

## INTRODUCTION

Sustainable design has become one of the most prominent trends in the building industry. Designers aiming for a more environmentally-friendly building design often turn to building rating systems to help them assess the environmental impact of a building and its components. The most widely used system in the U.S. is the LEED™ Rating System.

The U.S. Green Building Council (USGBC) first developed the LEED Rating system in 1998. LEED stands for Leadership in Energy and Environmental Design. The LEED Rating System was developed to provide a method to define and measure what are commonly called “green buildings”. From its inception as a pilot program for new buildings in 1998 to the present, the LEED Rating System has expanded and grown dramatically. There are currently seven different LEED rating systems under development or in use corresponding to different types of construction, including existing buildings, commercial interiors, homes, schools, and others. The most widely used rating system in the U.S. is currently LEED-NC for New Construction and Major Renovations. While each rating system is distinct, most of the topics covered can be grouped into the same general categories. This Bulletin examines the requirements of LEED-NC version 2.2 and their relevance to cast stone.

## THE USE OF CAST STONE

Cast stone is used primarily on the exterior of buildings. Cast stone veneer may be used alone or as an integral part of a clay or concrete masonry veneer. Cast stone may also be used as an accent or trim material on the exterior of buildings sheathed with other materials such as synthetic stucco. Other opportunities for use of cast stone include caps and copings on building walls and landscape walls, stair treads, and column covers. Though not common, cast stone can also be used as pavers and in interior applications. Many of these applications can be part of a strategy to earn points under the LEED Rating System.

## THE LEED™ RATING SYSTEM

LEED-NC version 2.2 is organized into five environmental categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality; plus an innovation and design category to recognize exceptional performance or areas not covered in the other categories. Each category may contain mandatory prerequisites as well as voluntary credits that are worth points toward a building

project’s certification. Figure 1 shows the percentage of points in each of the five environmental categories.

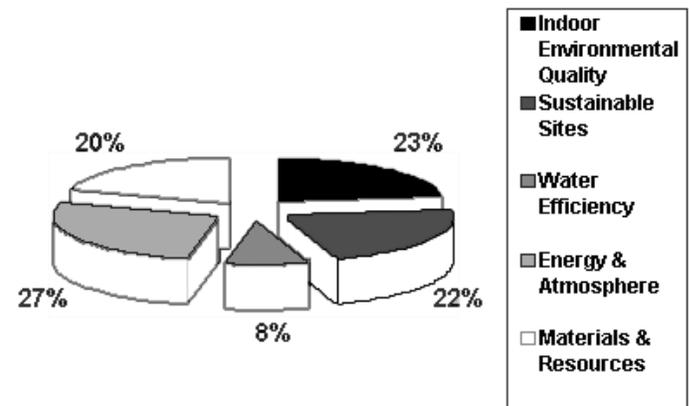


FIGURE 1: LEED-NC POINT DISTRIBUTION CERTIFICATION

A building project must earn at least 26 points out of a possible 69 to be LEED certified. In the LEED Rating System, the more points a building project earns, the “greener” the building. The USGBC recognizes four levels of LEED certification (Figure 2).

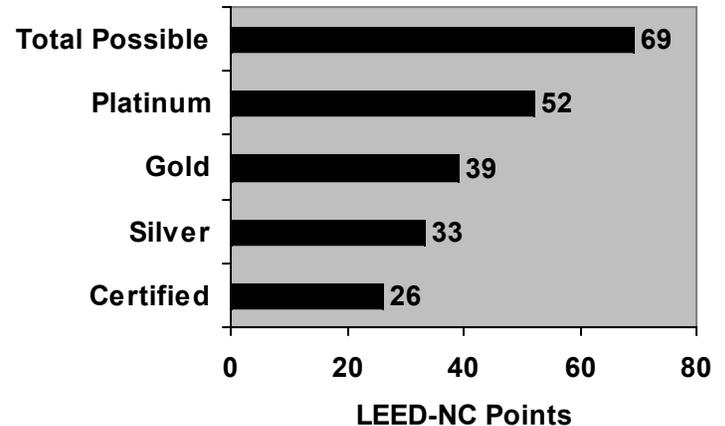


FIGURE 2: LEED-NC CERTIFICATION LEVELS EARNING LEED POINTS

Cast stone masonry can make a significant contribution toward earning LEED points on a project. While no one product or material alone can earn LEED points, (Certified wood is the only product that can earn 1 point through its use under Materials & Resources Credit 7.) cast stone masonry can be used as part of a strategy to earn points in at least 10 credits. It is important to remember that the calculations for these credits require inclusion of the entire building projects and materials to determine the percent of qualifying material.



## SUSTAINABLE SITES

This category addresses issues associated with site preparation as well as impacts on surrounding areas after construction is complete. A total of 14 points are available in the Sustainable Sites category. Cast stone may play a role in strategies associated with 4 of these credit points.

### **Credit 2 - Development Density (1 pt) -**

The intent of this credit is to encourage development in urban areas with existing infrastructure. Masonry materials are often used for urban infill development because of their appearance, size and scale, fire ratings, as well as for benefits in space required for construction. Cast stone masonry can often be installed without the use of a crane, thus helping to minimize the need for large equipment on site.

### **Credit 5.2 - Maximize Open Space (1pt) -**

The intent of this credit is to reduce the development footprint, including hardscape, parking, roads, etc. associated with the site. By building with materials such as cast stone, which do not require large open areas around the building perimeter during construction, the development footprint can be kept to a minimum and much of the surrounding land left undisturbed.

### **Credit 7.1 - non-roof Heat Island (1 pt) -**

The intent of this credit is to reduce the retention of heat due to dark colored surfaces by providing shade, using open grid pavement or using hardscape materials that are light in color for a minimum of 50% of the sites hardscape. Using cast stone hardscape as caps on landscaping walls, stair treads, and pavers with a solar reflectance index (SRI) of 29 or higher is one option for earning this point. Cast stone made with ordinary portland cement has an SRI around 35. Cast stone made with white portland cement generally has an SRI of 86. [Ref. Green Building Design with Architectural Precast article]

### **Credit 7.2 - roof Heat Island (1 pt) -**

The intent of this credit is the same as for Credit 7.1, but addresses roofs. This credit can be earned by utilizing reflective roofing materials for at least 75% of the roof's surface or installing a vegetated roof over at least 50% of the roof or some combination of both. Cast stone pavers can provide access via a walking surface as part of a vegetated, solar or other roof, or they can be used on their own. Non-vegetated roofs

with slopes equal to or less than 2:12 must have an SRI rating of 78 while roofs with slopes of greater than 2:12 must have an SRI of at least 29.

## ENERGY & ATMOSPHERE

The Energy and Atmosphere credit covers a variety of issues related to energy use associated with heating and cooling buildings including reduction in energy use, ozone reduction and use of renewable energy. There are three mandatory prerequisites and six voluntary credits that have a total of 17 points associated with them. The thermal mass associated with cast stone and other masonry materials can help reduce the amount of energy used for heating and cooling a building. There is one prerequisite and one credit associated with this intent.

### **Prerequisite 2 - minimum energy performance (0 pt) -**

As part of a masonry wall, cast stone can mitigate temperature swings and help achieve the required energy performance particularly when interior masonry is left exposed.

### **Credit 1 - Optimize energy performance (up to 10 pt) -**

As part of a masonry wall, cast stone can be used to help reduce the amount of energy consumed by the building. The benefit of thermal mass is best recognized when using an energy modeling tools such as BLAST or EnergyPlus.

## MATERIALS & RESOURCES

The intent of this category is to conserve the use of resources, encourage recycling, and reduce construction waste. There are a total of 13 points available in the Materials and Resources category. Cast stone can help earn up to 11 points in this category.

### **Credits 1.1, 1.2, 1.3 - Building Reuse (1 pt each) -**

The intent of these credits is encourage the renovation and reuse of existing buildings and interiors. Credits 1.1 and 1.2 cover the reuse of a building's structure and façade. Masonry buildings, many of which incorporate cast stone details, are good candidates for reuse. In addition, cast stone features on the building interior such as columns, fireplace mantels and surrounds, stair treads, etc. are good candidates for reuse as part of Credit 1.3.

**Credits 2.1 and 2.2 - Construction Waste Management (1pt each) -**

The intent of these credits is to eliminate construction waste from landfills. Up to 2 points can be earned for recycling or salvaging specified amounts of construction waste. On-site waste from cast stone elements is limited primarily to packaging materials. Cast stone elements are carefully detailed and exact amounts are delivered to the site so that waste stone is nearly eliminated. However, this credit is not presently structured to account for materials that do not have any or little on-site waste. It may be possible to meet the intent of this credit or an Innovation and Design credit for utilizing materials such as cast stone that have little on-site waste. The use of Innovation and Design credits are discussed later in this Bulletin. Any waste cast stone elements that are present can be crushed and used as aggregate or fill.

**Credits 3.1 and 3.2 - Materials Reuse (up to 2 pt) -**

These credits award points for the use of salvaged materials at a specified amount. Salvaged cast stone elements can be reused to help earn this credit. Anchoring details that allow for disassembly can facilitate this. Larger elements not set in mortar are especially suited for salvaging. In addition, cast stone can be repaired to conceal damage that may occur during disassembly and removal.

**Credits 4.1 and 4.2 - Recycled Content (up to 2 pt) -**

Points can be earned if the value of the recycled content of materials on a project is a least 10% for one point or 20% for two points. The recycled content of all building materials on the project must be determined to earn this credit. Cast stone elements can help earn this credit when they incorporate recycled materials into their mix, most often as aggregates or supplementary cementitious materials. Pre-consumer (post-industrial) recycled materials that may be incorporated into cast stone include recycled aggregate or slag that can be used as an aggregate, and supplementary cementitious materials like fly ash. Color may be affected by incorporation of recycled materials, so contacting the cast stone manufacturer is recommended.

**Credits 5.1 and 5.2 - Regional Materials (up to 2 pt) -**

The intent of these credits is to encourage use of materials that are extracted and manufactured within a region. One point is awarded if 10% of the total value of construction materials comes from regional sources and two points if that value is 20%. Raw materials

used in the manufacture of cast stone include the constituent materials such as cement, aggregate and water; wood, fiberglass, rubber and other materials used for forms; and steel, plastic and foam packaging materials. Most cast stone is locally produced and many raw materials are extracted or harvested within 500 miles of a project site. Exceptions to this may be cement and other materials used in the molding or packaging process. Most shipments are sent by truck

**INDOOR ENVIRONMENTAL QUALITY**

This category aims to ensure quality indoor air among other goals. One way to achieve this is by reduction or elimination of volatile organic compounds (VOCs) in materials used in the interior of a building.

**Credit 4 - Low-Emitting Materials (up to 4 pt) -**

Credit 4 covers emissions from four subcategories: adhesives and sealants; paints and coatings; carpet systems; and composite wood products. Each subcategory is worth one point. Only two of these are relevant to the use of cast stone: paints and coatings and carpet systems. While all of these subcategories are structured to keep the measured amount of VOCs of a building product below a specified limit using industry standards for measurement and specification, the intent of each is to reduce the amount of VOCs in the building interior. In this way, cast stone, like other masonry materials that do not contain any VOCs, meets the intent of eliminating VOC's from the indoor environment when used on exposed interior walls or floors.

**INNOVATION AND DESIGN PROCESS**

The Innovation and Design Process category is intended in part to award up to 4 points in Innovation in Design for exceptional performance in one of the existing LEED credit categories, or recognize innovation in areas not explicitly covered by LEED. One area not currently covered by LEED-NC in the United States is the use of durable materials. LEED-NC Canada has incorporated a credit to recognize the use of durable materials, and USGBC has indicated that this credit can be earned in the U.S. through the Innovation in Design credits. Another example of the use of the Innovation in Design credits is to meet the intent of the Indoor Environmental Quality category by using cast stone and other masonry materials to minimize the VOC content in a building. Improved Indoor Environmental Quality can also be achieved by reducing the possibility of mold growth by using materials such as cast stone and masonry that are not a food source



for mold, and by controlling moisture intrusion in a building. Similarly, it may be possible to receive an Innovation in Design credit for meeting the intent of the Construction Waste credit by reducing or eliminating on-site waste by utilizing materials such as cast stone that are delivered to the site in the exact quantities to be used, with little or no waste.

#### SUMMARY

The LEED-NC Rating System is one of the most commonly used tools in the U.S. for assessing the impact of a building and its components on the environment. LEED covers five environmental categories with credits in each that add to a total of 69 possible points. Cast stone, like other masonry materials, can play a role in strategies designed to achieve many of these credits, particularly in the Materials and Resources category.

Designers utilizing the LEED-NC Rating System are encouraged to look for opportunities and the synergy that can occur when cast stone masonry is chosen for use on a project.

#### WRITTEN BY

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*Ms. Subasic has been a member of The Masonry Society (TMS) since 1992 and a member of the Board of Directors since 2002. She serves on the Architectural Practices committee, the Design Practices committee, and is a founding member of the Sustainability Committee. Ms. Subasic also represents TMS on the U.S. Green Building Council and is a member of the Green Globes ANSI Standard Development Committee.*