



## TECHNICAL BULLETIN #5 SOLAR REFLECTIVITY INDEX (SRI)

With more emphasis on green building materials and resources, heat island effect and other related building standards, recreational surfaces are coming under scrutiny and evaluation. There are practical technologies and strategies that reduce the heat absorption of exterior materials. This Technical Bulletin discusses several issues of solar absorbance and radiance that relate to Solar Reflectivity, the Heat Island Effect and microclimates.

### What is the SRI?

**Solar Reflectivity Index (SRI)** is a numerical expression of a surface's ability to reject solar heat. Or otherwise stated by LEED, the SRI is the measure of a constructed surface's ability to reflect solar heat as shown by a temperature rise. There are two major components of "light"- nearly 56% is not visible to the eye (near infrared) , and about 44% is "visible" color. Both components are important factors of the SRI.

**Total Solar Reflectance (TSR)** is a measurement expressed as a percentage falling between 0% and 100% dependent on a product's Total Solar Reflectance as tested according to ASTM C-1959 and ASTM E-903.

**Emissivity (infrared emittance)** is the ability of a surface to shed or radiate some of its heat (infrared radiation) away from a surface as tested according to ASTM C-1371.

**Solar Reflectivity Index (SRI)** combines both the TSR percentage reflectivity value and emissivity value as a measure of a surface overall ability to reject solar heat..

The SRI Index calculation is done in accordance with ASTM E-1980-1. The calculation is based on a mathematical formula that includes values for thermal emittance, total solar reflectance, solar absorbance, three convective coefficients, solar flux, the Stefan Boltzman constant and various other coefficients. The average reflectance is determined by an averaging process, using a standard solar spectrum.

Example: A standard black with reflectivity 5% and emittance of 90% has an index of 0  
A standard white with reflectivity 80% and emittance 90% has an index of 100.

### What is the Heat Island Effect?

Cities and urban areas are 3 to 8 (F) degrees warmer than surrounding areas due to the Heat Island Effect. This temperature difference is attributed to more absorptive mass of buildings and hardscape site construction that have replaced vegetation that shades the ground and cool the air through transpiration and evaporation. The intent of the non-roof Leed program (SS Credit 7.1) is to reduce heat islands to minimize impacts on microclimates and wildlife habitats.

Recreational surface color selection is just one of many types of site construction materials that can contribute to reducing Heat Island Effect. Where resilient surfaces are required, using materials with higher SRI will reduce thermal gradient differences between developed and undeveloped areas and thus contribute to saving energy and providing lower surface temperatures.

To achieve a Leed Credit 7.1: Heat Island Effect – Non-roof, the use of hardscape materials requires one to consider materials with an SRI of 29 or greater; the greater the index would be the coolest and most environmental friendly choice of surface.

As a matter of reference comparison, the following are examples of average SRI:

<b>Material</b>	<b>Solar Reflectance</b>	<b>Emittance</b>	<b>SRI</b>
Black Paint	0.05	0.9	0
New Asphalt	0.05	0.9	0
Aged Asphalt	0.1	0.9	6
New Concrete	0.35 to 0.45	0.9	38-52
Aged Concrete	0.2 to 0.3	0.9	19-32
White Paint	0.8	0.9	100

Test results of a major manufacturer's EPDM colored granule (1-3.5mm), poured in place playground surfaces are shown below. It is important to note that the shade of EPDM color will vary by manufacturer and SRI results will vary. The cast samples tested for this discussion are considered typical of the planarity and texture of field applications and were artificially aged to represent 30-90 days of use. Worn surfaces typically have higher SRI than fresh new surfaces. A proportioning of colors usually results in an average SRI of each respective index. *There are approximately 60 EPDM color shades marketed by manufacturers; for SRI results of a specific EPDM manufacturer, contact that producer.*

<b>PIP Surface Color</b>			
<b>Example (values rounded)</b>	<b>Solar Reflectance</b>	<b>Emittance</b>	<b>SRI</b>
Pearl / Crème	0.48	0.9	57
Eggshell	0.48	0.9	55
Beige / Tan	0.31	0.9	34
Terra Cotta Red	0.28	0.9	30
Blue	0.29	0.9	31
Light Blue	0.31	0.9	33
Green	0.12	0.9	10
Light Green	0.12	0.9	11

**Note:** To obtain a LEED credit, a LEED Letter Template, signed by the Architect, Civil Engineer or responsible party, referencing the plans and specifications and certifying that the surface materials comply with the Energy Star label requirements and meet the emissivity or SRI requirements must be provided to the U. S. Green Building Council.

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