ALBEDO OF CONCRETE AND SELECT OTHER MATERIALS

Table 1 Solar reflectance (albedo) of select material surfaces[1,2,3,4]

Material surface	Solar Reflectance
Black acrylic paint	0.05
New asphalt	0.05
Aged asphalt	0.1
“White” asphalt shingle	0.2
Aged concrete	0.2 to 0.3
New concrete (traditional)	0.4 to 0.5
New concrete with white portland cement	0.7 to 0.8
White acrylic paint	0.8

LEED Sustainable Sites Credit 7.1 (1 point): Landscape and Exterior Design to Reduce Heat Islands. One option in this requirement is to "use light-colored/high-*albedo* materials (reflectance of at least 0.3) for 30% of the site’s non-roof impervious surfaces." This requirement can be met by using portland cement concrete rather than asphalt concrete for 30% of all sidewalks, parking lots, drives and other non-roof impervious surfaces. Albedo, which in this case is synonymous with solar reflectance, is the ratio of the amount of solar radiation reflected from a material to the amount shone on the material. Solar radiation includes the ultraviolet as well as the visible spectrum. Generally surfaces that look light colored have a high albedo, but this is not always the case. Surfaces with lower albedos absorb more solar radiation. This is then converted into heat and the surface gets hotter. Pavements with higher albedos absorb less energy and are thus cooler. Where paved surfaces are required, using materials with higher albedos will reduce the heat island effect, and thereby save energy by reducing the demand for air conditioning and improve air quality.

Traditional portland cement concrete generally has an albedo or *solar reflectance* of approximately 0.35 although values can vary. Measured values are reported in the range of 0.4 to 0.5. For “white” Portland cement, values are reported in the range of 0.7 to 0.8.[5] New asphalt concrete generally has a reflectance of approximately 0.05 and asphalt concrete five or more years old has a reflectance of approximately 0.10 to 0.15. More information on *urban heat islands* is available from the Lawrence Berkeley National Laboratory website on Urban Heat Islands http://eetd.lbl.gov/HeatIsland/

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1 Levinson, Ronnen and Akbari, Hashem, “Effects of Composition and Exposure on the Solar Reflectance of Portland Cement Concrete,” Lawrence Berkeley National Laboratory, Publication No. LBNL-48334, 2001, 39 pages.

2 Pomerantz, M., Pon, B., and Akbari, H., “The Effect of Pavements’ Temperatures on Air Temperatures in Large Cities,” Lawrence Berkeley National Laboratory, Publication No. LBNL-43442, 2000, 20 pages.

3 Berdahl, P. and Bretz, S, "Spectral Solar Reflectance of Various Roof Materials", *Cool Building and Paving Materials Workshop*, Gaithersburg, Maryland, July 1994 14 pages.

4 Pomerantz, M., Akbari, H., et al, “Examples of Cooler Reflective Streets for Urban Heat Islands: Cement Concrete and Chip Seals,” DRAFT, Lawrence Berkeley National Laboratory.

5 Levinson, R. and Akbari, H., “Effects of Composition and Exposure on the Solar Reflectance of Portland Cement Concrete,” Lawrence Berkeley National Laboratory, Publication No. LBNL-48334, December 2001, 39 pages.