

July 20, 2009

Colby DeHoff
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**ASTM C 1549 Solar Reflectance of Four Types of Whitacre-Greer Pavers
CTLGroup Project No. 315036**

Dear Colby:

As authorized by you, CTLGroup measured the solar reflectance of four types of Whitacre-Greer pavers in accordance with ASTM C 1549-04, *Standard Test Method for Determining Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer*.

The pavers, shown in Figure 1, were received at CTLGroup on July 14, 2009. Each set of three specimens were labeled by us as follows:

| | | | |
|----------|----------|----------|----------|
| WG 41 01 | WG 42 01 | WG 43 01 | WG 44 01 |
| WG 41 02 | WG 42 02 | WG 43 02 | WG 44 02 |
| WG 41 03 | WG 42 03 | WG 43 03 | WG 44 03 |

The specimens are rectangular and measure approximately 8 × 4 in. and 2-1/4 in. high. The top surface of each specimen is flat and relatively smooth. The pavers were kept in at room temperature until they were tested on July 20, 2009.

The solar reflectance of the top surface of each paver was measured in three randomly selected locations, for a total of 9 measurements per set. The air mass on the solar spectrum reflectometer was set to 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 Figure 2 and Table 1.

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 materials¹. The SRI is also shown in Table 1.

¹ *LEED-NC for New Construction Reference Guide*, Version 2.2, First Edition, October 2005, p. 91.

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

Sincerely,



Varsha Singh, Ph.D., LEED-AP
Analyst
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Figure 1. Pavers labeled WG 41, WG 42, WG 43 and WG 44 (top to bottom) and 01 to 03 (left to right).

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

| Paver label | Solar reflectance | Standard deviation | Solar reflectance index (SRI)* |
|-------------|-------------------|--------------------|--------------------------------|
| WG 41 | 0.43 | 0.01 | 49 |
| WG 42 | 0.40 | 0.02 | 45 |
| WG 43 | 0.37 | 0.01 | 41 |
| WG 44 | 0.32 | 0.01 | 34 |

*Assuming an emittance of 0.9, which is appropriate for non-metallic opaque building materials.

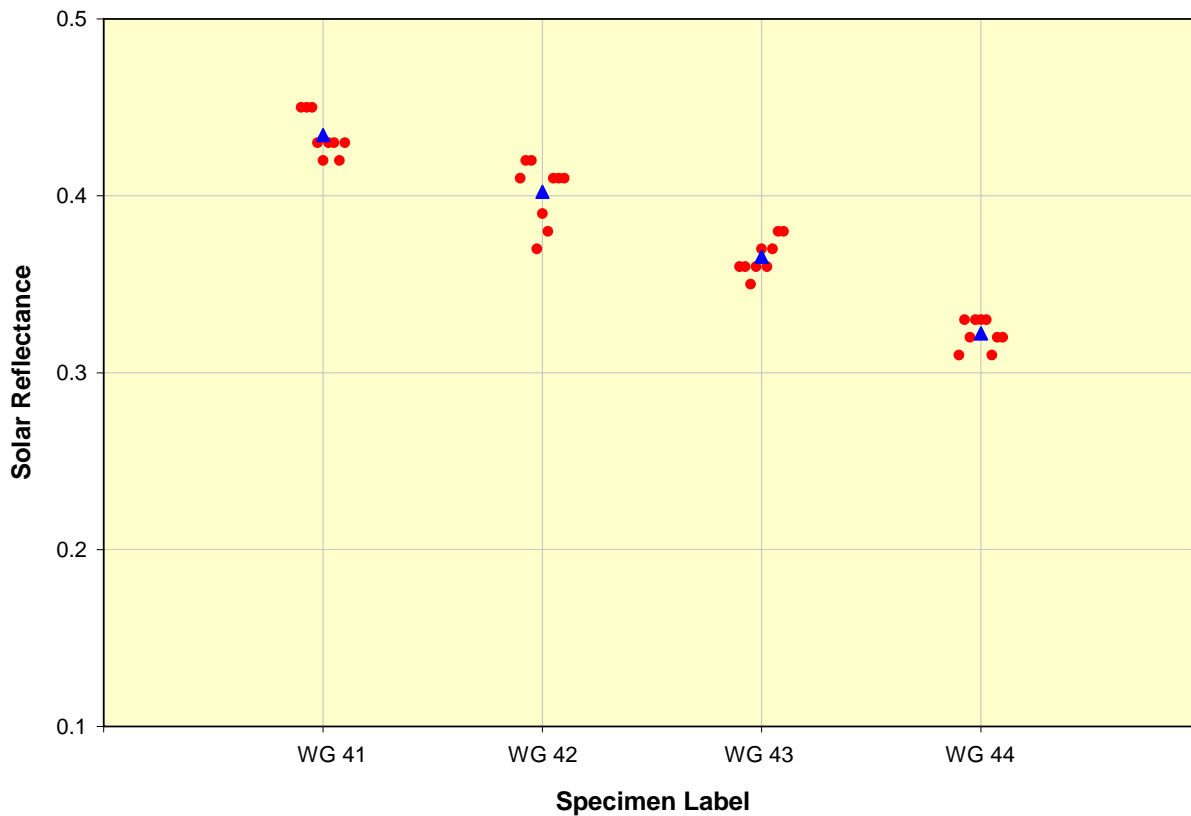


Figure 2. Solar reflectance of four types of Whitacre-Greer pavers was measured according to ASTM C 1549. The solid circles represent one of three measurements per paver, and the solid triangle represents the average of nine measurements per type.

APPENDIX A

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

Client: Whitacre-Greer
Project: C1549 Whitacre-Greer Pavers
Contact: Colby DeHoff
800-947-2837 x233

CTLGroup project no.: 315036
CTLGroup project mgr.: V. Singh
Analyst: V. Singh
Approved: M. VanGeem
Date tested: 2009 July 20

ASTM C 1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer ^{1,2}
WG 41

| Specimen | Location | Location reflectance | Specimen reflectance |
|--|----------|----------------------|----------------------|
| WG 41 01 | 1 | 0.45 | 0.45 |
| | 2 | 0.45 | |
| | 3 | 0.45 | |
| WG 41 02 | 1 | 0.43 | 0.43 |
| | 2 | 0.42 | |
| | 3 | 0.43 | |
| WG 41 03 | 1 | 0.43 | 0.43 |
| | 2 | 0.42 | |
| | 3 | 0.43 | |
| Standard deviation | | | 0.01 |
| Overall average | | | 0.43 |
| Solar reflectance index (SRI)³ corresponding to convective coefficients of three wind conditions | | Low wind | 47 |
| | | Medium wind | 49 |
| | | High wind | 50 |

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.

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ASTM C 1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer ^{1,2}
WG 42

| Specimen | Location | Location reflectance | Specimen reflectance |
|--|----------|----------------------|----------------------|
| WG 42 01 | 1 | 0.41 | 0.42 |
| | 2 | 0.42 | |
| | 3 | 0.42 | |
| WG 42 02 | 1 | 0.37 | 0.38 |
| | 2 | 0.39 | |
| | 3 | 0.38 | |
| WG 42 03 | 1 | 0.41 | 0.41 |
| | 2 | 0.41 | |
| | 3 | 0.41 | |
| Standard deviation | | | 0.02 |
| Overall average | | | 0.40 |
| Solar reflectance index (SRI)³ corresponding to convective coefficients of three wind conditions | | Low wind | 43 |
| | | Medium wind | 45 |
| | | High wind | 46 |

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**ASTM C 1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer ^{1,2}
WG 43**

| Specimen | Location | Location reflectance | Specimen reflectance |
|--|----------|----------------------|----------------------|
| WG 43 01 | 1 | 0.36 | 0.36 |
| | 2 | 0.36 | |
| | 3 | 0.35 | |
| WG 43 02 | 1 | 0.36 | 0.36 |
| | 2 | 0.37 | |
| | 3 | 0.36 | |
| WG 43 03 | 1 | 0.37 | 0.38 |
| | 2 | 0.38 | |
| | 3 | 0.38 | |
| 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 |

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ASTM C 1549, Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer^{1,2}
WG 44

| Specimen | Location | Location reflectance | Specimen reflectance |
|--|----------|----------------------|----------------------|
| WG 44 01 | 1 | 0.31 | 0.32 |
| | 2 | 0.33 | |
| | 3 | 0.32 | |
| WG 44 02 | 1 | 0.33 | 0.33 |
| | 2 | 0.33 | |
| | 3 | 0.33 | |
| WG 44 03 | 1 | 0.31 | 0.32 |
| | 2 | 0.32 | |
| | 3 | 0.32 | |
| Standard deviation | | | 0.01 |
| Overall average | | | 0.32 |
| Solar reflectance index (SRI)³ corresponding to convective coefficients of three wind conditions | | Low wind | 33 |
| | | Medium wind | 34 |
| | | High wind | 36 |

1. Tested in accordance with ASTM C 1549 - 04, *Standard Test Method for Determining Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer*.

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