TEST REPORT

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PRODUCTS EVALUATED: Premium + Cork Underlayment
EVALUATION PROPERTY: ASTM C518

Report of Testing SG360 Control for compliance with the applicable requirements of the following criteria: ASTM C518-2010: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus.

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2 Introduction

Intertek has conducted testing for Cali Bamboo on Premium + Cork Underlayment to evaluate the thermal transmission properties. Testing was conducted in accordance with ASTM C518-2010: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus. This evaluation began April 21, 2016 and was completed April 21, 2016.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were received directly from the client. Samples were received at the Intertek Middleton Evaluation Center April 7, 2016 in good condition.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Sample Name: Premium + Cork Underlayment
Sample Description: Three cork panels were provided by the client. The recorded dimensions and density are in section 4.2

The samples were then place in 22°C and 50 % R.H. for a period of time until less than a 1 % mass change is observed over a 24-h period

4 Testing and Evaluation Methods

4.1. Thermal Conductivity

The heat flow meter apparatus establishes steady state unidirectional heat flux through a test specimen between two parallel plates at constant but different temperatures. By appropriate calibration of the heat flux transducer(s) with calibration standards and by measurement of the plate temperatures and plate separation, Fourier's law of heat conduction is used to calculate thermal conductivity, thermal resistance, or resistivity.

The accurate use of the test method is limited by the capability of the apparatus to reproduce unidirectional constant heat flux density in the specimens, and by the precision in the measurement of temperature, thickness, EMF produced by the heat flux transducer, etc.

The apparatus shall not be used at temperatures, thickness or resistances, other than those within the range of the calibration; unless it can be shown that there is no difference in accuracy.

The apparatus must be capable of maintaining at least a 10°C temperature difference across the specimen for the duration of the test, unless a smaller LT is a requirement of a particular test. The specimens tested may also limit the use of the test method and these limitations are outlined in Practice C1045.

This evaluation was accomplished using a HFM436/3/1 ER Heat Flow Meter Thermal Conductivity Instrument, manufactured by Netzsch. The HFM436/3/1 ER determines thermal conductivity in accordance with ASTM C 518.

Heat flow through a solid, results from having a temperature gradient in the material. Thermal conductivity is a material property, which determines how much heat flows through a given thickness of the material when there is a temperature difference. The Fourier linear heat flow equation defines thermal conductivity under steady state conditions as:

$$\mathbf{l} = \text{ø}\,\frac{DX}{DT}$$

where:

$\mathbf{l}$ = thermal conductivity, $\frac{W}{m \bullet K}$

ø = heat flux, $\frac{W}{m^2}$

DT = temperature difference across distance LX, K

DX = distance between hot and cold plates, m

Prior to each series of tests, the HFM436/3/1 ER was calibrated using a sample whose thermal conductivity is known and traceable to national standards.

To perform the test, the specimens are placed in the HFM436/3/1 ER instrument; the top (hot) plate is brought downwards creating contact of both plates with the test specimen. The hot and cold plates were then allowed to equilibrate to the required temperatures and their exact temperatures were read from the instrument.

The mean temperature for testing is 75^{o}F with a temperature difference between plates at 40^{o}F.

Density Measurements were taken using standard ASTM D1622.

Testing and Evaluation Results

4.2. RESULTS AND OBSERVATIONS

Specimen	Length (mm)	Depth (mm)	Depth (in)	Weight	Density	
Cork Underlayment	Avg.	Avg.	Avg.	kg	(kg/m^3)	(lbs/ft^3)
1	307.85	3.06	0.1205	0.04780	164.68	10.28
2	304.06	2.84	0.1116	0.04303	163.71	10.22
3	306.17	2.93	0.1154	0.04553	165.27	10.32
				Mean:	**164.55**	**10.27**
				StdDev:	0.79	0.05

Test Information	Thermal Conductivity	Thermal Conductivity	Thermal Resistance	Thermal Resistance	Thermal Resistance per inch	Thermal Resistance per meter	Thermal Conductance	Heat Flux
	K Value	K Value	R Value	R Value	R/in	R/m	U	q
Units:	Btu-in/hr-ft^2-°F	W/m-K	Hr-ft^2-°F/Btu	m^2-K/W	Hr-ft^2-°F/Btu/in	m^2-K/W/m	W/m^2-K	W/m^2
Specimen 1	0.216403	0.03121	0.55682	0.0981	4.62	32.04	10.20	36.20
Specimen 2	0.200598	0.02893	0.55635	0.0980	4.99	34.56	10.21	36.06
Specimen 3	0.206882	0.02984	0.55771	0.0982	4.83	33.51	10.18	36.54
Average	0.207961	0.02999	0.55696	0.0981	4.81	33.37	10.20	36.27

Test Information	Duration of the measurement	Measured Thickness	Measured Thickness	Delta Temperature	Delta Temperature	Mean Temperature	Mean Temperature	Temperature Gradient	
Units:	min	(in)	(m)	°F	°C	°F	°C	°F/in	°K/m
Specimen 1	0:39:25	0.121	0.003061	38.39	3.55	76.12	24.51	318.53	63.75
Specimen 2	0:39:24	0.112	0.002835	38.36	3.53	75.82	24.34	343.67	64.27
Specimen 3	0:38:23	0.115	0.002931	38.46	3.59	75.81	24.34	333.34	64.06
Average	0:39:04	0.116	0.002942	38.40	3.56	75.92	24.40	331.85	64.03

4.2.1. Deviation to the test method

There were no deviations to the standard method.

4.2.2. Statement of Measurement Uncertainty

The uncertainty of the Netzsch Thermal Conductivity Instrument HFM436/3/1 ER is estimated to be 1-3%.

4.2.3. Calibration of ASTM C518

NIST standard SRM1450c Fibrous Glass board #1450C748 was run before testing began. The calibration testing was within 1% error of the NIST standard value.

5 Conclusion

Intertek has conducted testing for Cali Bamboo on Premium + Cork Underlayment to evaluate the thermal transmission properties. Testing was conducted in accordance with ASTM C518-2010: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus.

There is no pass fail criterion for ASTM C518.

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

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6 Revision Summary

DATE	SUMMARY
April 22, 2016	Original Issue Date