

Using Concrete to Achieve Credits in LEED for Homes

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Concrete's many environmentally friendly benefits can help achieve certification using the LEED for Homes green building rating system. Leadership in Energy and Environmental Design for Homes (LEED-H) is a point based rating system devised by the U.S. Green Building Council (USGBC) to evaluate the environmental performance of residential buildings. The system is credit-based, allowing residential projects to earn points for environmentally friendly strategies employed during the design and construction process.

U.S. Green Building Council (USGBC) has developed several LEED systems, including LEED for New Construction, LEED for Core and Shell, LEED for Schools, LEED for Health Care, LEED for Neighborhood Development and LEED for Homes, among others. LEED for Homes was released by the U.S. Green Building Council in January 2008 and is intended to cover single-family houses and multi-family residences less than three stories in height.

LEED-H is a voluntary, consensus-based national standard for developing high-performance, sustainable homes. LEED provides a framework for evaluating residential performance and for meeting sustainability goals through eight credit categories: Innovation and Design Processes (ID), Location and Linkages (LL), Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Materials and Resources (MR),

Indoor Environmental Quality (EQ), and Awareness and Education (AE). Specific points available in each credit category are provided in Table 1. It should be noted, however, that LEED points are not gained directly by the use of a product but by meeting a specific sustainability goal of the rating program. Concrete can contribute to all LEED credit categories.

Table 1. LEED for Homes credit categories and points available in each category.

Credit Category	Points Available
Innovation and Design Processes (ID)	10
Location and Linkages (LL)	10
Sustainable Sites (SS)	22
Water Efficiency (WE)	15
Energy and Atmosphere (EA)	38
Materials and Resources (MR)	16
Indoor Environmental Quality (EQ)	21
Awareness and Education (AE)	3
Total Points Available	136

Points for Certification

LEED-H provides points for specific green building strategies. The program does not require that every project meet identical requirements or have identical design to achieve certification. Instead, the LEED-H rating system provides credit for achieving a level of sustainability, in most cases,

regardless of the material or method chosen. Four levels of certification are available: Certified, Silver, Gold

and Platinum. A building requires at least 45 points for basic certification level. Silver level requires 60 points, Gold level requires 75 points, and Platinum level requires 90 points. There are a total of 136 points available. Certification levels are provided in Table 2.

Table 2. LEED for Homes certification levels and points required for each level.

LEED-H Certification Levels	Points Required
Certified	45-59
Silver	60-74
Gold	75-89
Platinum	90+

Concrete and LEED for Homes

The following are suggestions for earning LEED points through the use of ready mixed concrete products. The paragraph headings correspond to the credit categories and the credit numbers in the LEED-H rating system.





Innovation in Design Credit 2: Durability Management Processes

The intent of this credit is to promote durability and high performance of the building enclosures and its components and systems through appropriate design, materials selection and construction practices. To achieve this credit, the project team must develop specific measures, among other requirements, to ensure durability and moisture control within the home. Concrete homes have proven to have unparalleled disaster and wind resistance, durable long lasting finishes, low maintenance, less frequent replacement, and mold and mildew resistance.



Location and Linkages Credit 3: Preferred Locations

The intent of this credit is to encourage the building of LEED homes near or within existing communities. This credit can be achieved in part by locating the lot such that 75% of the perimeter borders previously developed land or if the home is built on a previously developed lot. A brownfield site is previously developed property, for which the expansion, redevelopment or reuse is complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant. Cementitious materials can be used to solidify and stabilize contaminated soils and reduce leaching concentrations to below regulatory levels. Although not typical, ready mixed concrete trucks and plants have been used to mix and deliver cementitious slurries for solidification and stabilization projects.

Sustainable Sites Credit 1: Site Stewardship

The intent of this credit is to minimize longterm environmental damage to the building lot during the construction process. This credit can be achieved in part by minimizing disturbance area of the site. Concrete basements can increase living space without increasing building footprint reducing site disturbance. In addition, fire resistant concrete building systems allow for increased development density, including multifamily construction.

Sustainable Sites Credit 3: Heat Islands

The Intent of this credit is to reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat. This credit requires high albedo materials (reflectance of at least 0.3) and/or vegetation for at least 50% of the sidewalks, patios and driveways within 50 feet of the home. White concrete and new gray concrete typically have SRI of at least 29; therefore, they meet the requirements of this credit. Concrete materials other than typical white or gray concrete must be tested in accordance with ASTM E903, ASTM E1918 or ASTM C1549 to determine the material's albedo.

Sustainable Sites Credit 4: Surface Water Management

The intent of this credit is to design site features to minimize erosion and runoff from the home site. Several options exist to achieve this credit, however, the lot must be designed such that 70% of the built environment (not including area under roof) is permeable or designed to capture stormwater runoff on site. One method to achieve this credit is through the use of permeable paving such as pervious concrete. The pervious paving must include porous above ground materials and 6-inch porous sub-base and the base layer must be designed to ensure proper drainage away from the home.

Sustainable Sites Credit 5: Nontoxic Pest Control

The intent of this credit is to design home features to minimize the need for poisons for control of insects, rodents and other pests. In areas where "moderate to heavy" through "very heavy" termite infestation exists based on the probability map provided in the LEED for homes document, points are awarded if non-cellulosic wall materials are not used and/or solid concrete foundation walls are provided. Concrete wall and floor and roof systems can be used for above-grade and below-grade applications to meet the intent of this credit.

Water Efficiency Credit 1: Water Reuse

The intent of this credit is to use municipal recycled water or offset central water supply through the capture and controlled reuse

of rainwater and/or graywater. To achieve this credit, a rainwater harvesting system must be installed to hold all the water from a 1-inch rainfall event. One method of rainwater harvesting is through the use concrete cisterns.

Energy and Atmosphere Pre-requisite 1: Optimize Energy Performance Energy and Atmosphere Credit 1: Optimize Energy Performance

The intent of these credits is to improve the overall energy performance of the home by meeting or exceeding the performance requirements of an ENERGY STAR labeled home. To achieve this prerequisite, you must meet the prerequisite ENERGY STAR program and have third party verification. To achieve points under credit 1, you must exceed the requirements of the ENERGY STAR program based on the Home Energy Standards (HERS) equations found in LEED-H. Up to 34 points are available. The primary role of ready mixed concrete in improving energy performance is in reducing heat loss and gain through foundation and exterior above grade walls using insulated wall technologies that incorporate insulation and thermal mass. Using these high-performance wall systems can save energy and help reduce heating and cooling equipment size that can lead to further energy and construction cost savings.

Energy and Atmosphere Credit 2: Insulation

The intent of this credit is to minimize heat transfer and thermal bridging. To achieve this credit, insulation must exceed the R-value requirements listed in Chapter 4 of the 2004 International Energy Conservation Code (IECC) by at least 5%. Concrete wall systems such as insulated concrete forms (ICFs), insulated tilt-up concrete wall systems and traditional insulated concrete walls can help meet the requirements of this credit.

Energy and Atmosphere Credit 3: Air Infiltration

The intent of this credit is to minimize energy consumption caused by uncontrolled air leakage into and out of conditioned spaces. To meet the criteria of this credit, the air leakage rate for the home must be



in the range of 1.5 to 7.0 depending on the IECC climate zone as specified in Table 17 of LEED-H. Concrete forms an integral wall which is often solid and airtight, which can help meet the criteria of this credit.

Materials and Resources Credit 2: Environmentally Preferable Products

The intent of this credit is to increase the demand for environmentally preferable products or building products that are extracted, processed and manufactured within the

region. To achieve credits, 90% of the building materials must meet one or more of the following criteria:

- Environmentally preferred products.
- Low emissions.
- Local products. Use products that were extracted, processed and manufactured within 500 miles of the home.

Based on the table provided in the LEED-H, concrete using cementitious materials with 30% fly ash or slag would qualify toward a low emission material for residential foundations. In addition, ready mixed concrete almost always qualifies for the local products portion of this credit because it is produced, extracted and manufactured within the 500 miles of the home. If a portion of the material is not manufactured or processed within the 500-mile radius, an assembly calculation can be performed that would allow partial credit.

Materials and Resources Credit 3: Waste Management

The intent of this credit is to reduce waste management below the industry norm. To achieve this credit, waste must be diverted or reduced from new construction activities to levels below the industry norm. Since concrete is a relatively heavy construction material and is frequently crushed and recycled into aggregate for road base or construction fill it can contribute to this credit.

Indoor Environmental Quality Credit 1: ENERGY STAR with Indoor Air Package

The intent of this credit is to improve the overall quality of a home's indoor environment by installing an approved bundle of air quality measures. To achieve this credit, the home must complete all the requirements of the U.S. Environmental Protection Agency's ENERGY STAR with Indoor Air Package (IAP). Concrete construction provides a durable exterior envelope that is mold and moisture resistant. The concrete exterior envelope reduces air infiltration which aids in improving the overall indoor air quality of the home.

Awareness and Education Credit 1: Education of Homeowner or Tenant

The intent of this credit is to maintain the performance of the home by educating the occupants about the operations and maintenance of the home's LEED features and



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equipment. To achieve this credit, the homeowner should be provided with basic training on the home features. Concrete homes provide the homeowner with years of trouble-free durable, low maintenance living.

Benefits of LEED-H Certification

Certification using the LEED for Homes Building Standard demonstrates a positive environmental image to the community. Implementing green building practices can result in energy and cost savings over the life of a building. Other advantages include better indoor air quality and thermal comfort. Natural resources such as building materials and water are conserved. LEED certified homes can often command a premium price and resale value over conventional construction. Using concrete for homebuilding can provide solutions to many of the green building practices specified in LEED-H. Table 3 provides a summary of credits where concrete contributes to credits for residential buildings. ■

Table 3. Concrete's Potential Contribution to LEED for Homes

Credit Category	Points for Concrete
Innovation in Design (11 Points Available)	
ID Credit 2: Durability Management Process	Required
Location and Linkages (10 Points Available)	
LI Credit 3: Site Selection	2
Sustainable Sites (22 Points Available)	
SS Credit 1: Site Stewardship	1
SS Credit 3: Local Heat Island Effects	1
SS Credit 4: Surface Water Management	5
SS Credit 5: Nontoxic Pest Control	1
Water Efficiency (15 Points Available)	
WE Credit 1: Water Reuse	4
Energy and Atmosphere (38 Points Available)	
EA Pre-Requisite 1: Optimize Energy Performance	Required
EA Credit 1: Optimize Energy Performance	34
EA Credit 2: Insulation	2
EA Credit 3: Air Infiltration	3
Materials and Resources (16 Points Available)	
MR Credit 2: Environmentally Preferable Products	3.5
MR Credit 3: Construction Waste Reduction	3
Indoor Environmental Quality (21 Points Available)	
EQ Credit 1: ENERGY STAR with Indoor Air Package	13
Awareness and Education (3 Points Available)	
AE Credit 1: Education of the Homeowner or Tenant	1
Total	73.5 possible points

Detailed information on the LEED program and project certification process is available on the USGBC Web site, www.usgbc.org. More information about the environmental benefits of concrete can be found at www.nrmca.org/greenconcrete.

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