August 15, 2011

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ASTM C1549 Solar Reflectance of One Sample
CTLGroup Project No. 315127 – Gray (PaveDrain) Unit

Dear Doug:

As authorized by you, CTLGroup measured the solar reflectance of one sample, submitted by you, in general accordance with ASTM C1549 – 09, *Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer*.

The sample, shown in Figure 1, was received at CTLGroup on August 11, 2011. The sample was labeled by you as "Gray (PaveDrain) Unit." The sample was stored at room temperature until it was tested. The top surface of the sample is fairly level and even, and had some whitish-colored marks that were avoided during testing.

On August 12, 2011, the approximately 12 in. by 12 in. by 6-in.-thick sample was divided into three equal strips (each approximately 4 in. by 12 in.) by drawing lines with chalk. The solar reflectance of the top surface of each of the sample's three strips was measured in three locations. The air mass on the solar spectrum reflectometer was set at 1.5, which approximates the length a beam of sunlight travels through the atmosphere over the conterminous United States. The measured solar reflectance, average, and standard deviation are reported in the attached data sheets in Appendix A. The measurements are summarized in Table 1.

Table 1. Average Solar Reflectance, Standard Deviation, and Solar Reflectance Index (Rounded)

Sample Label	Solar Reflectance	Standard Deviation	Solar Reflectance Index (SRI)*
Gray (PaveDrain) Unit	0.37	0.01	41

*Assuming a convection coefficient of 12 W/m²·°C (for medium wind speed) and an emittance of 0.9, which is appropriate for non-metallic opaque building materials.

The solar reflectance *index* (SRI) was also calculated according to ASTM E1980 – 01, *Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces*, assuming a convection coefficient of 12 W/m²·°C (for medium wind speed) and an emittance of 0.9, which is appropriate for non-metallic opaque building materials.[1] The SRI is also shown in Table 1.

If you have any questions, please do not hesitate to call.

Sincerely,

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Figure 1 – Sample: "Gray (PaveDrain) Unit"

[1] *LEED Reference Guide for Green Building Design and Construction for the Design, Construction and Major Renovations of the Commercial and Institutional Buildings Including Core & Shell and K-12 School Projects,* 2009 edition, page 112.

APPENDIX A

ASTM C1549, STANDARD TEST METHOD FOR DETERMINATION OF SOLAR REFLECTANCE NEAR AMBIENT TEMPERATURE USING A PORTABLE SOLAR REFLECTOMETER, DATA SHEETS

Client:	PaveDrain LLC	CTLGroup project no.:	315127
Project:	C1549 - PaveDrain - Buch	CTLGroup project mgr.:	E. Lorenz
		Analyst:	E. Lorenz
Contact:	Doug Buch	Approved:	M. VanGeem
	202-999-9483	Date tested:	Aug 12, 2011

ASTM C1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer[1, 2]
Sample Set - GRAY (PaveDrain) UNIT

Specimen	Location	Location reflectance	Specimen reflectance
GRAY (PaveDrain) UNIT - 1	1	0.38	0.38
	2	0.39	
	3	0.37	
GRAY (PaveDrain) UNIT - 2	1	0.36	0.37
	2	0.37	
	3	0.37	
GRAY (PaveDrain) UNIT - 3	1	0.36	0.37
	2	0.38	
	3	0.36	
		Standard deviation	0.01
		Overall average	0.37
Solar reflectance index (SRI)[3] corresponding to convective coefficients of three wind conditions		**Low wind**	39
		Medium wind	41
		High wind	42

1. Tested in accordance with ASTM C 1549 - 09, *Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer*.

2. Air mass index is 1.5.

3. Solar reflectance index calculated according to ASTM E 1980 - 01, *Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces* with an emittance for non-metallic opaque building materials of 0.9. Low wind corresponds to a convection coefficient of 5 W/m²•˚C, medium wind corresponds to a convection coefficient of 12 W/m²•˚C, and high wind corresponds to a convection coefficient of 30 W/m²•˚C.

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