

January 19, 2010

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**ASTM C 1549 Solar Reflectance of Two Sets of Specimens  
CTLGroup Project No. 315059**

Dear Jeff:

As authorized by you, CTLGroup measured the solar reflectance of two sets of specimens, submitted by you, in general accordance with ASTM C 1549 – 04, *Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer*.

Containers of material, shown in Figures 1 and 2, were received at CTLGroup on January 13, 2010. The containers were labeled by you as “Snow White Stone ½” x ¼”” and “Snow White Stone ¾” x 1-½””. The containers were stored at room temperature until the material was tested. The material was indicated by you to be White Calcite and is dimensioned according to its label.

On January 15, 2010, the solar reflectance of the top surface of the material in each container was measured. The small aggregate, Snow White Stone ½” x ¼””, was smoothed as flat as possible and divided into three sections with a marker as seen in Figure 1. For each of these three sections, the solar reflectance at the top of the surface was measured in three locations. The solar reflectance of the surface of the larger aggregate, White Stone ¾” x 1-½””, was measured on each of nine different pieces as seen in Figure 2. 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 solar reflectance values obtained from the Solar Spectrum Reflectometer for “Snow White Stone ½” x ¼”” were adjusted for the irregular surface (non-flat surface) as per the D&S Technical Note 08-1; *Solar Spectrum Reflectometer Model SSR-ER – Reflectance Measurements of Irregular Surfaces, by Devices & Services Company*. The solar reflectance values were adjusted for the irregular surface by measuring the “in contact” reflectance and the average displacement of the surface from the surface of the reflectometer to estimate a correction. As shown in Table 1, the “Non-adjusted” value is “in contact” solar reflectance and the “Adjusted” value is the solar reflectance with the correction factor applied. The measured solar reflectance, average, standard deviation, and adjusted values 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)**

Specimen Label	Non-Adjusted			Adjusted		
	Solar Reflectance	Standard Deviation	Solar Reflectance Index (SRI)*	Solar Reflectance	Standard Deviation	Solar Reflectance Index (SRI)*
Snow White Stone ½" x ¼"	0.51	0.04	60	0.68	0.05	83
Snow White Stone ¾" x 1-½"	0.54	0.03	64	N/A	N/A	N/A

\*Assuming 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 E 1980 – 01, *Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces*, assuming an emittance of 0.9, which is appropriate for non-metallic opaque building materials<sup>1</sup>. The SRI is also shown in Table 1.

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

Sincerely,

**CONSTRUCTION TECHNOLOGY LABORATORIES, INC.**  
**An AASHTO Accredited Laboratory – Aggregates, Cement & Concrete**



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<sup>1</sup> 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.



**Figure 1 - Material:** "Snow White Stone ½" x ¼"



**Figure 2 - Material:** (left) "Snow White Stone ¾" x 1-½" and (right) "Snow White Stone ¾" x 1-½" - Nine pieces that were tested.

## **APPENDIX A**

**ASTM C 1549, SOLAR REFLECTANCE NEAR AMBIENT TEMPERATURE USING A  
PORTABLE SOLAR REFLECTOMETER, DATA SHEETS**

Client: Coloured Aggregates Inc.  
Project: C1549 - Coloured Aggregates  
Contact: Jeff Oravec  
416-491-0230

CTLGroup project no.: 315059  
CTLGroup project mgr.: M. VanGeem  
Analyst: E. Rodriguez  
Approved: M. VanGeem  
Date tested: Jan 15, 2010

**ASTM C 1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer<sup>1,2</sup>**  
**Specimen Set - Snow White Stone - 1/2" x 1/4"**

Specimen	Location	Location reflectance	Specimen reflectance	Adjusted for Irregular surfaces
1/2" x 1/4" - 1	1	0.53	0.55	0.73
	2	0.59		
	3	0.53		
1/2" x 1/4" - 2	1	0.40	0.46	0.61
	2	0.46		
	3	0.51		
1/2" x 1/4" - 3	1	0.45	0.52	0.69
	2	0.59		
	3	0.52		
<b>Standard deviation</b>			0.04	0.05
<b>Overall average</b>			0.51	0.68
<b>Solar reflectance index (SRI)<sup>3</sup> corresponding to convective coefficients of three wind conditions</b>		<b>Low wind</b>	58	82
		<b>Medium wind</b>	60	83
		<b>High wind</b>	61	84

1. Tested in accordance with ASTM C 1549 - 04, *Standard Test Method for Determining 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.

Client:	Coloured Aggregates Inc.	CTLGroup project no.:	315059
Project:	C1549 - Coloured Aggregates	CTLGroup project mgr.:	M. VanGeem
		Analyst:	E. Rodriguez
Contact:	Jeff Oravec	Approved:	M. VanGeem
	416-491-0230	Date tested:	Jan 15, 2010

**ASTM C 1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer<sup>1,2</sup>**  
**Specimen Set - Snow White Stone - 3/4" x 1-1/2"**

Specimen	Location	Location reflectance	Specimen reflectance
3/4" x 1-1/2" - 1 to 3	1	0.54	0.52
	2	0.51	
	3	0.51	
3/4" x 1-1/2" - 4 to 6	1	0.51	0.51
	2	0.50	
	3	0.52	
3/4" x 1-1/2" - 7 to 9	1	0.56	0.59
	2	0.57	
	3	0.63	
<b>Standard deviation</b>			0.03
<b>Overall average</b>			0.54
<b>Solar reflectance index (SRI)<sup>3</sup> corresponding to convective coefficients of three wind conditions</b>		<b>Low wind</b>	62
		<b>Medium wind</b>	64
		<b>High wind</b>	65

1. Tested in accordance with ASTM C 1549 - 04, *Standard Test Method for Determining 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.