**The Significance of POLYCON E-KRETE Solar Reflective Gray's Solar Reflectance Index of 38**

The Solar Reflectance Index (SRI) is used to estimate how hot a surface will get when exposed to full sun. This composite index is used to determine the effect of the reflectance (albedo), a measure of a material's ability to reflect sunlight, and emittance, a measure of how well a surface emits or releases heat, on the surface temperature. The SRI ranges from 0 for a standard black surface to 100 for a standard white surface. E-KRETE in Solar Reflective Gray (SR100) with a SRI of 38 far exceeds the minimum SRI of 29 established by LEED® (Leadership in Energy and Environmental Design) as a paving material that meets the LEED performance criteria and can contribute toward satisfying SS Credit 7.1: Heat Island Effect-Non Roof. * (See below.) **

In the document, *Reducing Urban Heat Islands: Compendium of Strategies/Cool Pavements*, The Environmental Protection Agency (EPA) refers to pavement materials with high solar reflectance or permeability as cool pavements. As a cool pavement, E-KRETE in Solar Reflective Gray (SR 100)gives property owners and decision makers an alternative to the traditional coal tar or asphaltic-based sealants that have been the typical pavement preservation options in the past. Using reflective pavement surfaces is one way to mitigate the urban heat island effect, a phenomenon whereby the ambient urban air temperature is greater than rural areas as a result of vegetation being replaced with pavement, buildings and other heat-absorbing infrastructure. According to the Lawrence Berkeley National Laboratory (LBNL), on a clear summer afternoon, the air temperature in a typical city is as much as 4.5° Fahrenheit higher than in the surrounding rural areas. The EPA states that in the evening the difference can be as much as 22° Fahrenheit. This is because of the dark surfaces such as asphalt pavements and roofs radiate heat as the energy absorbed during the day from sunlight. LBNL has found that there can be as much as a 40° Fahrenheit difference in the surface temperatures that black asphalt pavements can reach compared to that of cool pavements. Considering an EPA study of four diverse urban centers, which showed that 30-40% are covered with pavement, choice of pavement and pavement preservation material emerges as a critical element when developing strategies to mitigate the urban heat island.

Urban heat islands have many negative effects including raising summertime energy demands, raising costs of air-conditioning, poorer air quality, a reduction in building material durability, an increase in demand for water and lowering water quality.
Urban residents, who can suffer from prolonged exposure to heat, experience the most costly effect. In the United States alone, an average of 1,000 people die from exposure to extreme heat each year. Therefore, measures and construction practices that reduce the urban heat island effect are encouraged.

According to new studies by international building contractors McGraw-Hill Construction and Turner Construction, the demand for green buildings is increasing even with a challenging worldwide economy. In addition, the studies found that 81% of U.S. executives now believe the public expects them to "institutionalize" sustainability. However, they are no longer going green just because they think it is the right thing to do. Top reasons for implementing green

design include key economic issues such as protecting human health, enhancing worker productivity and lowering operating costs. As the importance of implementing green solutions becomes a growing part of corporate and public sector culture, the defined measurable standards that LEED established remain the focal point whether a project is ultimately LEED certified or not.

LEED® is an internationally recognized program that provides building owners and operators with a framework for identifying and implementing measurable green building design, construction, operations and maintenance solutions. Even though the program is voluntary, the benefits of LEED certification include lowering operating costs, increasing the value of the asset, reducing waste sent to landfills, conserving energy and water, providing healthier and safer environment for occupants, and qualifying for tax rebates, zoning allowances and other incentives in hundreds of cities. The global market has driven the establishment of LEED projects in 135 countries as well.

To achieve LEED certification, a project must satisfy all LEED prerequisites and earn a minimum 40 points on a 110-point LEED rating system scale. Homes must earn a minimum of 45 points on a 136-point scale. LEED projects earn points during the certification process and then are awarded one of the four certification levels: Certified, Silver, Gold, and Platinum.

United States Green Building Council® (USGBC) issued Version 2.2 of *LEED for New Construction & Major Renovations* in October 2005 to provide consensus-based rating systems using well-founded energy and environmental principles. Section 7.1* outlines options for reducing heat islands and earning a LEED credit. (See below.) E-KRETE SR 100 Solar Reflective Gray meets the LEED performance criteria and can contribute toward satisfying this credit under LEED.** This solar reflective coating is applied as a micro-overlay over asphalt or concrete. Microsurfacing with a cool pavement that increases solar reflectance is also suggested by the EPA as a strategy for reducing urban heat islands in the document, *Reducing Urban Heat Islands: Compendium of Strategies/Cool Pavements*.

Benefits of utilizing cool pavement strategies such as E-KRETE are compelling. In the work, *Energy Saving Potentials and Air Quality Benefits of Urban Heat Island Mitigation*, Lawrence Berkeley National Laboratory states that summer heat islands not only increase system-wide energy demands, they also increase smog production due to higher metropolitan ambient temperatures. It further states, "Smog is created by photo-chemical reactions of pollutants in the air, and these reactions are more likely to intensify at higher temperatures. For example, in Los Angeles, for every 1° Celsius, incident of smog increases by 5%." Furthermore, the EPA now recognizes that air temperature is as much a cause of smog as nitrogen oxides ($NO_x$) or volatile organic compounds (VOCs).

In addition to the advantage that cooler temperatures can have on preventing smog formation, there is a growing body of extensive research worldwide indicating a component in E-KRETE Solar Reflective Gray actually functions as a photo catalyst to convert air pollutants such as $NO_x$,

VOCs, carbon monoxide (CO) and ozone to compounds with little or no environmental consequence. The ability of this component to clean air is not in question and has even been quantified in terms of the rate at which air pollutants can be removed by a given area of photo catalyst. Ongoing research is needed to validate the most effective and most economically feasible strategies. Combining this photo catalyst with our exceptional polymer-modified cement ensures E-KRETE's solar-reflective coating is not only environmentally friendly. It is also pregnant with potential to improve the environment in terms of air quality and the quality of urban life.

Other advantages of cool pavements according to the EPA's *Reducing Urban Heat Islands: Compendium of Strategies/Cool Pavements* include enhanced nighttime visibility, more comfortable air temperatures, waste reduction and increased pavement life because of the pavement stress that high temperatures create such as rutting and cracking.

As a 100% environmentally green microsurfacing option, E-KRETE is able to deliver all of these benefits at a fraction of the cost of other cool pavements that require a much thicker application. Those using E-KRETE for its heat reflectance and in connection with a LEED project will be getting a lot more for their money than simply a green, cool overlay. E-KRETE is first and foremost a pavement seal. The seal itself will extend the life of asphalt pavements by excluding the effects of weathering.

Hot mix asphalt concrete (HMAC) pavements begin to deteriorate as soon as they are placed due to oxidation from oxygen, sunlight, and moisture. This causes the liquid asphalt that binds everything (the aggregate) together to become brittle with age. Consequently, as the binder becomes brittle, the pavement shrinks and cracks develop that allow water to reach the pavement foundation. This softens the foundation and accelerates the deterioration of the pavement surface. Also, as the asphalt becomes brittle, aggregate breaks loose from the surface more readily and the surface begins to ravel. A seal of the surface slows this process way down.

E-KRETE has many more benefits than the common asphalt seals because it is environmentally green, durable, and provides a smooth surface that is pleasing to the eye and quiet for traffic. So, both achieving a heat-reflecting surface as well as extending the life cycle of HMAC can be accomplished by applying E-KRETE. Front-end maintenance is recommended, but if the pavement is not sealed early on, E-KRETE will still be strategic as long as the pavement has enough flexibility and life left in it to warrant preserving. The color can also be customized to best suit the look desired.

**SS Credit 7.1: Heat Island Effect: Non-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.*

***REQUIREMENT:***

***OPTION 1:***

*Provide any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards and parking lots):*

- *Shade (within 5 years of occupancy)*
- *Paving materials with Solar Reflectance Index (SRI)* of at least 29*
- *Open grid pavement system*

*OR*

***OPTION 2:***

*Place a minimum of 50% of parking spaces under cover (defined as underground, under deck, under roof, or under a building). Any roof used to shade or cover parking must have an SRI of at least 29.*

*Potential Technologies & Strategies*

*Shade constructed surfaces on the site with landscape features and utilize high- reflectance materials for hardscape. Consider replacing constructed surfaces (i.e. roof, roads, sidewalks, etc.) with vegetated surfaces such as vegetated roofs and open grid paving or specify high albedo materials to reduce the heat absorption.*

- *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 1980-01. 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 for some materials will be available in the LEED for New Construction v2.2 Reference Guide.*

**Products are not reviewed under LEED. LEED credit requirements cover the performance of materials in aggregate, not the performance of individual products or brands. For more information on LEED, visit http://www.usgbc.org/leed.

Visit the general USGBC website at http://www.usgbc.org/.