

**Technical Report**

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**BARRIER-1  
HIGH PERFORMANCE  
AD MIXTURE  
AND TOPICAL SYSTEM  
And the  
LEED RATING SYSTEM**

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# **BARRIER-1 HIGH PERFORMANCE AD MIXTURE AND TOPICAL SYSTEM And the LEED RATING SYSTEM**

## **INTRODUCTION**

More and more building teams are focusing on green building for both new construction and major renovation projects. This means that they are now seeking more information about the products they select and how these products can potentially contribute points toward LEED certified building projects. Even with non-LEED projects, building owners and designers are frequently seeking to voluntarily comply with other sustainability standards, as well as updated building and energy codes, and need to know the potential advantages of each product they specify.

In an effort to assist members of the building team, Barrier-1 has commissioned The Green Apple Group, LLC to prepare an objective analysis of its Ad Mixture and Topical System products within the framework of LEED.

In developing this report, Green Apple Group relied solely on information and documents provided by Barrier-1. The LEED credit references presented in this report are based on data provided the U.S. Green Building Council (USGBC) at the time this report was prepared. The LEED applicant is ultimately responsible for determining the product attributes that will help enhance energy efficiency and reduce the environmental impact and, therefore, provide LEED-certification of a structure. The final decision on LEED compliance is ultimately determined by the judging panel at USGBC. The role of the architect, designer, contractor or other member of the building team is to document a building's sustainable design, construction, operation and performance data, and to make that data available to the USGBC. It is strongly recommended that project teams employ a LEED Accredited Professional to compile the necessary documentation for review and submittal to the USGBC for a positive outcome.

## **WHAT IS LEED**

The LEED (Leadership in Energy and Environmental Design) Rating System has emerged as a significant force in measuring sustainability in today's building industry. The initiative was developed by the U.S. Green Building Council and it is important to understand that LEED certifies projects, not products. Specific products serve as components in a system, which in turn, earns rating points toward certification. No single product can stand on its own and earn LEED points.

The USGBC is the nation's foremost non-profit coalition, comprised of over 6,000 companies and organizations from every part the building industry, united in promoting high-performance green buildings that are environmentally responsible, profitable, and healthy places to live and work. The USGBC developed the LEED Rating System as a voluntary, consensus-based national standard to support and validate successful green building design, construction, and operations. The group provides third-party certification of qualifying buildings and interiors, high-performance design guidelines, and professional training and accreditation services.

LEED was created to define "green building" by establishing a common standard of measurement and promote integrated building design practices. The LEED Rating System has also raised consumer awareness of the benefits of green building and in the overall need for a higher level of environmental accountability.

The LEED Rating System measures projects in five categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources and Indoor Environmental Quality. There are required pre-requisites and bonus credits can be awarded for non-addressed Design Innovations.

Projects can that meet the published criteria are awarded certification in one of four levels. Basic LEED Certification is earned by the achievement of 40 percent or more of the credit points. LEED Silver is awarded if 50 percent or more of the credits are achieved. LEED Gold certification comes when 60 percent or more of the credit points are earned. The top level, LEED Platinum, is achieved when 80 percent or more of the credits are earned.

There are several different versions of the LEED Rating System currently released or in the final stages of development. Each is designed to address specific types of projects. These include LEED-NC (New Construction), the original program designed to evaluate new commercial construction and major renovation projects. LEED-CI (Commercial Interiors) is designed to address the specifics of spaces in office and institutional buildings up fitted by individual tenants. LEED-EB (Existing Buildings) is designed to establish performance standards for the sustainable operation of existing buildings. LEED-CS (Core & Shell Development) addresses the overall development of structures like shopping malls and commercial building shells, where interior build-outs are the tenant's responsibility.

## **CONCRETE AND SUSTAINABILITY**

In general terms, a concrete floor is considered to be a thermal mass. By definition, thermal mass is a property that enables building materials to absorb, store, and later release significant amounts of heat. Buildings constructed of concrete and masonry have a unique energy-saving advantage because of their inherent thermal mass. These materials absorb energy slowly and hold it for much longer periods of time

than do less massive materials. This delays and reduces heat transfer through a thermal mass building component, leading to a reduction in energy costs because a building uses less energy than a similar low mass building due to the reduced heat transfer through the massive elements.

There are other factors that make concrete a great choice for a builder seeking a sustainable structure or trying to qualify a LEED project. These include the use of recycled materials in the concrete mix, the inherent strength of concrete makes it outlast many other alternative building components, and the fact the concrete can be broken up and recycled again instead of ending up in a landfill.

Building teams can gain points toward LEED project certification in several different categories for a building project with concrete floor systems. If this concrete floor is further enhanced through the application of the Barrier-1 Admixture, or refurbished through the utilization of the Barrier-1 Topical System, then the Barrier-1 components play a role in qualifying the floor system for appropriate points.

The documentation below provides detailed information for building teams, pursuing LEED certification of a building project through LEED. These various categories – Materials & resources, Energy & Atmosphere and Indoor Environmental Quality are present in all versions of LEED (LEED-NC, LEED-CI, LEED-EB, etc.).

## **BARRIER-1 POTENTIAL LEED CREDITS**

### EA (Energy & Atmosphere): Optimize Energy Performance Credits (1-10 points)

The intent of this category or credit is to establish the minimum level of energy efficiency for the proposed building and systems. In order to meet this credit standard, the building team must design the building to comply with both the mandatory provisions of ASHRAE/IESNA Standard 90.1-2004 AND the Prescriptive Requirements of 90.1 OR the Section 11 Performance Requirements of 90.1 (without amendments) OR the requirements in the local energy code (whichever criteria is more rigorous).

A concrete floor system enhanced with the Barrier-1 High Performance Admixture can help qualify for this credit because of the thermal mass of a concrete floor. The thermal properties of concrete floors can reduce the cooling and heating loads within a building envelope. These insulation qualities are further enhanced through the use of Barrier-1 Admixture because of the densification properties of the product. In simple terms, a harder surface makes a better insulator. In addition, the Barrier-1 Admixture creates a floor that will not de-bond due to moisture migration or capillary action inside the slab. The additive acts as a plasticizer and a water reducer, which further enhances the overall insulation properties.

The number of LEED points available in this section will depend on the area of the building with concrete flooring. For example, if the building team can document that the concrete floor has increased the energy efficiency of a building by 10.5 percent over the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004, then LEED will award 1 point. Theoretically, 10 points could be awarded for a 42 percent increase in energy efficiency and some of that increase is potentially due to the thermal mass of a concrete floor assembly. Higher numbers are achievable in concrete floors enhanced with the Barrier-1 Admix.

MR (Materials & Resources): Building Reuse Credit (1 point)

The intent of the Building Reuse credits are to extend the life span of existing buildings and that will help to conserve resources, retain cultural resources, reduce waste and reduce the environmental impacts of new buildings as they relate to materials, manufacturing and transport.

The addition of the Barrier-1 Admix densifies the concrete, increasing the overall strength of the slab between 5 and 25 percent. A stronger slab will provide years of addition life for both the floor and the building itself.

This point is also applicable to the use of the Barrier-1 Topical System because this process is specifically designed to renovate an existing concrete floor. The life of the concrete floor is further enhanced because the barrier-1 product provides a chemical seal preventing moisture intrusion from hydrostatic pressure and capillary action.

In projects where the concrete flooring comprises from 75 percent to 95 percent of the materials in the original building, the concrete floor, enhanced with a Barrier-1 product, may assist a building team with points toward LEED-certification of a major renovation. These projects can include buildings with large expanses of concrete floor that can be reused such as in warehouses or retail showrooms. Barrier-1 applied through the Topical System can also reduce impacts from construction or demolition, because the existing concrete floor has been strengthened and sealed against moisture penetration and thus diverted from the landfill. Depending on the size of the floor, this process may also contribute to maintaining 50 percent of the interior non-structural elements and therefore extend the life cycle of the building's existing flooring materials.

MR (Materials & Resources): Material Reuse Credit (1-2 points)

The intent of the Materials Reuse credit is to reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of previously undisturbed resources.

The requirements for this credit is to use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5percent, based on cost, of the total value of the materials on the project. The calculation for this credit can only include materials permanently installed in the project, like a concrete floor.

This credit can be achieved through the use of the Barrier-1 Topical System. This three-step process is designed to refurbish permanently installed concrete flooring and thus reduces the demand and impact of extracting and processing raw materials.

To gain the point, the building team needs to document the use of the Barrier-1 Topical System to enable the reuse of existing concrete materials with a cost of at least 5 percent and up to 10 percent of the total materials for the project.

#### MR (Materials & Resources): Regional Materials Credit (1 point)

The intent of this credit is to increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation. The barrier-1 manufacturing facility is located in Morehead City, North Carolina. Therefore building projects within the LEED prescribed 500-mile radius of this area could potentially qualify for this credit.

The credit requirements are as follows: use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value. If only a fraction of a product or material is extracted/ harvested/ recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

#### EQ (Indoor Environmental Quality): Low-Emitting Materials: Adhesives & Sealants Credit (1 point)

The intent of this credit is to reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well being of the installers and occupants. To gain points in this credit category, the building team must specify that all adhesives and sealants used on the interior of the building shall comply with the requirements of South Coast Air Quality Management District (SCAQMD) Rule #1168.

The Barrier-1 Admixture and the Topical System can significantly assist in the reduction of indoor air contaminants that are odorous, irritating and harmful to the comfort and well-being the building's occupants because the product contains zero VOC's (Volatile organic Compounds).

More importantly, however, both Barrier-1 products also contain an additive that inhibits mold growth. This factor can potentially assist with other aspects of the LEED IEQ requirements since the Barrier-1 products prevent water penetration and mold growth, both important factors in maintaining healthy indoor air quality, especially of carpeting or other organic-based floor covering is used over the Barrier-1 treated concrete.

In the Pilot Program, LEED for Schools, the area of Mold and Mildew growth is specifically addressed and 1 additional point is available. If this methodology is passed through the final version, the concrete floors treated with Barrier-1 products will also potentially assist in the qualification for this specific credit.

#### IEQ (Indoor Environmental Quality): Thermal Comfort: Verification Credit (1 point)

The intent of this Thermal Comfort Verification credit is to provide for the assessment of building thermal comfort over time. To gain a point in this category, the building team is required to implement a thermal comfort survey of the building's occupants within a period of six to 18 months after occupancy. This survey should collect anonymous responses about thermal comfort in the building including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems. Agree to develop a plan for corrective action if the survey results indicate that more than 20 percent of occupants are dissatisfied with thermal comfort in the building. This plan should include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55-2004.

Use of the Barrier-1 products can contribute to this credit because of the densification and mold inhibiting qualities that the Barrier-1 products contribute to the concrete, thus enhancing the thermal mass that reduces heating and cooling loads and therefore aids in fulfillment of credit compliance. As mentioned earlier, a slab treated with Barrier-1 is more dense and waterproof, both characteristics that enhance the insulation benefits of the thermal mass.

## **CONCLUSIONS**

The above section itemizes the potential LEED credit points to which the usage of Barrier-1 Admixture or Topical System can contribute. In every case, the use of a Barrier-1 product alone will not earn the credit. The LEED applicant is ultimately responsible for determining the product attributes that will help provide LEED-certification of a building project. Under the LEED-NC category, the use of Barrier-1 High Performance Admixture or the Barrier-1 Topical System can assist building teams in obtaining a minimum of six LEED points, as long as the overall design

meets or exceeds the LEED building performance standards. The final decision on LEED product compliance lies with the LEED Accredited Professional retained for the specific project. The role of the architect, designer, contractor or other member of the building team is to make this data available and allow the LEED A/P to make the final determination.

## **OTHER GREEN BUILDING RATING SYSTEMS**

It is worth noting, there are more sustainability or building performance rating systems in addition to LEED to potentially consider. However, because LEED for New Construction, as an initiative of the US Green Building Council, was considered both the first American system for rating the sustainability of a new commercial building (mainly offices) and it is considered to be the current benchmark. It should be noted that other rating systems and energy codes will typically provide points toward compliance, based on The LEED Rating System. In general, if points are applicable in LEED then they are usually available in other rating systems.

The only other U.S. national green building ranking system directly comparable to LEED-NC is from the Green Building Initiative (GBI), which awards Green Globes to certified buildings. It was launched by trade groups representing manufacturers of building products. And today, some within the design community believe the “preferred products list” within the Green Globes (and the DOE’s Energy Star) green building rating systems positions it ahead of the LEED rating system at least from a product manufacturer’s standpoint and therefore for some others within the architectural community.

For informational purposes, here is a partial list of other prominent sustainable building rating systems:

- Energy Star – US Department of Energy program for products and buildings
- BREEM – English and Canadian green building rating systems, which pre-dated LEED
- SPIRIT – U.S. Air Force sustainability standards
- CHPS - California Collaborative for High Performance Schools
- Go Green – Building Owners & Managers Association (BOMA)