

TEST REPORT

Intertek

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EVALUATION CENTER
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RENDERED TO
Monoglass Incorporated
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Vancouver, BC V6P 6G5
Attn: Mr. Joe McDermid

PRODUCT EVALUATED: MONOGLASS /SONOGLASS COATINGS
EVALUATION PROPERTY: STEADY-STATE THERMAL TRANSMISSION
PROPERTIES

Report of Testing Monoglass/Sonoglass Specimens for Steady-State Thermal Transmission Properties in accordance with ASTM C518-04, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

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2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for Monoglass Incorporated on Monoglass and Sonoglass coating samples to evaluate Steady-State Thermal Transmission Properties. Testing was conducted in accordance with ASTM C518-04, "Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus". The evaluation of the samples was performed July 30-31, 2008.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client and were not independently selected for testing. Samples were received at the Evaluation Center on July 28, 2008.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Each sample was nominally 3" – 3-½" x 12-½" x 12-½". Three samples were identified as "Monoglass" and three as "Sonoglass". See attached photograph. Each sample was conditioned for a minimum of 40 hours at 23 ± 2° C and 50 ± 5% RH prior to testing.

4 Testing and Evaluation Methods

- 4.1. The specimens were conditioned for at least 40 hours at $23\pm 2^{\circ}\text{C}$ ($73\pm 5^{\circ}\text{F}$), and 50% relative humidity in the test lab area. The test specimens were weighed using an Ohaus Model GT4100 scale (inventory number 280 01 0075), and then measured for length, width, and thickness in at least three points for each dimension using a Mitutoyo vernier S/N 1045609 (inventory number 280 01 0909). The apparent densities for the specimens were calculated. The specimens were then evaluated in accordance with ASTM C518-04 "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus" using a Netzsch Lambda 2000 Heat Flow Meter Model 436/3/1, Serial No. 183A-1204-606000390 (inventory number 280 01 0725).

4.1.1 TEST STANDARD 1

Thermal Resistance: ASTM C518-04 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

Specimen	Thermal Resistance at 25 mm (0.984 in.) Km^2/W ($^{\circ}\text{Fft}^2 \text{h/Btu}$)	Thermal Resistance at 25.4 mm (1 in.) Km^2/W ($^{\circ}\text{Fft}^2 \text{h/Btu}$)
Monoglass	0.700 (3.974)	0.711 (4.038)
Sonoglass	0.647 (3.674)	0.657 (3.733)

5.1.1. Statement of Measurement Uncertainty

It was estimated that these results have an overall measurement uncertainty of 0.66% at the 95% confidence level.


6 Conclusion

Intertek has performed testing in accordance with ASTM C518-04 "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus". Results showed that the "Monoglass" samples had a higher thermal resistance (better insulating value) than the "Sonoglass" samples.

Tested by: D.J. Carter

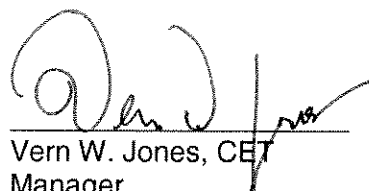
INTERTEK TESTING SERVICES NA LTD

Reported by:



D. J. Carter, P. Eng.
Building Products Engineer
Physical Testing Services

Reviewed by:



Vern W. Jones, CET
Manager
Physical Testing Services

DJC/VWJ/dc

APPENDIX A
Test Data

Test Data

Test: Steady-State Thermal Transmission

Date: July 30-31, 2008

Test Method(s): ASTM C518-04 "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus".

Conditioning: 40 hours at a temperature of $23 \pm 2^\circ\text{C}$ and relative humidity of $50 \pm 2\%$

Equipment: Scale (inventory number 280 01 0075), Calipers (inventory number 280 01 0909), Netzsch Heat Flow Meter (inventory number 280 01 0725).

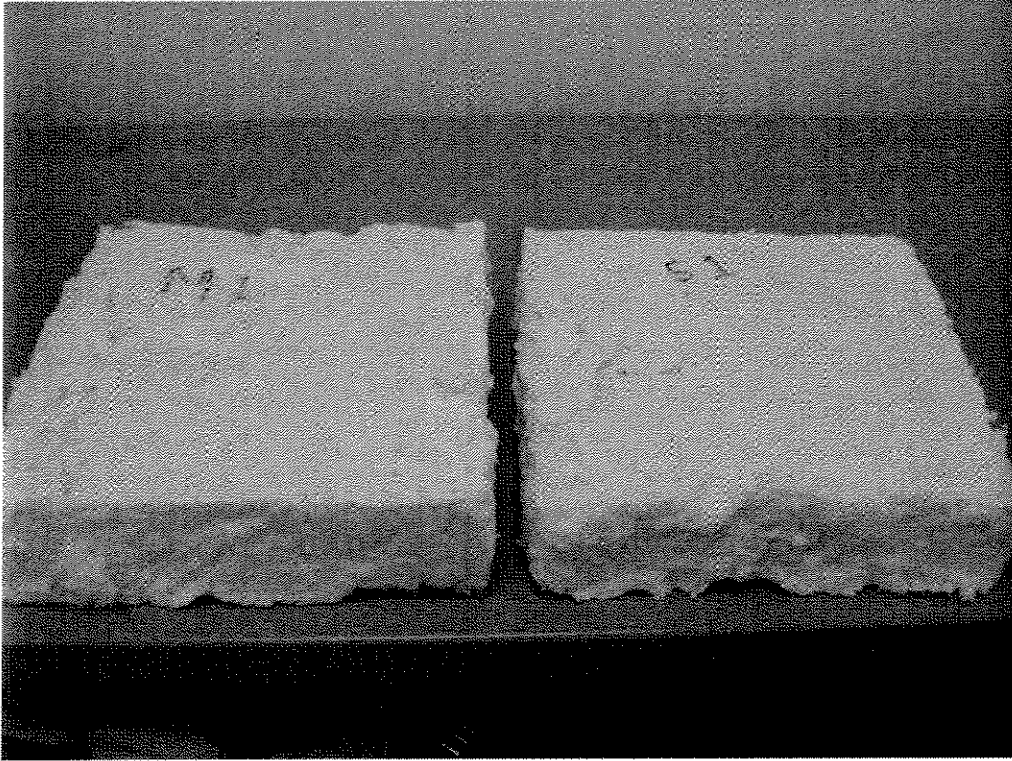
Eng/Tech: Dave Carter

Thermal Transmission

Property			
	Monoglass #1	Monoglass #2	Monoglass #3
Density	59.46 kg/m ³ (3.71 lb/ft ³)	57.36 kg/m ³ (3.58 lb/ft ³)	62.91 kg/m ³ (3.93 lb/ft ³)
Thickness	87.59 mm (3.45 in.)	78.87 mm (3.11 in.)	84.07 mm (3.31 in.)
Upper Surface Temperature	34.76° C (94.56° F)	34.76° C (94.57° F)	34.76° C (94.56° F)
Lower Surface Temperature	12.78° C (55.00° F)	12.79° C (55.02° F)	12.77° C (54.98° F)
Temperature Differential	21.98° C (39.56° F)	21.97° C (39.55° F)	21.99° C (39.58° F)
Mean Temperature	23.77° C (74.78° F)	23.78° C (74.80° F)	23.76° C (74.77° F)
Rate of Heat Flux	9.056 W/m ² (2.871 Btu/h·ft ²)	9.865 W/m ² (3.127 Btu/h·ft ²)	9.324 W/m ² (2.956 Btu/h·ft ²)
Thermal Conductance	0.412 W/m ² ·K (0.073 Btu/h·ft ² ·°F)	0.449 W/m ² ·K (0.079 Btu/h·ft ² ·°F)	0.424 W/m ² ·K (0.075 Btu/h·ft ² ·°F)
Thermal Resistance	2.427 K·m ² /W (13.779 °F·ft ² ·h/Btu)	2.228 K·m ² /W (12.648 °F·ft ² ·h/Btu)	2.358 K·m ² /W (13.388 °F·ft ² ·h/Btu)
Thermal Conductivity	0.036 W/m·K (0.250 Btu·in/h·ft ² ·°F)	0.035 W/m·K (0.245 Btu·in/h·ft ² ·°F)	0.036 W/m·K (0.247 Btu·in/h·ft ² ·°F)
Thermal Resistivity	27.705 K·m/W (3.996 °F·ft ² ·h/Btu·in)	28.245 K·m/W (4.074 °F·ft ² ·h/Btu·in)	28.048 K·m/W (4.046 °F·ft ² ·h/Btu·in)
Thermal Resistance @ 25 mm (0.984 in)	0.693 K·m ² /W (3.933 °F·ft ² ·h/Btu)	0.706 K·m ² /W (4.009 °F·ft ² ·h/Btu)	0.701 K·m ² /W (3.981 °F·ft ² ·h/Btu)
Thermal Resistance @ 25.4 mm (1.00 in)	0.704 K·m ² /W (3.996 °F·ft ² ·h/Btu)	0.0717 K·m ² /W (4.073 °F·ft ² ·h/Btu)	0.712 K·m ² /W (4.045 °F·ft ² ·h/Btu)

Property			
	Sonoglass #1	Sonoglass #2	Sonoglass #3
<i>Density</i>	96.68 kg/m ³ (6.04 lb/ft ³)	102.36 kg/m ³ (6.39 lb/ft ³)	98.78 kg/m ³ (6.17 lb/ft ³)
<i>Thickness</i>	87.28 mm (3.44 in.)	88.48 mm (3.48 in.)	91.18 mm (3.59 in.)
<i>Upper Surface Temperature</i>	34.85° C (94.73° F)	34.79° C (94.62° F)	34.73° C (94.51° F)
<i>Lower Surface Temperature</i>	12.89° C (55.21° F)	12.82° C (55.08° F)	12.75° C (54.95° F)
<i>Temperature Differential</i>	21.96° C (39.52° F)	21.97° C (39.54° F)	21.98° C (39.56° F)
<i>Mean Temperature</i>	23.87° C (74.97° F)	23.81° C (74.85° F)	23.74° C (74.73° F)
<i>Rate of Heat Flux</i>	9.640 W/m ² (3.054 Btu/h-ft ²)	9.711 W/m ² (3.075 Btu/h-ft ²)	9.298 W/m ² (2.947 Btu/h-ft ²)
<i>Thermal Conductance</i>	0.439 W/m ² ·K (0.077 Btu/h-ft ² ·°F)	0.442 W/m ² ·K (0.078 Btu/h-ft ² ·°F)	0.423 W/m ² ·K (0.074 Btu/h-ft ² ·°F)
<i>Thermal Resistance</i>	2.279 K·m ² /W (12.942 °F·ft ² ·h/Btu)	2.265 K·m ² /W (12.860 °F·ft ² ·h/Btu)	2.364 K·m ² /W (13.425 °F·ft ² ·h/Btu)
<i>Thermal Conductivity</i>	0.038 W/m·K (0.265 Btu·in/h-ft ² ·°F)	0.039 W/m·K (0.271 Btu·in/h-ft ² ·°F)	0.039 W/m·K (0.267 Btu·in/h-ft ² ·°F)
<i>Thermal Resistivity</i>	26.116 K·m/W (3.767 °F·ft ² ·h/Btu·in)	25.599 K·m/W (3.692 °F·ft ² ·h/Btu·in)	25.931 K·m/W (3.740 °F·ft ² ·h/Btu·in)
<i>Thermal Resistance @ 25 mm (0.984 in)</i>	0.653 K·m ² /W (3.707 °F·ft ² ·h/Btu)	0.640 K·m ² /W (3.634 °F·ft ² ·h/Btu)	0.648 K·m ² /W (3.681 °F·ft ² ·h/Btu)
<i>Thermal Resistance @ 25.4 mm (1.00 in)</i>	0.663 K·m ² /W (3.766 °F·ft ² ·h/Btu)	0.650 K·m ² /W (3.692 °F·ft ² ·h/Btu)	0.658 K·m ² /W (3.740 °F·ft ² ·h/Btu)

APPENDIX B
Photograph



Photograph 1: Samples of Monoglass and Sonoglass coatings