Intent

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

#### Requirements

##### OPTION 1 — CALCULATION

Achieve a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas. The glazing factor is calculated as follows:

<b>Glazing Factor</b>	<b>=</b>	$\frac{\text{Window Area [SF]}}{\text{Floor Area [SF]}}$	<b>x</b>	<b>Window Geometry Factor</b>	<b>x</b>	$\frac{\text{Actual } T_{vis}}{\text{Minimum } T_{vis}}$	<b>x</b>	<b>Window Height Factor</b>
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OR

##### OPTION 2 — SIMULATION

Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 footcandles has been achieved in a minimum of 75% of all regularly occupied areas. Modeling must demonstrate 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.

OR

##### OPTION 3 — MEASUREMENT

Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

In all cases, only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements can be applied towards the 75% of total area calculation required to qualify for this credit.

## **ID Credit 2: LEED Accredited Professional**

### **1 Point**

#### **Intent**

To support and encourage the design integration required by a LEED-NC green building project and to streamline the application and certification process.

#### **Requirements**

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

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

Educate the project team members about green building design & construction and application of the LEED Rating System early in the life of the project. Consider assigning the LEED AP as a facilitator of an integrated design & construction process.