Hanover® Architectural Products presents...

SOLAR REFLECTIVITY AND GREEN ROOFS

HANOVER®
Architectural Products

ACHIEVING LEED STANDARDS

Reducing the heat island effect and managing stormwater runoff when developing a building project both contribute to achieving LEED standards. The USGBC awards LEED credits in several categories, and the number of credits and points possible differ per category. The total number of possible points a building project can acquire is 69, including 64 core points and 5 additional points for innovation.

GAINING GROUND

Evidence is mounting that the idea of the "green building" has finally hit the mainstream in the United States. Cities large and small are making great strides toward managing stormwater runoff and reducing the heat island effect. In New York, the rebuilding of 7 World Trade Center is focused on sustainability (using high-reflective Glacier White Hanover® Prest® Pavers), while convention centers and public parks in cities such as Pittsburgh, PA; Chattanooga, TN; and Bloomington, IN; are making use of high-reflective and permeable pavers to create environment-friendly developments. The need for sustainability continues to grow as energy and natural resources become increasingly scarce.

For additional information, trends in green building, and case studies, check out the following websites:
www.epa.gov
www.usgbc.org
www.advancedpavement.com

Pearl Residences, Houston, TX
Hanover® Glacier White Prest® Pavers

HANOVER® PREST® PAVERS AND LIFE-CYCLE COSTING

Along with their viability for use in green building projects, Hanover® concrete pavers have become an increasingly popular choice as architects and builders continue to look at life-cycle costing when specifying materials. Manufacturing has improved for pavers in regard to their durability and builders can now mechanically install many of these products that previously required expensive manual installation.

As repairs become necessary in the paving itself or systems that lie beneath the pavers—whether drainage, electrical work, gas pipes, air conditioning ducts, etc.—it is often simpler to remove and replace individual pavers as repairs are needed than it is to cut into asphalt or concrete coverings. Many builders have identified savings in the following areas:

101 Seaport, Boston, MA
Hanover® Glacier White Prest® Pavers

- Expensive equipment is not required for removal
- Pavers can be reinstated after the repair
- Traffic interruptions and delays are reduced
- When removed, there is no damage to surrounding units
- Pavers do not leave visible patches to detract from the aesthetics

WHAT IS THE SOLAR REFLECTANCE INDEX?

In October 2005, the USGBC released new guidelines for LEED credits. The New Construction Version 2.2 revised the values required for mitigating the heat island effect. The guidelines are now based on the Solar Reflectance Index (SRI) of specified materials as calculated by ASTM E 1980.

EMITTANCE – The emittance of a material refers to its ability to release absorbed heat. Scientists use a number between 0 and 1 to express emittance. With the exception of metals, most construction materials have emittances above 0.85.

SOLAR REFLECTANCE – Also known as albedo, is the ratio of the amount of solar radiation reflected from a surface to the total amount reaching that surface (which includes visible and ultraviolet light and infrared radiation).

SOLAR REFLECTANCE INDEX (SRI) – SRI is a value that incorporates both solar reflectance and emittance in a single value to represent a material's temperature in the sun. SRI quantifies how hot a surface would get relative to standard black and standard white surfaces. It is calculated using equations based on previously measured values of solar reflectance and emittance as laid out in the American Society for Testing and Materials Standard E 1980.

HANOVER'S GLACIER WHITE PREST® PAVERS VS. COATINGS

White concrete pavers have been in use for over 20 years, but it has been only in the past five to seven years—as green building has taken hold—that they have dramatically increased in popularity. Many builders and architects have also used special coatings to increase the reflectivity of roofing materials—covering the surface of heat absorbing materials with high-sheen glaze that can temporarily contribute to reducing the heat island effect. White pavers have proven to be a more effective solution than coatings when labor and maintenance are taken into consideration.

LABOR – By providing a one-step solution to reflectivity, white pavers reduce labor costs. There is never a need to coat the surface of the pavers to increase their effectiveness.

MAINTENANCE – White concrete pavers maintain their reflectivity over time. Because pavers are made of a single material throughout, surface wear (whether by foot or vehicular traffic, or harsh weather conditions) does not adversely affect their reflectivity values.

LOW ABSORPTION – The water absorption rate for white concrete pavers is less than 4 percent. Because of this, the pavers reduce the surface staining that can adversely affect reflectivity.

HANOVER'S GLACIER WHITE PAVER WITH FINISH #13
Reflectance Value : 0.66, Emittance Value : 0.91
S R I Value : 81

HANOVER® ARCHITECTURAL PRODUCTS

Hanover® Architectural Products has been considered a leader and at the forefront of unit paver system development since 1971. Hanover® manufactures a variety of products ranging from small hand-held Prest® Brick and Asphalt Block, to larger scaled Prest® Pavers. Hanover® can also provide vertical walling products. Visit www.hanoverpavers.com for more information.

There are more than 76 million residential buildings and nearly 5 million commercial buildings in the U.S. today. These buildings together use approximately one-third of all the energy consumed in the U.S. and two-thirds of the electricity. In addition, traditional construction methods generate inordinate amounts of waste while, at the same time, taxing sources of raw materials.* Water consumption and a building site's impact on water quality are also major concerns for cities—large and small—throughout the country. By addressing these concerns in their projects, architects, builders, and owners stand to benefit in a number of ways, from municipal incentive programs to drastically reduced annual operational costs and higher real estate value.

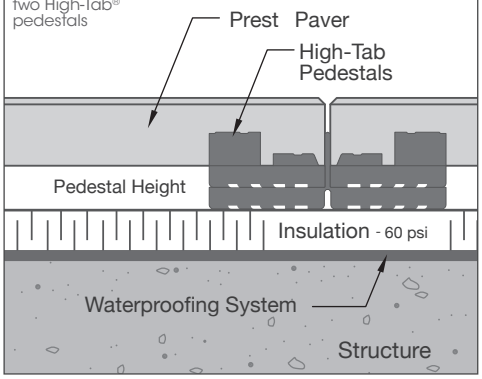
When it comes to identifying best practices and guidelines for green building design and construction in this country, the U.S. Green Building Council (USGBC) offers the most widely accepted standards, based on their LEED (Leadership in Energy and Environmental Design) Green Building Rating System. This tool provides a framework under which building design and construction decisions can be made and sustainable building projects can be evaluated.

Building projects earn points for compliance with individual Sustainable Sites (SS) Credits, and the total points earned result in an overall rating for the building. Ratings range from "Certified" to "Platinum". This article focuses on how concrete pavers can play an integral role in green building projects and earning SS Credits toward an overall LEED rating.

HANOVER® PREST® PAVERS AND THE HEAT ISLAND EFFECT

According to the Environmental Protection Agency, suburban and urban areas are consistently 2° to 10°F warmer than nearby rural areas due to a phenomenon called the heat island effect. The temperature difference is the result of removing natural vegetation and green areas that provide shade and give off water, and replacing them with buildings and pavement that are dry and absorb high amounts of solar heat. These elevated temperatures impact communities by increasing peak energy demand, air-conditioning costs, air pollution levels, and even heat-related illness and mortality. Lawrence Berkley National Laboratories (LBNL), which has performed extensive research on the heat island effect in urban areas, has established that the probability of smog creation rises 5 percent for each one-half degree increase above 70°F. While LBNL has concluded that reduced vegetation accounts for the largest percentage of urban heat islands at 56 percent, dark roofing surfaces run a strong second at 38 percent. The USGBC has addressed the heat island effect in regard to both roofing surfaces and other large, typically paved areas in its LEED guidelines.

HANOVER® PREST® PAVERS ON HIGH-TAB® PEDESTALS
shown on two High-Tab® pedestals



This illustration shows a cross-section of a pedestal-type roof assembly. A membrane system is applied over the roof material to protect the building from excessive moisture. Insulation, with a minimum psi of 60 for pedestrian traffic, is applied over the membrane to support the High-Tab® Pedestals and ultimately the Prest® Paver. Hanover® can provide several types of adjustable pedestals to create a level surface, when the underlying roof is not itself level.

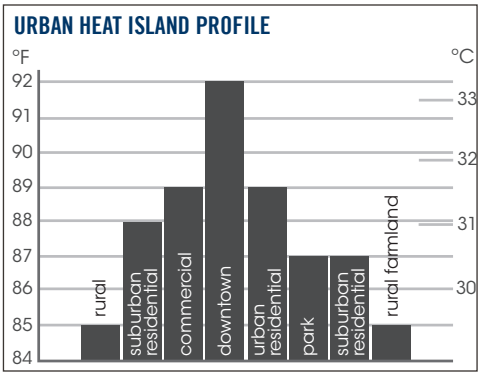
A recent change in the LEED New Construction Version 2.2 SS Credits* regarding the heat island effect incorporates the Solar Reflectance Index that is calculated according to ASTM E 1980, using values for roofing reflectance and emittance (ASTM E 408 and ASTM E 903, respectively) for making material selection guidelines. This is a change from the earlier Energy Star reflectivity values that were utilized in Version 2.1.

SS CREDIT 7.1 HEAT ISLAND EFFECT: NON-ROOF (1 POINT)

This LEED credit was established to reduce the heat island effect in non-roof areas of a building site. Architects and builders can meet this requirement by using materials that stay cool in sunlight for at least 50 percent of the site's non-roof, impermeable surfaces, such as plazas, courtyards, parking lots, and sidewalks. The SRI of the chosen material must be at least 29. Concrete pavers are ideally suited to meet this requirement, while at the same time providing appealing, low-maintenance design solutions. LEED allows an SRI of 35 for pavers made with ordinary concrete methods, whereas white concrete pavers are designed and manufactured to achieve an SRI of up to 87, far outpacing the requirement and providing additional protection against heat absorption.

Other options include placing a minimum of 50 percent of parking spaces under cover, using an open-grid paving system.

URBAN HEAT ISLAND PROFILE



As vegetation is reduced in suburban and urban areas, the temperature rises proportionally – up to 10°F in some cities.

SS CREDIT 7.2 HEAT ISLAND EFFECT: ROOF (1 POINT)

On a hot and sunny day it is not unusual to find traditional roofing materials approaching 190°F. This LEED credit was established to reduce the head island effect as pertains to roofs by qualifying both material selection and design solutions. The material requirements differ for low-sloped roofs (generally commercial or multi-housing buildings) and steep-sloped roofs (generally residential), as low-sloped roofs are more susceptible to heat absorption.

ROOF TYPE	SLOPE	SRI
Low-sloped roof	≤ 2:12	82
Steep-sloped roof	> 2:12	39

LEED guidelines offer three options for roofing materials and design that will meet the new requirements.

OPTION 1. Use roofing materials having an SRI equal to or greater than the values in the table above for a minimum of 75 percent of the roof surface.

OPTION 2. Install a vegetated roof for at least 50 percent of the roof area.

OPTION 3. Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria:

(Area of SRI roof / 0.75) + (Area of vegetated roof / 0.5) > Total Roof Area

High albedo concrete pavers serve as an excellent material choice for low-slope roof designs. With an SRI of up to 87, they again surpass the minimum requirement defined by LEED, and can be used to achieve the entire SS Credit 7.2 as described in Option 1. Used in combination with vegetated roofing, as in Option 3, high-albedo concrete pavers can be used to create rooftop pool areas, plazas, and other pedestrian-friendly or recreational spaces that are in high demand in urban areas. At the same time these "cool roof" or "green roof" designs can increase the quality of life for building users, they also work to reduce the building's energy consumption: They can reduce annual air conditioning costs by 10 to 40 percent, depending on location, building design, climate, and other factors. Concrete pavers are not recommended for steep-slope applications.