TEST REPORT

REPORT NUMBER: 141128002SHJ-BP-1
ORIGINAL ISSUE DATE: March 23, 2015

EVALUATION CENTER

Intertek Testing Services Ltd., Shanghai
Plant 7, No. 6958 Daye Road, Fengxian District, Shanghai, China

RENDERED TO

BBMG Energy Saving Materials & Technology Co. Ltd
#2, Gaojing, Chaoyang District, Beijing, China

PRODUCT EVALUATED
Rock wool with a density from 60 ~ 200 kg/m^3

EVALUATION PROPERTY
Surface burning, Compressive resistance, Airborne sound transmission loss, Non-combustibility, Thermal conductivity, Non-fibrous content, Water vapor sorption, Fungi resistance

Report of Testing Rock wool for compliance with the applicable requirements of the following criteria: *ASTM E84-14 (UL 723, UBC 8-1, NFPA 255), CAN/ULC S102-10, CAN/ULC S114-5, ASTM C165-07(Reapproved 2012), ASTM C518-13, ASTM C1335-12, ASTM C1104-13a, ASTM C1338-14, ASTM E90-09, ASTM E413-10.*

1 Table of Contents

2 Introduction

Intertek has conducted testing for BBMG Energy Saving Materials & Technology Co. Ltd, on rock wool with a density from 60 to 200 kg/m^3, to evaluate its performance of Surface burning, Compressive resistance, Acoustic, Non-combustible, Apparent thermal conductivity, Non-fibrous content, Linear Shrinkage, Water vapor sorption, Fungi resistance. This evaluation began on November 28, 2014 and was completed March 22, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. The samples were received at evaluation center on December 8, 2014. The sample ID was S141128001SHJ.

The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The samples were identified as rock wool with a density range from 60 to 200 kg/m^3. The selected sample densities were 60 kg/m^3, 120 kg/m^3, 140 kg/m^3 and 200 kg/m^3. Photographs of samples were presented in Appendix A. The main composition of the product was basalt, slag, dolomite and resin.

4 Testing and Evaluation Methods

4.1. SURFACE BURNING CHARACTERISTICS PER ASTM E84

Upon receipt of the samples at Intertek Shanghai laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 2.8°C (73.4 ± 5°F) and 50 ± 5% relative humidity. The test was conducted in accordance with ASTM E84-14 (UL 723, UBC 8-1, NFPA 255), Standard Test Method for Surface Burning Characteristics of Building Materials. The specimens are placed directly on the tunnel ledges. The 200 kg/m^3 specimen consisted of six sections of rock wool, each section was 3.94-ft. long ×23.62-in. wide be 1.97-in. thick. The 60 kg/m^3 specimen consisted of six sections of rock wool, each section was 3.94-ft. long ×23.62-in. wide be 3.23-in. thick. Six sections were butted end-to-end to create a 23.62-ft long specimen. As required by the standard, one or more layers of 0.25 inch thick reinforced concrete board are placed on top of the test sample between the sample and the tunnel lid. After the test, the samples are removed from the tunnel, examined and disposed of.

4.2. SURFACE BURNING CHARACTERISTICS PER CAN/ULC S102

Upon receipt of the samples at Intertek Coquitlam laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3°C (73.4 ± 5°F) and 50 ± 5% relative humidity. For each trial run, six 4ft. lengths of insulation were placed on the upper ledges of the flame spread tunnel, and butted together to form the required 24 ft. sample length. A layer of 6mm reinforced cement board was placed on top of the sample, the tunnel lid was lowered into place, and the samples were the tested in accordance with CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

4.3. NON-COMBUSTIBILITY PER CAN/ULS S114

Upon receipt of the samples at Intertek Middleton laboratory, the samples were dried at 60± 3°C for not less than 24 hours but not more than 48 hours. The samples were placed in desiccators to cool for at least one hour.

Testing was conducted in accordance with CAN/ULC S114-05, Standard Method of Test for Determining Non-Combustibility in Building Materials. The method used a furnace which consisted of two concentric vertical refectory ceramic tubes containing an electric coil to expose building materials to a temperature of 750 +/- 3°C for 15 minutes at the controlling thermocouple, and stabilized at that temperature within +/- 1°C. The current though the heating coils were not be adjusted during the test.

All test specimens were 38 by 38 by 50 +/- 2 mm. The specimens were dried at 60 +/- 3°C for not less than 24 hours but no more than 48 hours. The specimens were then place in a desiccator to cool at least 1 hour before testing. Not less than three identical specimens were tested to pass the testing test criteria. The test room and furnace setup was in compliance with the testing standard. The weight of each specimen in grams was recorded before and after testing. The specimen was inserted as rapidly as possible with its long axis vertical to the furnace. No more than 10 seconds elapsed between opening and closing the furnace. Readings for the thermocouples were made every 500 ms for the testing interval. The test continued for a period of 15 minutes. Visual observations were taken recoding the intensity and duration of smoke, time of flaming, and change of state.

4.4. COMPRESSIVE PROPERTY

Upon receipt of the samples at Intertek Shanghai laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5% relative humidity. Test was conducted in accordance with ASTM C165-07 (Reapproved), Procedure A. The 51mm thick specimen was placed between the loading surfaces of the testing machine. The crosshead speed was adjusted to 10 mm/min. The test result was calculated based on the load-deformation curve in accordance with section 8.1 of ASTM C165. The compressive resistance at 10% deformation was recorded.

4.5. THERMAL CONDUCTIVITY

Upon receipt of the samples at Intertek Middleton laboratory they were placed in a conditioning

room where they remained in an atmosphere of 72°F and 50% relative humidity for at least 24 hours before testing.

Testing was conducted in accordance with ASTM C518-13, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. The heat flow meter apparatus established 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 mean temperature for testing was 75°F with a temperature difference between plates at 40°F. Density Measurements were taken using standard ASTMD1622.

4.6. NON-FIBROUS CONTENT

Upon receipt of the samples at Intertek York laboratory they were placed in a conditioning room where they remained in an atmosphere of 70±2°F and 50±5% relative humidity for duration of 48 hours.

Testing was conducted in accordance with ASTM C 1335-12, Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation, Procedure B. The nominal 0.35 oz (10g) specimen was fired for 15 minutes at 1100 ±10 ºF (593 ±5.6 ºC), cooled for 20 minutes and the mass determined utilizing a Mettler Toledo AX504 Balance (ICN 003449). The fired specimen was manually passed through three sieves, No.'s 20, 50 and 100, and the non-fibrous material retained on each sieve was weighed.

4.7. WATER VAPOR SORPTION

Upon receipt of the samples at Intertek York laboratory they were placed in a conditioning room where they remained in an atmosphere of 70±2°F and 50±5% relative humidity for duration of 48 hours.

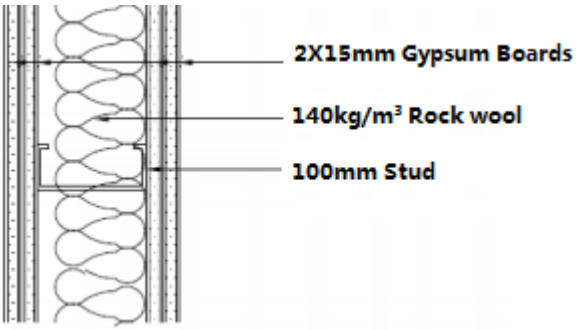
Testing was conducted in accordance with ASTM C1104/C1104M-13a, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation, Procedure A. Initial measurements of the nominal 15 cm x 15 cm x material thickness specimen were taken utilizing Calipers (ICN 538-2) and a Mettler Toledo PL6001-S Balance (ICN 004473). The specimen was then dried at 102 ºC (215 ºF) to a moisture-free weight, heated to a uniform temperature of 60 ºC (140 ºF), conditioned at 49 ±2 ºC (120 ±3 ºF) and 95 ±3% relative humidity in an Espec Environmental Chamber (ICN 64509) for 96 ±4 hours, sealed in a pre-weighed plastic bag, cooled to room temperature and weighed.

4.8. FUNGI RESISTANCE

Testing was conducted in accordance with ASTM 1338-14, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings. This test method is used to determine the relative ability of an insulation and its facing to support or resist fungal growth under conditions favorable for their development. Test was conduct in Intertek Columbus, OH.

4.9. AIRBORNE SOUND TRANSMISSION LOSS

Upon receipt of the samples at Intertek Shanghai laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5% relative humidity. A 4m wide by 3m high by 160mm thick steel stud gypsum board wall with 140kg/m^3 rock wool insulation sampled from the manufacturing facility was constructed. Test wall conducted in accordance with ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements. And the classification for rating sound insulation was calculated in accordance with ASTM E413-10, Classification for Rating Sound Insulation. Design and structure of the test wall were shown below. The test result was for the specified wall system only.



5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The test results are summarized in the tables below. Detail data was in Appendix B.

Table 1 Fire performance

Test Method	Characters	Sample density	Result
ASTM E84-14 (UL 723, UBC 8-1, NFPA 255)	Surface burning characteristics	60 kg/m^3	Flame Spread Index = 0; Smoke Developed Index =5
		200 kg/m^3	Flame Spread Index = 0; Smoke Developed Index =5
CAN/ULC S102-10[1]	Surface burning characteristics	60 kg/m^3	Flame Spread Rating = 0; Smoke Developed Classification = 0
		200 kg/m^3	Flame Spread Rating = 0; Smoke Developed Classification = 0
CAN/ULC-S114-5[2]	Non-combustibility	60 kg/m^3	Pass
		200 kg/m^3	Pass

Note:

1. The test was conducted by Intertek Testing Services NA Ltd. Detail information was referred to report No. 101943447COQ-001a and 101943447COQ-001b in Appendix B.
2. The test was conducted by Intertek Testing Services NA Ltd. Detail information was referred to report No. 101943432MID-001aRev1 and 101943432MID-001bRev1 in Appendix B.

Table 2 Physical Performance			
Test Method	**Characters**	**Sample density**	**Result**
ASTM C165-07, Procedure A	Compressive property	60 kg/m^3	σ_{10} = 7.5 kPa
		120 kg/m^3	σ_{10} = 33.0 kPa
		140 kg/m^3	σ_{10} = 45.0 kPa
		200 kg/m^3	σ_{10} = 80.4 kPa
ASTM C518-13[3]	Thermal Conductivity[4]	60 kg/m^3	0.03399 W/m-K
		200 kg/m^3	0.03949 W/m-K
ASTM C1335-12, Procedure B[5]	Non-fibrous content	60 kg/m^3	Non-Fibrous Material = 8.55%
		200 kg/m^3	Non-Fibrous Material = 10.80%
ASTM C1104-13a, Procedure A[6]	Water vapor sorption	60 kg/m^3	Water Vapor Sorption by Weight= 0.1%; Water Vapor Sorption by Volume = 0.0%
		200 kg/m^3	Water Vapor Sorption by Weight= 0.1%; Water Vapor Sorption by Volume = 0.0%
ASTM C1338-14[7]	Fungi resistance	60 kg/m^3	Growth rating: < Comparative Material
		200 kg/m^3	Growth rating: No growth

Note:

3. The test was conducted by Intertek Testing Services NA Ltd. Detail information was referred to report No. 101943432MID-003aRev1 and 101943432MID-003bRev1 in Appendix B.
4. The mean temperature was 24°C.
5. The test was conducted by Architectural Testing Inc., a subsidiary of Intertek (Intertek-ATI). Detail information was referred to report No. E4199.03-106-31 in Appendix B.
6. The test was conducted by Architectural Testing Inc., a subsidiary of Intertek (Intertek-ATI). Detail information was referred to report No. E4199.02-106-31 in Appendix B.
7. The test was conducted by Intertek Testing Services NA Ltd. Detail information was referred to report No. 101945035COL-001 in Appendix B.

Table 3 Acoustic Performance		
Test Method	**Characters**	**Result**
ASTM E90-09 ASTM E413-10	Airborne sound transmission loss	Based on the wall system[8,9], STC= 50

Note:

8. The test wall system was included 4 layers of 15 mm thick standard gypsum boards, 140 kg/m^3 rock wool and 100 mm thick stud. Detail test data were referred to Appendix B.
9. The STC value was for the specified wall system only.

6 Conclusion

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on rock wool with a density range from 60 to 200 kg/m^3, to evaluate its performance of Surface burning, Compressive resistance, Non-combustible, Apparent thermal conductivity, Non-fibrous content, Water vapor sorption, Fungi resistance and Acoustic.

Test result can be found in Section 5 of this report.

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

Reported by: Harrison Li

Harrison Li
Senior Project Engineer, Building Product

Reviewed by: Jodie Zhou

Jodie Zhou
Senior Technical Supervisor, Building Product

7 Appendix A: Product Photographs

60 kg/m^3

120 kg/m^3

140 kg/m^3

200 kg/m^3

8 Appendix B: Test Data

8.1. ASTM E84 test data

Intertek Testing Services Ltd.

TEST DATA PACKAGE

Client:	BBMG Energy Saving Materials & Technology Co. Ltd	Project Engineer:	Harrison Li
Project No.:	141128001SHJ-BP	Tested By:	Timothy Li
Product:	Rock wool	Reviewed By:	Sun Sun
Model:	60 kg/m^3 and 200 kg/m^3		
Sample ID:	S141128001SHJ-001~012	Sample Tracker #	/
Standard (S):	ASTM E84-14		
Witnesses:	n/a		

TABLE OF TEST EQUIPMENT USED

Item	Equipment Type	Equipment #	Cal. Due Date
1	Wratten filters	SH1145-1~4	2015-05-06
2	Thermocouple	SH1145-5~7	2015-04-30
3	Pressure transducer	SH1145-8~9	2015-05-05
4	Magnehelic	SH1145-10~11	2015-05-05
5	Inclined plane manometer	SH1145-12	2015-05-07
6	Rotameter	SH1145-13	2015-05-06
7	Fuel orifice pressure manometer	SH1145-14	2015-05-07
8	Orifice plate	SH1145-15	2015-05-05
9	Thermal couple channel	SH1145-16~18	2015-04-28
10	Displacement meter	SH1145-19~20	2015-4-28

Intertek Testing Services Ltd.

Test Method	Lab ID	Project #
ASTM E84	Intertek Fire Laboratory	141128001

Date: 22 Dec 2014 Time (Test Start) 3:23 PM Test No. 1

Specimen ID: Rock Wool

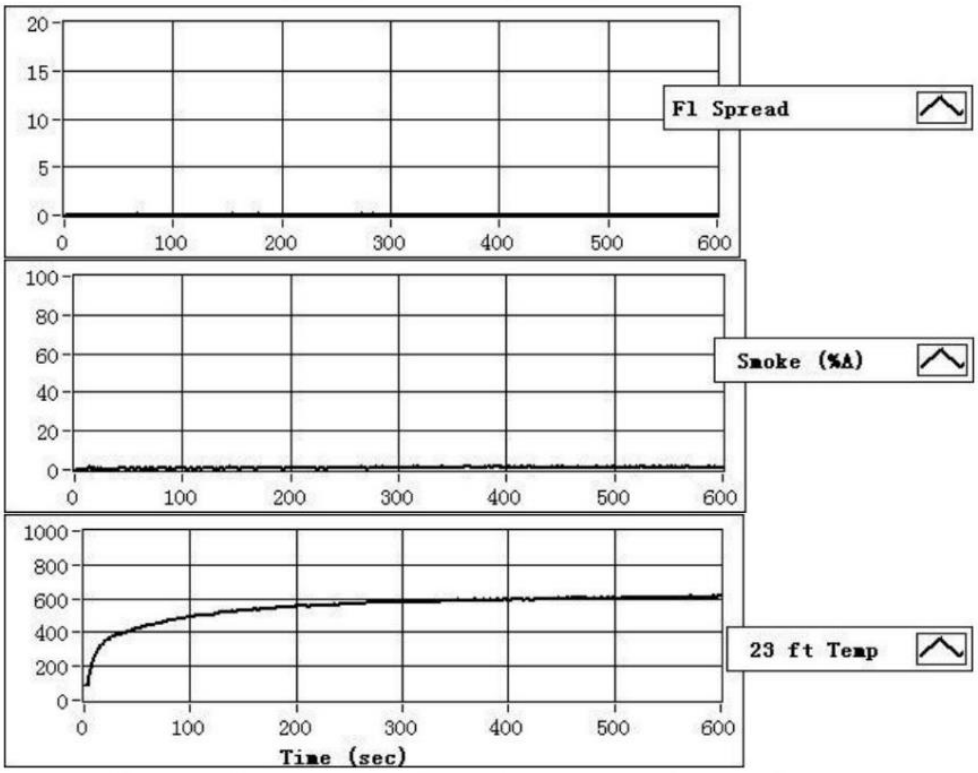
Specimen Description: Rock Wool 200kg

Mounting Procedure: Self-supporting

Fuel (CF) 43.4 RO Smk Area 59.1 Smoke Area (%A min) 2.77

FS Area (ft-min) 1.47 Maximum FS 0.20

MAX FS Time (min) 4.56 Max Temp 613.



Raw SD 4.7 Final FSI 0 Final SD 5

Time to 980F (min) 0.00

Intertek Testing Services Ltd.

Test Method	Lab ID	Project #
ASTM E84	Intertek Fire Laboratory	141128001

Date

23 Dec 2014	Time (Test Start)	1:47 PM	Test No.	1

Specimen ID

Rock Wool

Specimen Description

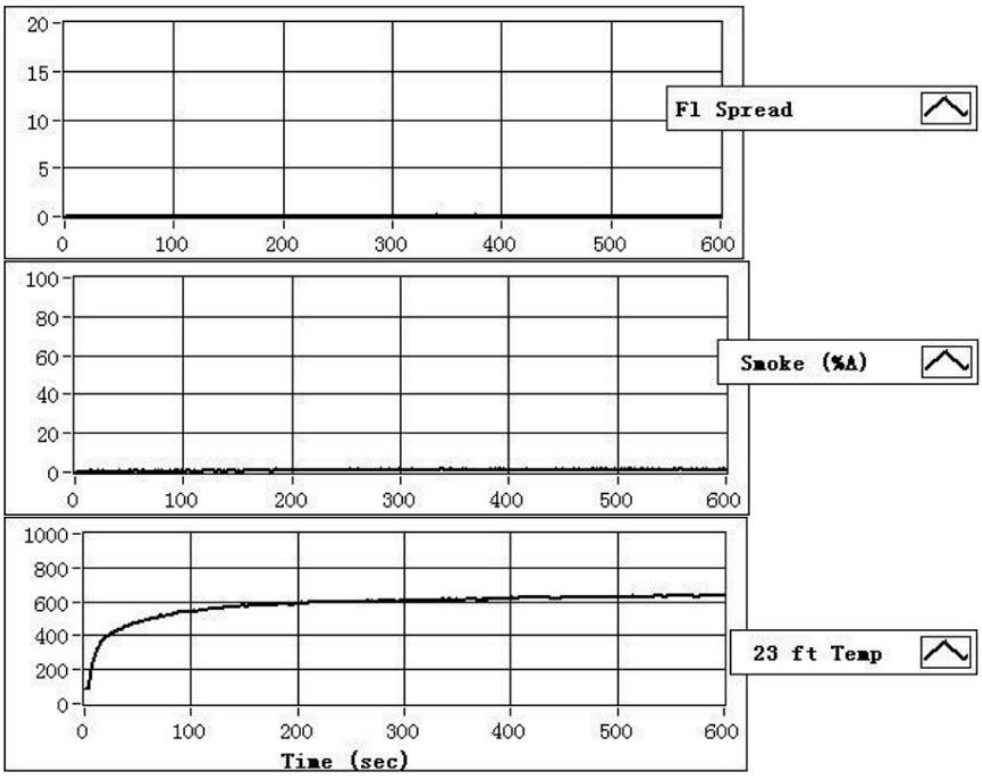
Rock Wool, 60kg

Mounting Procedure

Fuel (CF) 43.3 RO Smk Area 59.1 Smoke Area (%A min) 2.15

FS Area (ft-min) 0.43 Maximum FS 0.10

MAX FS Time (min) 5.67 Max Temp 636.



Raw SD 3.6 Final FSI 0 Final SD 5

Time to 980F (min) 0.00

8.2. Report of CAN/ULC S102

TEST REPORT

Intertek

REPORT NUMBER: 101943447COQ-001a
ORIGINAL ISSUE DATE: January 28, 2015

EVALUATION CENTER
Intertek Testing Services NA Ltd.
1500 Brigantine Drive
Coquitlam, B.C. V3K 7C1

RENDERED TO

BBMG Energy Saving Material & Technology Co. Ltd.
Gaojing#2, Chaoyang District,
Beijing, China

PRODUCT EVALUATED: 3 in. thick 60 Kg/m3 Rockwool Insulation
EVALUATION PROPERTY: Surface Burning Characteristics

Report of testing 3 in. thick 60 Kg/m3 Rockwool Insulation for compliance with the applicable requirements of the following criteria: CAN/ULC S102-10, *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.*

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for BBMG Energy Saving Material & Technology Co, Ltd. to evaluate the surface burning characteristics of 3 in. thick 60 Kg/m3 Rockwool Insulation. Testing was conducted in accordance with the standard methods of CAN/ULC S102-10, *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*.

This evaluation began January 27, 2015 and was completed January 27, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected by Intertek representative Daniel Zhang at the BBMG Energy Saving Material & Technology Co. Ltd. manufacturing facility located at #8, Xiaan Road, Dachang County, Hebei Province R.P.C. The sample materials were received at the Evaluation Center on January 5, 2015.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Upon receipt of the samples at the Intertek Coquitlam laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3°C (73.4 ± 5°F) and 50 ± 5% relative humidity.

The sample material consisted of 3 in. thick by 24 in. wide by 4 ft. long rockwool insulation and was identified as 3 in. thick 60 Kg/m3 Rockwool Insulation.

For each trial run, six 4 ft. lengths of insulation were placed on the upper ledges of the flame spread tunnel, and butted together to form the required 24 ft. sample length. A layer of 6mm reinforced cement board was placed on top of the sample, the tunnel lid was lowered into place, and the samples were then tested in accordance with CAN/ULC S102-10.

4 Testing and Evaluation Methods

4.1. TEST STANDARD

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and inorganic-cement board.

(A) Flame Spread Index:

This index relates to the rate of progression of a flame along a sample in the 25 foot tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time.

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

(A) Flame Spread

The resultant flame spread indexes are as follows:
(Rating rounded to nearest 5)

3 in. thick 60 Kg/m3 Rockwool Insulation	Flame Spread	Flame Spread Rating
Run 1	2	0
Run 2	3	
Run 3	0	

(B) Smoke Developed

The areas beneath the smoke developed curve and the related indexes are as follows:
(Classification rounded to nearest 5)

3 in. thick 60 Kg/m3 Rockwool Insulation	Smoke Developed	Smoked Developed Classification
Run 1	0	0
Run 2	0	
Run 3	0	

(C) Observations

During the tests, there was no visible surface ignition or smoke.

6 Conclusion

The 3 in. thick 60 Kg/m3 Rockwool Insulation, submitted by BBMG Energy Saving Material & Technology Co, Ltd., exhibited the following flame spread characteristics when tested in accordance CAN/ULC S102-10, *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*.

A series of three test runs of each material was conducted to conform to the requirements of the National Building Code of Canada.

Sample Material	Flame Spread Rating	Smoke Developed Classification
3 in. thick 60 Kg/m3 Rockwool Insulation	0	0

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES NA LTD.

Reported by: Gregory Philp
Greg Philp
Technician – Building Products

Reviewed by: Riccardo DeSantis
Riccardo DeSantis
Manager – Building Products

APPENDIX A

DATA SHEETS

CAN/ULC S102-10 DATA SHEETS
Run 1

Standard: ULC S102

Page 1 of 2

Client: BBMG Energy Saving Material & Technology
Date: 01 27 2015
Project Number: 101943447
Test Number: 1
Operator: Greg Philp

Specimen ID: 75 mm thick 60 Kg/m3 Rockwool Insulation

TEST RESULTS

FLAMESPREAD INDEX: 0

SMOKE DEVELOPED INDEX: 0

SPECIMEN DATA . . .

Time to Ignition (sec): 0
Time to Max FS (sec): 229
Maximum FS (mm): 153.4
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 306
Time to Max Temperature (sec): 595
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (M*min): 1.1
Smoke Area (%A*min): 0.2
Unrounded FSI: 2.0
Unrounded SDI: 0.1

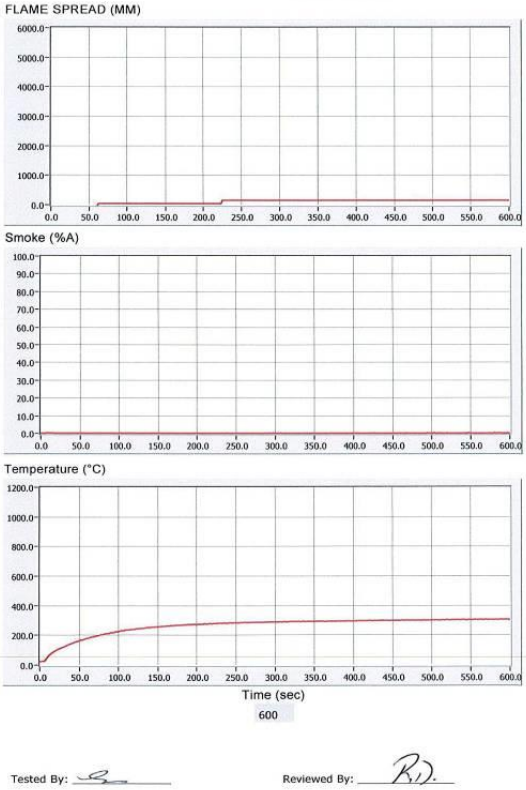
CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 44.0
Red Oak Smoke Area (%A*min): 184.1

Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 1

Client: BBMG Energy Saving Material &
Specimen ID: 75 mm thick 60 Kg/m3 Rockwool
Test No.: 1
Standard: ULC S102



Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 2

Standard: ULC S102

Page 1 of 2

Client: BBMG Energy Saving Material & Technology
Date: 01 27 2015
Project Number: 101943447
Test Number: 2
Operator: Greg Philp

Specimen ID: 75 mm thick 60 Kg/m3 Rockwool Insulation

TEST RESULTS

FLAMESPREAD INDEX: 5

SMOKE DEVELOPED INDEX: 0

SPECIMEN DATA . . .

Time to Ignition (sec): 0
Time to Max FS (sec): 304
Maximum FS (mm): 229.0
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 306
Time to Max Temperature (sec): 591
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (M*min): 1.5
Smoke Area (%A*min): 0.1
Unrounded FSI: 2.8
Unrounded SDI: 0.0

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 44.0
Red Oak Smoke Area (%A*min): 184.1

Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 2

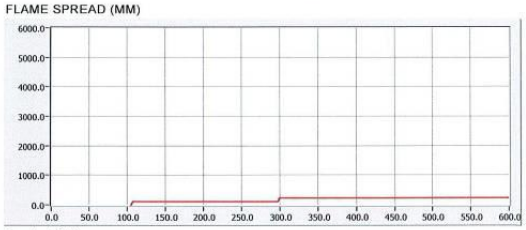
Client: BBMG Energy Saving Material &

Specimen ID: 75 mm thick 60 Kg/m3 Rockwool

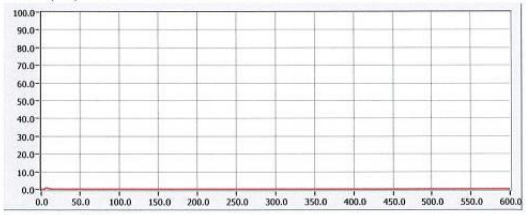
Test No.: 2

Standard: ULC S102

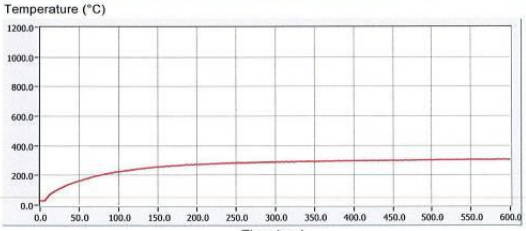
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 3

Standard: ULC S102

Page 1 of 2

Client: BBMG Energy Saving Material & Technology
Date: 01 27 2015
Project Number: 101943447
Test Number: 3
Operator: Greg Philp

Specimen ID: 75 mm thick 60 Kg/m3 Rockwool Insulation

TEST RESULTS

FLAMESPREAD INDEX: 0

SMOKE DEVELOPED INDEX: 0

SPECIMEN DATA . . .

Time to Ignition (sec): 0
Time to Max FS (sec): 74
Maximum FS (mm): 44.2
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 307
Time to Max Temperature (sec): 586
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (M*min): 0.4
Smoke Area (%A*min): 0.0
Unrounded FSI: 0.7
Unrounded SDI: 0.0

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 44.0
Red Oak Smoke Area (%A*min): 184.1

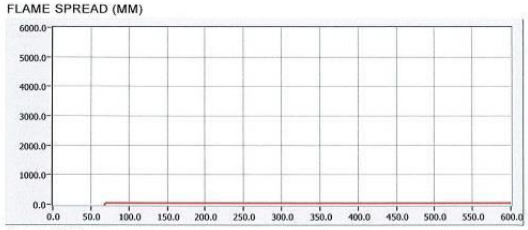
Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 3

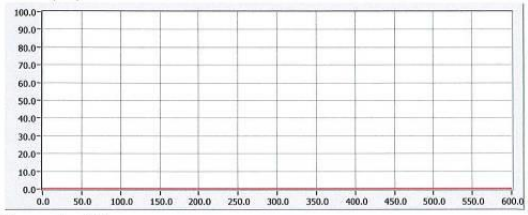
Client: BBMG Energy Saving Material &
Specimen ID: 75 mm thick 60 Kg/m3 Rockwool

Test No.: 3
Standard: ULC S102

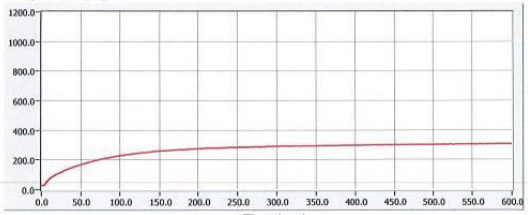
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)
600

Tested By: _____ Reviewed By: _____

REVISION SUMMARY

DATE	PAGE(S)	SUMMARY
January 28, 2015	All	Original Issue Date

TEST REPORT

REPORT NUMBER: 101943447COQ-001b
ORIGINAL ISSUE DATE: January 28, 2015

EVALUATION CENTER
Intertek Testing Services NA Ltd.
1500 Brigantine Drive
Coquitlam, B.C. V3K 7C1

RENDERED TO

BBMG Energy Saving Material & Technology Co. Ltd.
Gaojing#2, Chaoyang District,
Beijing, China

PRODUCT EVALUATED: 2 in. thick 200 Kg/m3 Rockwool Insulation
EVALUATION PROPERTY: Surface Burning Characteristics

Report of testing 2 in. thick 200 Kg/m3 Rockwool Insulation for compliance with the applicable requirements of the following criteria: CAN/ULC S102-10, *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.*

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for BBMG Energy Saving Material & Technology Co, Ltd. to evaluate the surface burning characteristics of 2 in. thick 200 Kg/m3 Rockwool Insulation. Testing was conducted in accordance with the standard methods of CAN/ULC S102-10, *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*.

This evaluation began January 27, 2015 and was completed January 28, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected by Intertek representative Daniel Zhang at the BBMG Energy Saving Material & Technology Co. Ltd. manufacturing facility located at #8, Xiaan Road, Dachang County, Hebei Province R.P.C. The sample materials were received at the Evaluation Center on January 5, 2015.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Upon receipt of the samples at the Intertek Coquitlam laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3°C (73.4 ± 5°F) and 50 ± 5% relative humidity.

The sample material consisted of 2 in. thick by 24 in. wide by 4 ft. long rockwool insulation and was identified as 2 in. thick 200 Kg/m3 Rockwool Insulation.

For each trial run, six 4 ft. lengths of insulation were placed on the upper ledges of the flame spread tunnel, and butted together to form the required 24 ft. sample length. A layer of 6mm reinforced cement board was placed on top of the sample, the tunnel lid was lowered into place, and the samples were then tested in accordance with CAN/ULC S102-10.

4 Testing and Evaluation Methods

4.1. TEST STANDARD

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and inorganic-cement board.

(A) Flame Spread Index:

This index relates to the rate of progression of a flame along a sample in the 25 foot tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time.

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

(A) Flame Spread

The resultant flame spread indexes are as follows:
(Rating rounded to nearest 5)

2 in. thick 200 Kg/m3 Rockwool Insulation	Flame Spread	Flame Spread Rating
Run 1	1	0
Run 2	1	
Run 3	1	

(B) Smoke Developed

The areas beneath the smoke developed curve and the related indexes are as follows:
(Classification rounded to nearest 5)

2 in. thick 200 Kg/m3 Rockwool Insulation	Smoke Developed	Smoked Developed Classification
Run 1	0	0
Run 2	0	
Run 3	0	

(C) Observations

During the tests, there was no visible surface ignition or smoke.

6 Conclusion

The 2 in. thick 200 Kg/m3 Rockwool Insulation, submitted by BBMG Energy Saving Material & Technology Co, Ltd., exhibited the following flame spread characteristics when tested in accordance CAN/ULC S102-10, *Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*.

A series of three test runs of each material was conducted to conform to the requirements of the National Building Code of Canada.

Sample Material	Flame Spread Rating	Smoke Developed Classification
2 in. thick 200 Kg/m3 Rockwool Insulation	0	0

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK TESTING SERVICES NA LTD.

Reported by: Gregory Philp
Greg Philp
Technician – Building Products

Reviewed by: Riccardo DeSantis
Riccardo DeSantis
Manager – Building Products

APPENDIX A

DATA SHEETS

CAN/ULC S102-10 DATA SHEETS
Run 1

Standard: ULC S102

Client: BBMG EnerySaving Material
Date: 01 27 2015
Project Number: 101943447
Test Number: 1
Operator: Greg Philp

Specimen ID: 50 mm thick 200 kg/m3 Rockwool Insulation

TEST RESULTS

FLAMESPREAD INDEX: 0

SMOKE DEVELOPED INDEX: 0

SPECIMEN DATA . . .

Time to Ignition (sec): 0
Time to Max FS (sec): 353
Maximum FS (mm): 100.2
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 306
Time to Max Temperature (sec): 594
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (M*min): 0.6
Smoke Area (%A*min): 0.0
Unrounded FSI: 1.1
Unrounded SDI: 0.0

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 44.0
Red Oak Smoke Area (%A*min): 184.1

Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 1

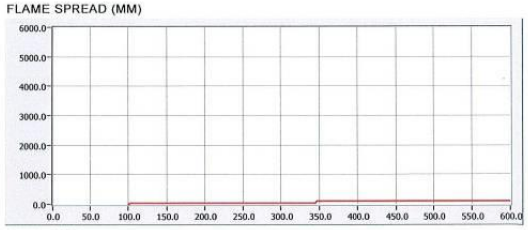
Client: BBMG EnerySaving Material

Specimen ID: 50 mm thick 200 kg/m3 Rockwool

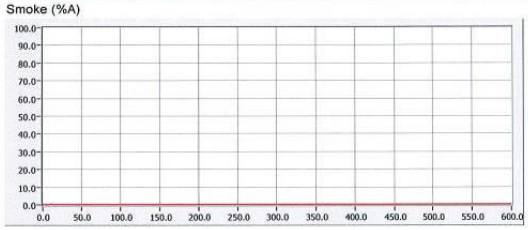
Test No.: 1

Standard: ULC S102

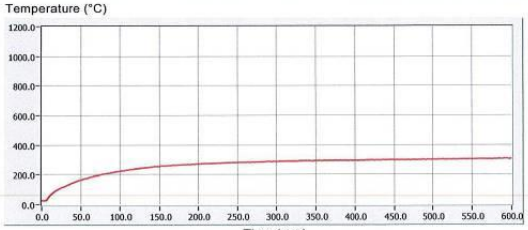
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: _____

Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 2

Standard: ULC S102

Page 1 of 2

Client: BBMG Energy Saving Material
Date: 01 28 2015
Project Number: 101943447
Test Number: 2
Operator: Greg Philp

Specimen ID: 50 mm thick 200 Kg/m3 Rockwool Insulation

TEST RESULTS

FLAMESPREAD INDEX: 0

SMOKE DEVELOPED INDEX: 0

SPECIMEN DATA . . .

Time to Ignition (sec): 0
Time to Max FS (sec): 107
Maximum FS (mm): 40.9
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 308
Time to Max Temperature (sec): 600
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (M*min): 0.3
Smoke Area (%A*min): 0.0
Unrounded FSI: 0.6
Unrounded SDI: 0.0

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 44.0
Red Oak Smoke Area (%A*min): 184.1

Tested By: _____ Reviewed By: R.D

CAN/ULC S102-10 DATA SHEETS
Run 2

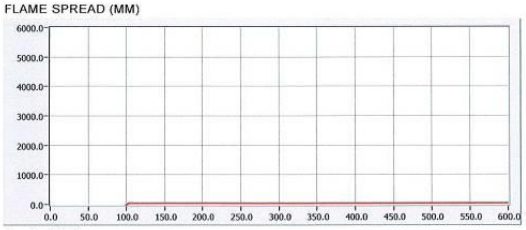
Client: BBMG Energy Saving Material

Specimen ID: 50 mm thick 200 Kg/m3 Rockwool

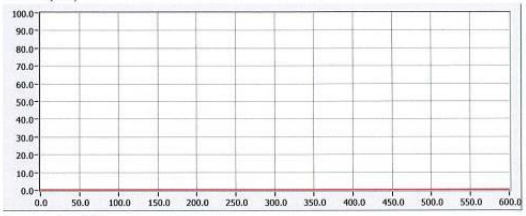
Test No.: 2

Standard: ULC S102

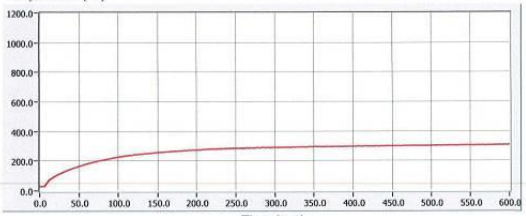
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 3

Standard: ULC S102

Page 1 of 2

Client: BBMG Energy Saving Material
Date: 01 18 2015
Project Number: 101943447
Test Number: 3
Operator: Greg Philp

Specimen ID: 50 mm thick 200 Kg/m3 Rockwool Insulation

TEST RESULTS

FLAMESPREAD INDEX: 0

SMOKE DEVELOPED INDEX: 0

SPECIMEN DATA . . .

Time to Ignition (sec): 0
Time to Max FS (sec): 135
Maximum FS (mm): 47.0
Time to 527 C (sec): Never Reached
Time to End of Tunnel (sec): Never Reached
Max Temperature (C): 307
Time to Max Temperature (sec): 586
Total Fuel Burned (cubic feet): 47.00

FS*Time Area (M*min): 0.4
Smoke Area (%A*min): 0.0
Unrounded FSI: 0.7
Unrounded SDI: 0.0

CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 44.0
Red Oak Smoke Area (%A*min): 184.1

Tested By: _____ Reviewed By: _____

CAN/ULC S102-10 DATA SHEETS
Run 3

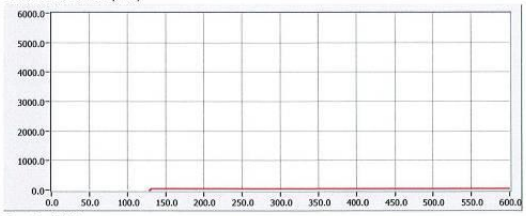
Client: BBMG Energy Saving Material

Specimen ID: 50 mm thick 200 Kg/m3 Rockwool

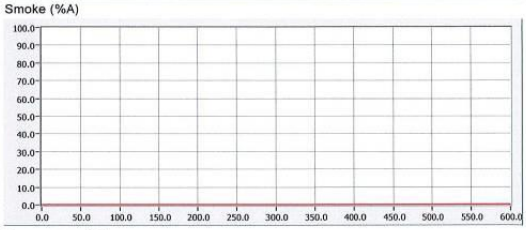
Test No.: 3

Standard: ULC S102

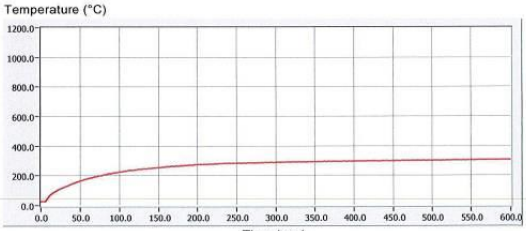
FLAME SPREAD (MM)



Smoke (%A)



Temperature (°C)



Time (sec)

600

Tested By: _____

Reviewed By: R.D.

REVISION SUMMARY

DATE	PAGE(S)	SUMMARY
January 28, 2015	All	Original Issue Date

8.3. Report of CAN/ULC S114

Intertek

TEST REPORT

REPORT NUMBER: 101943432MID-001aRev1
ORIGINAL ISSUE DATE: January 16, 2015
REVISED DATE: January 19, 2015

EVALUATION CENTER
Intertek
8431 Murphy Drive
Middleton, WI 53562

RENDERED TO
BBMG Energy Saving Material & Technology Co. Ltd
Gaojing #2, Chaoyang District, Beijing
China
Sharon Zhao
Zhaoshanshan@bemt.com.cn

PRODUCT EVALUATED: Rockwool 60kg/m³
EVALUATION PROPERTY: CAN/ULC-S114-05

Report of Testing of Rockwool 60kg/m³ for compliance with the applicable requirements of the following criteria: CAN/ULC-S114-5 Standard Method of Test for Determining Non-Combustibility in Building Materials.

1 Table of Contents

2 Introduction

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd on Rockwool 60kg/m³. Testing was conducted in accordance with CAN/ULC-S114-5 Standard Method of Test for Determining Non-Combustibility in Building Materials. This evaluation began January 14, 2015 and was completed January 14, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. Samples were received at the Middleton Evaluation Center on December 15, 2014 in good condition.
The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Sample Name: Rockwool 60kg/m³
Sample description: Rockwool

The samples were cut into 38mm by 38mm by 51+/- 2.5 mm by the client.

The samples were dried at 60°C +/- 3°C for not less then 24 hours but not more than 48 hours. The samples were placed in a desiccator to cool for at least one hour.

Environmental Conditions: 72°F at 40% relative humidity.

This Test Witnessed by: None

4 Testing and Evaluation Methods

4.1 TEST STANDARD

The method used a furnace which consisted of two concentric vertical refectory ceramic tubes containing an electric coil to expose building materials to a temperature of 750 +/- 3 °C for 15 minutes at the controlling thermocouple, and stabilized at that temperature within +/- 1 °C. The current though the heating coils were not be adjusted during the test.
All test specimens were 38 by 38 by 50 +/- 2 mm. The specimens were dried at 60 +/- 3 °C for not less than 24 hours but no more than 48 hours. The specimens were

then place in a desiccator to cool at least 1 hour before testing. Not less than thee identical specimens were tested to pass the testing test criteria. The test room and furnace setup was in compliance with the testing standard. The weight of each specimen in grams was recorded before and after testing. The specimen was

inserted as rapidly as possible with its long axis vertical to the furnace. No more than 10 seconds elapsed between opening and closing the furnace. Readings for the thermocouples were made every 500 msec for the testing interval. The test continued for a period of 15 minutes. Visual observations were taken recoding the intensity and duration of smoke, time of flaming, and change of state.

4.2 TEST CRITERIA

The material shall be reported as non-combustible, if:

1. The mean of the maximum temperature rise for the three (or more) specimen of the sample during the test does not exceed 36 °C: and
2. The is no flaming of any of the three (or more) specimen during the last 14 min and 30 s of the test; and
3. The maximum loss of mass of any of the three (or more) specimens during the test does not exceed 20 per cent.

4.3 RESULTS AND OBSERVATIONS

Specimen #	Observations (quality, quantity, or intensity and duration of flaming and/or smoking, and change in state):
1	No smoke or flames were observed
2	No smoke or flames were observed
3	No smoke or flames were observed

Stabilized Furnace Temperature = 752.0 °C

Specimen Number	Initial Wt. (g	Final Wt. (g)	Wt. Loss (%)	Initial Furnace Temp. (°C)	Max. Surface (T4) (°C)	Max. Interior Temp.(T3) (°C)
1	4.30	4.20	2%	752.0	771.8	797.0
2	4.72	4.61	2%	752.0	707.0	752.9
3	4.57	4.45	3%	752.0	700.1	751.8
4	NA	NA	NA	NA	NA	NA
5	NA	NA	NA	NA	NA	NA
Average	4.5	4.4	2%	752.0	726.3	767.2

	Specimen #				
	1	2	3	4	5
Furnace Temperature Initial T_2(°C)	752.0	752.0	752.0		
Difference of Max Interior Temp with T_2 (°C)	45	1	0	NA	NA
Difference of Max Exterior Temp with T2 (°C)	20	-45	-52	NA	NA

5 Conclusion

Intertek has conducted testing BBMG Energy Saving Material & Technology Co. Ltd on Rockwool 60kg/m³. Testing was conducted in accordance with CAN/ULC-S114-5 Standard Method of Test for Determining Non-Combustibility in Building Materials.

The product **passed** the test requirements of CAN/ULC-S114-5.

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

Reported by:

Sandy Osborne
Lab Technician II, Verification Center

Reviewed by:

Bryan Bowman
Chemist, Verification Center

6 Revision Summary

DATE	SUMMARY
January 16, 2015	Original date of report
January 19, 2015	Added sample selection information

Intertek

TEST REPORT

REPORT NUMBER: 101943432MID-001bRev1
ORIGINAL ISSUE DATE: January 16, 2015
REVISED DATE: January 19, 2015

EVALUATION CENTER
Intertek
8431 Murphy Drive
Middleton, WI 53562

RENDERED TO
BBMG Energy Saving Material & Technology Co. Ltd
Gaojing #2, Chaoyang District, Beijing
China
Sharon Zhao
Zhaoshanshan@bemt.com.cn

PRODUCT EVALUATED: Rockwool 200kg/m³
EVALUATION PROPERTY: CAN/ULC-S114-05

Report of Testing of Rockwool 200kg/m³ for compliance with the applicable requirements of the following criteria: CAN/ULC-S114-5 Standard Method of Test for Determining Non-Combustibility in Building Materials.

1 Table of Contents

2 Introduction

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd on Rockwool 200kg/m³. Testing was conducted in accordance with CAN/ULC-S114-5 Standard Method of Test for Determining Non-Combustibility in Building Materials. This evaluation began January 14, 2015 and was completed January 14, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. Samples were received at the Middleton Evaluation Center on December 15, 2014 in good condition.
The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Sample Name: Rockwool 200kg/m³
Sample description: Rockwool

The samples were cut into 38mm by 38mm by 51+/- 2.5 mm by the client.

The samples were dried at 60°C +/- 3°C for not less then 24 hours but not more than 48 hours. The samples were placed in a desiccator to cool for at least one hour.

Environmental Conditions: 72°F at 40% relative humidity.

This Test Witnessed by: None

4 Testing and Evaluation Methods

4.1 TEST STANDARD

The method used a furnace which consisted of two concentric vertical refectory ceramic tubes containing an electric coil to expose building materials to a temperature of 750 +/- 3 °C for 15 minutes at the controlling thermocouple, and stabilized at that temperature within +/- 1 °C. The current though the heating coils were not be adjusted during the test.
All test specimens were 38 by 38 by 50 +/- 2 mm. The specimens were dried at 60 +/- 3 °C for not less than 24 hours but no more than 48 hours. The specimens were

then place in a desiccator to cool at least 1 hour before testing. Not less than thee identical specimens were tested to pass the testing test criteria. The test room and furnace setup was in compliance with the testing standard. The weight of each specimen in grams was recorded before and after testing. The specimen was

inserted as rapidly as possible with its long axis vertical to the furnace. No more than 10 seconds elapsed between opening and closing the furnace. Readings for the thermocouples were made every 500 msec for the testing interval. The test continued for a period of 15 minutes. Visual observations were taken recoding the intensity and duration of smoke, time of flaming, and change of state.

4.2 TEST CRITERIA

The material shall be reported as non-combustible, if:

1. The mean of the maximum temperature rise for the three (or more) specimen of the sample during the test does not exceed 36 °C: and
2. The is no flaming of any of the three (or more) specimen during the last 14 min and 30 s of the test; and
3. The maximum loss of mass of any of the three (or more) specimens during the test does not exceed 20 per cent.

4.3 RESULTS AND OBSERVATIONS

Specimen #	Observations (quality, quantity, or intensity and duration of flaming and/or smoking, and change in state):
1	No smoke or flames were observed
2	No smoke or flames were observed
3	No smoke or flames were observed

Stabilized Furnace Temperature = 752.0 °C

Specimen Number	Initial Wt. (g	Final Wt. (g)	Wt. Loss (%)	Initial Furnace Temp. (°C)	Max. Surface (T4) (°C)	Max. Interior Temp.(T3) (°C)
1	12.77	12.42	3%	752.0	703.4	751.3
2	14.78	14.15	4%	752.0	697.8	759.8
3	14.90	14.24	4%	752.0	742.2	774.1
4	NA	NA	NA	NA	NA	NA
5	NA	NA	NA	NA	NA	NA
Average	14.1	13.6	4%	752.0	714.5	761.7

	Specimen #				
	1	2	3	4	5
Furnace Temperature Initial T_2(°C)	752.0	752.0	752.0		
Difference of Max Interior Temp with T_2 (°C)	-1	8	22	NA	NA
Difference of Max Exterior Temp with T2 (°C)	-49	-54	-10	NA	NA

5 Conclusion

Intertek has conducted testing BBMG Energy Saving Material & Technology Co. Ltd on Rockwool 200kg/m^3. Testing was conducted in accordance with CAN/ULC-S114-5 Standard Method of Test for Determining Non-Combustibility in Building Materials.

The product **passed** the test requirements of CAN/ULC-S114-5.

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

Reported by:

Sandy Osborne
Lab Technician II, Verification Center

Reviewed by:

Bryan Bowman
Chemist, Verification Center

6 Revision Summary

DATE	SUMMARY
January 16, 2015	Original date of report
January 19, 2015	Added sample selection information

8.4. Test data of ASTM C165

Intertek

Test: Compressive Board
Start Date: 2015.1.7
Target Date: 2015.1.15
Job No: 14112801SHJ-BP
Client: BBMG Energy Saving Material Technology Co., Ltd
Sample: Rock Wool
Sample ID: S141128001SHJ-037~056
Standards: ASTM C165:2007
Procedure: ASTM C165:2007 procedure A
Conditioning: (23 ± 2) °C and (50 ± 5) % relative humidity

Reviewer: Jodie Zhou

Eng/Tech: Torres Qi

Equipment Item	*ID*	Cal Due Date
Tensile machine	SH1122	2016.1.13
Digital caliper	SH1009	2015.5.13

60 kg/m^3 test speed: 10 mm/min

Specimen	length (mm)	width (mm)	depth (mm)	$F_{10\%}$ (N)	F_m (N)	σ_{10} (Kpa)	σ_m (Kpa)
1	148.85	149.60	49.28	179.1	/	8.04	/
2	149.00	148.93	49.53	165.7	/	7.47	/
3	148.91	149.44	49.34	156.5	/	7.03	/
4	149.59	149.06	50.15	168.1	/	7.54	/
5	148.93	149.80	49.78	161.4	/	7.23	/
Average					/	7.5	/

120 kg/m^3 test speed: 10 mm/min

Specimen	length (mm)	width (mm)	depth (mm)	$F_{10\%}$ (N)	F_m (N)	σ_{10} (Kpa)	σ_m (Kpa)
1	147.60	149.64	52.23	688.8	/	31.19	/
2	148.45	149.55	52.45	764.4	/	34.43	/
3	148.57	149.44	50.90	636.7	/	28.68	/
4	148.70	149.48	51.89	825.4	/	37.13	/
5	148.93	149.42	52.13	743.6	/	33.42	/
Average					/	33.0	/

140 kg/m^3 test speed: 10 mm/min

Specimen	length (mm)	width (mm)	depth (mm)	$F_{10\%}$ (N)	F_m (N)	σ_{10} (Kpa)	σ_m (Kpa)
1	149.63	150.21	51.48	943.4	/	41.97	/
2	149.51	149.55	50.44	1040.4	/	46.53	/
3	149.15	149.45	50.30	983	/	44.10	/
4	149.05	149.60	50.26	980.6	/	43.98	/
5	149.17	149.20	49.86	1081.2	/	48.58	/
Average					/	45.0	/

200 kg/m^3 test speed: 10 mm/min

Specimen	length (mm)	width (mm)	depth (mm)	$F_{10\%}$ (N)	F_m (N)	σ_{10} (Kpa)	σ_m (Kpa)
1	149.55	149.82	49.51	1695	/	75.65	/
2	149.30	149.80	49.60	1704	/	76.17	/
3	149.31	149.73	49.91	1961	/	87.70	/
4	149.55	150.70	48.93	1859	/	82.49	/
5	149.78	149.74	49.94	1790	/	79.81	/
Average					/	80.4	/

8.5. Report of ASTM C518

Intertek

TEST REPORT

REPORT NUMBER: 101943432MID-003aRev1
ORIGINAL ISSUE DATE: Jan 8, 2015
REVISED DATE: January 19, 2015

EVALUATION CENTER
Intertek
8431 Murphy Drive
Middleton, WI 53562

Rendered To:
Sharon Zhao
BBMG Energy Saving Material & Technology Co. Ltd
Gaojing #2
Chaoyang District, Beijing
China

PRODUCTS EVALUATED: 60 kg/m^3 Rockwool
EVALUATION PROPERTY: ASTM C518: *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus*

Report of Testing of 60 kg/m3 Rockwool for compliance with the applicable requirements of the following criteria: ASTM C518, 2013, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus.

1 Table of Contents

2 Introduction

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on 60 kg/m3 Rockwool to evaluate the thermal transmission properties. Testing was conducted in accordance with ASTM, following the standard methods of C518 (2013) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. This evaluation began Jan 6, 2015 and was completed Jan 6, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. Samples were received at the Middleton Evaluation Center on December 15, 2014 in good condition.
The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Samples were cut by the client.

The 60 kg/m3 Rockwool is green fibrous material. The recorded dimensions and density is in section 4.2

The samples were then place in 72 ^{o}F 50% relative humidity for at least 24 hours before testing.

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℃ 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:

$$\lambda = \phi \frac{DX}{DT}$$

where:

λ = thermal conductivity, $\frac{W}{m \cdot K}$

ϕ = 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°F with a temperature difference between plates at 40°F.

Density Measurements were taken using standard ASTM D1622.

Testing and Evaluation Results

4.2. RESULTS AND OBSERVATIONS

Specimen	Length (mm)	Width (mm)	Depth (mm)	Weight	Density	
	Avg.	Avg.	Avg.	(kg)	(kg/m^3)	(lbs/ft^3)
1	298.41	297.03	50.89	0.3017	66.88	4.18
2	293.30	297.93	49.94	0.3016	69.11	4.31
3	297.99	297.70	50.27	0.2786	62.47	3.90
				Mean:	**66.16**	**4.13**
				StdDev:	3.38	0.21
				COV:	0.05	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	0.236205	0.03407	8.32180	1.4655	4.23	29.36	0.68	3.21
Specimen 2	0.235973	0.03403	8.23401	1.4501	4.24	29.38	0.69	3.26
Specimen 3	0.234786	0.03386	8.30445	1.4625	4.26	29.53	0.68	3.23
Average	0.235655	0.03399	8.28675	1.4594	4.24	29.42	0.69	3.23

Test Information	Duration of the measurement	Instrument Measured Thickness	Instrument 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	0:55:04	1.965	0.049921	40.48	4.71	74.65	23.69	20.59	-39.27
Specimen 2	0:56:34	1.943	0.049357	40.50	4.72	74.69	23.72	20.84	-37.95
Specimen 3	0:56:46	1.950	0.049530	40.49	4.72	74.74	23.74	20.76	-38.37
Average	0:56:08	1.953	0.049603	40.49	4.72	74.69	23.72	20.73	-38.53

4.2.1. Deviation to the test method

There were no deviations from the standard.

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 is within 1% error of the NIST standard value.

5 Conclusion

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on 60 kg/m3 Rockwool to evaluate the thermal transmission properties. Testing was conducted in accordance with ASTM, following the standard methods of C518 (2013) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

There is no pass fail criterion for ASTM C C518 (2013).

The conclusions of this test report 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

Reported by: _____
Bryan Bowman
Chemist, Verification Center

Reviewed by: _____
Mark Crawford
Chemist and Team Lead, Verification Center

6 Revision Summary

DATE	SUMMARY
Jan 8, 2015	Original Issue Date
January 19, 2015	Added sample selection information

Intertek

TEST REPORT

REPORT NUMBER: 101943432MID-003bRev1
ORIGINAL ISSUE DATE: Jan 8, 2015
REVISED DATE: January 19, 2015

EVALUATION CENTER
Intertek
8431 Murphy Drive
Middleton, WI 53562

Rendered To:
Sharon Zhao
BBMG Energy Saving Material & Technology Co. Ltd
Gaojing #2
Chaoyang District, Beijing
China

PRODUCTS EVALUATED: 200 kg/m3 Rockwool
EVALUATION PROPERTY: ASTM C518: *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus*

Report of Testing of 200 kg/m3 Rockwool for compliance with the applicable requirements of the following criteria: ASTM C518, 2013, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus.

1 Table of Contents

2 Introduction

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on 200 kg/m3 Rockwool to evaluate the thermal transmission properties. Testing was conducted in accordance with ASTM, following the standard methods of C518 (2013) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. This evaluation began Jan 6, 2015 and was completed Jan 6, 2015.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. Samples were received at the Middleton Evaluation Center on December 15, 2014 in good condition.
The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Samples were cut by the client.

The 200 kg/m3 Rockwool is green fibrous material. The recorded dimensions and density is in section 4.2

The samples were then place in 72 ^{o}F 50% relative humidity for at least 24 hours before testing.

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℃ 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:

$$\lambda = \phi \frac{DX}{DT}$$

where:

λ = thermal conductivity, $\frac{W}{m \cdot K}$

ϕ = 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°F with a temperature difference between plates at 40°F.

Density Measurements were taken using standard ASTM D1622.

Testing and Evaluation Results

4.2. RESULTS AND OBSERVATIONS

Specimen	Length (mm)	Width (mm)	Depth (mm)	Weight	Density	
	Avg.	Avg.	Avg.	(kg)	(kg/m^3)	(lbs/ft^3)
1	301.13	300.77	48.80	0.9144	206.90	12.92
2	300.46	301.11	49.07	0.9098	204.96	12.80
3	300.93	301.02	52.78	0.8954	187.29	11.69
				Mean:	**199.72**	**12.47**
				StdDev:	10.804	0.674
				COV:	0.054	0.054

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	0.276798	0.03992	7.07349	1.2457	3.61	25.05	0.80	3.78
Specimen 2	0.272289	0.03927	7.27240	1.2807	3.67	25.46	0.78	3.68
Specimen 3	0.272331	0.03928	7.69792	1.3557	3.67	25.46	0.74	3.47
Average	0.273806	0.03949	7.34794	1.2940	3.65	25.32	0.77	3.64

Test Information	Duration of the measurement	Instrument Measured Thickness	Instrument 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	1:15:00	1.958	0.049736	40.48	4.71	74.77	23.76	20.67	-38.84
Specimen 2	1:13:53	1.981	0.050307	40.48	4.71	74.77	23.76	20.44	-40.08
Specimen 3	1:16:50	2.097	0.053254	40.47	4.71	74.60	23.67	19.30	-46.63
Average	1:15:14	2.012	0.051099	40.48	4.71	74.71	23.73	20.14	-41.85

4.2.1. Deviation to the test method

There were no deviations from the standard.

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 is within 1% error of the NIST standard value.

5 Conclusion

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on 200 kg/m3 Rockwool to evaluate the thermal transmission properties. Testing was conducted in accordance with ASTM, following the standard methods of C518 (2013) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

There is no pass fail criterion for ASTM C C518 (2013).

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

Reported by: _____
Bryan Bowman
Chemist, Verification Center

Reviewed by: _____
Mark Crawford
Chemist and Team Lead, Verification Center

6 Revision Summary

DATE	SUMMARY
Jan 8, 2015	Original Issue Date
January 19, 2015	Added sample selection information

8.6. Report of ASTM C1335

PERFORMANCE TEST REPORT

Rendered to:

Intertek Testing Services Ltd., Shanghai

PRODUCT: Rock Wool Insulation
TYPES: 60 kg/m^3 and 200 kg/m^3

Report No.: E4199.03-106-31
Report Date: 03/20/15
Test Record Retention Date: 02/24/19

130 Derry Court
York, PA 17406

www.archtest.com . www.intertek.com/building

p. 717.764.7700
f. 717.764.4129

Intertek | Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

Intertek Testing Services Ltd., Shanghai
Plant 7, No. 6958 Daye Road
Fengxian District, Shanghai,
China

Report No.:	E4199.03-106-31
Test Dates:	01/27/15
Through:	02/24/15
Report Date:	03/20/15
Test Record Retention Date:	02/24/19

Product: Rock Wool Insulation

Types: 60 kg/m^3 and 200 kg/m^3

Project Summary: Architectural Testing, Inc., a subsidiary of Intertek (Intertek-ATI), was contracted by Intertek-China to evaluate two Rock Wool Insulations, 60 kg/m^3 and 200 kg/m^3. The product description, test procedure and test results are reported herein.

Product Descriptions: The two Rock Wool Insulations, 60 kg/m^3 and 200 kg/m^3, were submitted to Intertek-ATI, York, Pennsylvania, USA by Intertek-China. They were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. The two Rock Wool Insulations were received at Intertek-ATI, York, Pennsylvania, USA on December 16, 2014.

The subject test specimens are traceable specimens selected from the manufacturer's facility. Intertek selected the specimens and has verified the composition, manufacturing techniques and quality assurance procedures.

The two Rock Wool Insulations were tested as-received with the exception of machining the smaller test specimens from the pieces provided. Refer to the photos in Appendix A.

Test Method: The test specimens were evaluated in accordance with the following method:

ASTM C 1335-12, *Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation*, Procedure B

Test Procedure and Test Results: The testing procedure and the results obtained from testing are reported as follows. All conditioning of test specimens and test conditions were at standard laboratory conditions set at 70 ±2 °F and 50 ±5% relative humidity unless otherwise reported. Refer to the photos in Appendix A and data sheets in Appendix B.

ASTM C 1335, Procedure B - Non-Fibrous Content

The nominal 0.35 oz (10g) specimen was fired for 15 minutes at 1100 ±10 °F (593 ±5.6 °C), cooled for 20 minutes and the mass determined utilizing a Mettler Toledo AX504 Balance (ICN 003449). The fired specimen was manually passed through three sieves, No.'s 20, 50 and 100, and the non-fibrous material retained on each sieve was weighed.

Rock Wool Insulation, 60 kg/m^3

Specimen No.	Non-Fibrous Material (%)			
	No. 20 Sieve	No. 50 Sieve	No. 100 Sieve	Total
1	0.06	0.85	7.56	8.46
2	0.06	0.57	7.57	8.20
3	0.05	0.79	8.15	9.00
Average	**0.06**	**0.74**	**7.76**	**8.55**

Rock Wool Insulation, 200 kg/m^3

Specimen No.	Non-Fibrous Material (%)			
	No. 20 Sieve	No. 50 Sieve	No. 100 Sieve	Total
1	0.07	1.18	10.11	11.36
2	0.00	0.91	9.73	10.64
3	0.08	0.83	9.50	10.40
Average	**0.05**	**0.97**	**9.78**	**10.80**

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For Intertek-ATI:

Digitally Signed by: Dawn M. Chaney

Dawn M. Chaney
Senior Technician
Components / Materials Testing

Digitally Signed by: Gary Hartman

Gary Hartman, P.E.
Director
Components / Materials Testing

DMC:dmc/kf

Attachments (pages) This report is complete only when all attachments listed are included.
Appendix A - Photographs (5)
Appendix B - Data Sheets (2)

Architectural Testing

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	03/20/15	N/A	Original report issue

E4199.03-106-31

APPENDIX A

Photographs

Intertek | Architectural Testing

E4199.03-106-31

Photo No. 1
Rock Wool Insulation As-Received

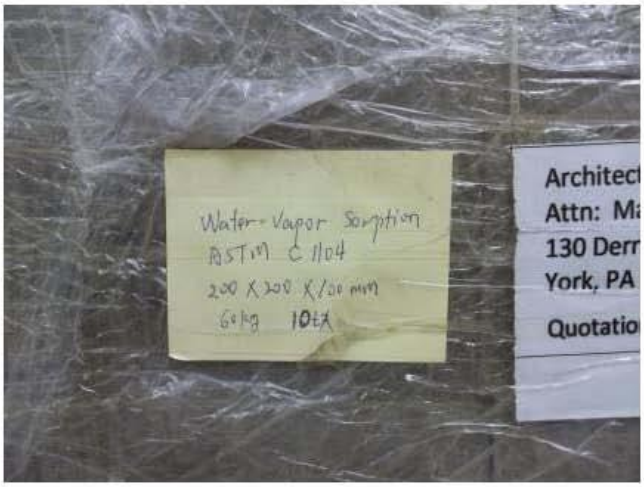


Photo No. 2
Rock Wool Insulation As-Received

Intertek | Architectural Testing

E4199.03-106-31

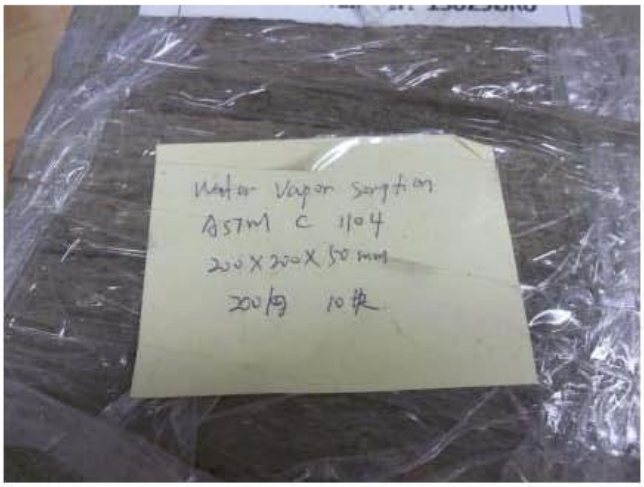


Photo No. 3
Rock Wool Insulation As-Received

Photo No. 4
Rock Wool Insulation As-Received

Intertek | Architectural Testing

E4199.03-106-31

Photo No. 5
Rock Wool Insulation As-Received

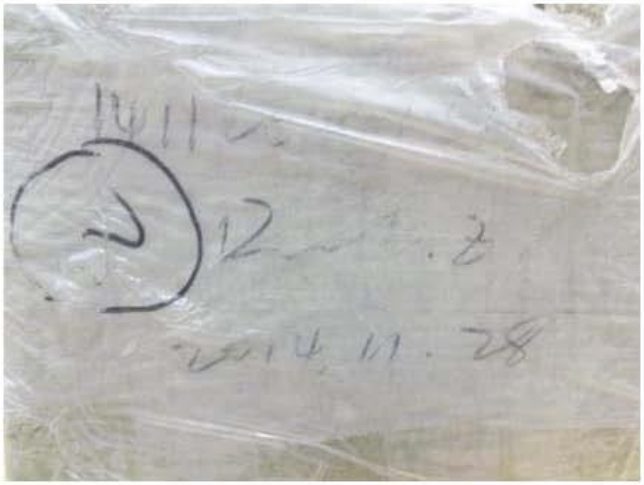


Photo No. 6
Rock Wool Insulation As-Received

Intertek | Architectural Testing

E4199.03-106-31

Photo No. 7
Rock Wool Insulation, 60 kg/m^3 As-Received

Photo No. 8
Rock Wool Insulation, 60 kg/m^3 Prior to Testing

Intertek | Architectural Testing

E4199.03-106-31

Photo No. 9
Rock Wool Insulation, 200 kg/m^3 Prior to Testing

Photo No. 10
Typical Non-Fibrous Content

E4199.03-106-31

APPENDIX B

Data Sheets

Architectural Testing

ASTM C 1335-12 - Procedure B
Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation

ATI Job Number:	E4199.01-106-31
Customer Name:	Intertek - China
Date of Testing:	2/6/2015
Technician:	DMC

Lab Conditions at Time of Testing	
Temperature:	69.6F
Relative Humidity:	49.7%

Material Description:

60 kg/m^3 Rock Wool Insulation

Equipment Information	
Name:	Balance, Furnace
ICN:	003449, Y002864
Calibration Due:	8/20/15, N/A

Test Data

Test Specimen Conditioning Before Testing

Duration: 48 hrs	Average Temperature: 68.8F	Average Relative Humidity: 49.4%

Specimen Firing:

Firing Temperature (°F)	Firing Time (min)	Cooling Time (min)
1100	15	20

Specimen	Weight of Dish Before Firing (oz)	Weight of Dish & Specimen After Firing (oz)	Weight of Specimen After Firing (oz)
1	4.30659	4.63189	0.32531
2	4.30646	4.65783	0.35137
3	4.30672	4.64660	0.33988

Shot-Fiber Separation:

Specimen	Weight of Non-Fibrous Material (oz)			
	No. 20 Sieve	No. 50 Sieve	No. 100 Sieve	Total Sieve Weight
1	0.00019	0.00276	0.02460	0.02754
2	0.00021	0.00201	0.02659	0.02880
3	0.00019	0.00270	0.02772	0.03060

Calculations:

Specimen	Percentage of Non-Fibrous Material			
	No. 20 Sieve	No. 50 Sieve	No. 100 Sieve	Total
1	0.06	0.85	7.56	8.46
2	0.06	0.57	7.57	8.20
3	0.05	0.79	8.15	9.00
Average	**0.06**	**0.74**	**7.76**	**8.55**

Architectural Testing

ASTM C 1335-12 - Procedure B
Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation

ATI Job Number:	E4199.01-106-31
Customer Name:	Intertek - China
Date of Testing:	2/5/2015
Technician:	DMC

Lab Conditions at Time of Testing	
Temperature:	69.4F
Relative Humidity:	50.1%

Material Description:

200 kg/m^3 Rock Wool Insulation

Equipment Information	
Name:	Balance, Furnace
ICN:	003449, Y002864
Calibration Due:	8/20/15, N/A

Test Data

Test Specimen Conditioning Before Testing

Duration: 48 hrs	Average Temperature: 69.6F	Average Relative Humidity: 48.8%

Specimen Firing:

Firing Temperature (°F)	Firing Time (min)	Cooling Time (min)
1100	15	20

Specimen	Weight of Dish Before Firing (oz)	Weight of Dish & Specimen After Firing (oz)	Weight of Specimen After Firing (oz)
1	1.56306	1.88592	0.32287
2	1.37251	1.74192	0.36942
3	1.37106	1.70493	0.33387

Shot-Fiber Separation:

Specimen	Weight of Non-Fibrous Material (oz)			
	No. 20 Sieve	No. 50 Sieve	No. 100 Sieve	Total Sieve Weight
1	0.00023	0.00381	0.03265	0.03668
2	0.00000	0.00337	0.03595	0.03932
3	0.00027	0.00276	0.03171	0.03473

Calculations:

Specimen	Percentage of Non-Fibrous Material			
	No. 20 Sieve	No. 50 Sieve	No. 100 Sieve	Total
1	0.07	1.18	10.11	11.36
2	0.00	0.91	9.73	10.64
3	0.08	0.83	9.50	10.40
Average	**0.05**	**0.97**	**9.78**	**10.80**

8.7. Report of ASTM C1104

Intertek | Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

Intertek Testing Services Ltd., Shanghai

PRODUCT: Rock Wool Insulation
TYPES: 60 kg/m^3 and 200 kg/m^3

Report No.: E4199.02-106-31
Report Date: 03/20/15
Test Record Retention Date: 02/24/19

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York, PA 17406
www.archtest.com . www.intertek.com/building
p. 717.764.7700
f. 717.764.4129

Intertek | Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

Intertek Testing Services Ltd., Shanghai
Plant 7, No. 6958 Daye Road
Fengxian District, Shanghai,
China

Report No.:	E4199.02-106-31
Test Dates:	01/27/15
Through:	02/24/15
Report Date:	03/20/15
Test Record Retention Date:	02/24/19

Product: Rock Wool Insulation

Types: 60 kg/m^3 and 200 kg/m^3

Project Summary: Architectural Testing, Inc., a subsidiary of Intertek (Intertek-ATI), was contracted by Intertek-China to evaluate two Rock Wool Insulations, 60 kg/m^3 and 200 kg/m^3. The product description, test procedure and test results are reported herein.

Product Descriptions: The two Rock Wool Insulations, 60 kg/m^3 and 200 kg/m^3, were submitted to Intertek-ATI, York, Pennsylvania, USA by Intertek-China. They were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8, Xiaan Road, Dachang County, Hebei Province, R.P.C. The two Rock Wool Insulations were received at Intertek-ATI, York, Pennsylvania, USA on December 16, 2014.

The subject test specimens are traceable specimens selected from the manufacturer's facility. Intertek selected the specimens and has verified the composition, manufacturing techniques and quality assurance procedures.

The two Rock Wool Insulations were tested as-received with the exception of machining the smaller test specimens from the pieces provided. Refer to the photos in Appendix A.

Test Method: The test specimens were evaluated in accordance with the following method:

ASTM C 1104-13a, *Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation*, Procedure A

Test Procedure and Test Results: The testing procedure and the results obtained from testing are reported as follows. All conditioning of test specimens and test conditions were at standard laboratory conditions set at 70 ±2 °F and 50 ±5% relative humidity unless otherwise reported. Refer to the photos in Appendix A and data sheets in Appendix B.

ASTM C 1104, Procedure A - Water Vapor Sorption

Initial measurements of the nominal 15 cm x 15 cm x material thickness specimen were taken utilizing Calipers (ICN 538-2) and a Mettler Toledo PL6001-S Balance (ICN 004473). The specimen was then dried at 102 °C (215 °F) to a moisture-free weight, heated to a uniform temperature of 60 °C (140 °F), conditioned at 49 ±2 °C (120 ±3 °F) and 95 ±3% relative humidity in an Espec Environmental Chamber (ICN 64509) for 96 ±4 hours, sealed in a pre-weighed plastic bag, cooled to room temperature and weighed.

Rock Wool Insulation, 60 kg/m^3

Specimen No.	Average Dimensions (cm)			Initial Weight (g)	Density (g/cm^3)
	Length	Width	Thickness		
1	15.11	15.10	9.88	152.1	0.0675
2	15.19	15.12	9.84	142.8	0.0632
3	15.16	15.18	9.78	142.1	0.0632
				Average	**0.0646**

Specimen No.	Moisture-Free Weight (g)	After 96 hrs at 49 °C (120 °F) and 95% RH		
		Weight (g)	Water Vapor Sorption by Weight (%)	Water Vapor Sorption by Volume (%)
1	151.8	152.0	0.1	0.0
2	142.6	142.6	0.0	0.0
3	141.9	142.0	0.1	0.0
		Average	**0.1**	**0.0**

Test Procedure and Test Results: (Continued)

ASTM C 1104, Procedure A - Water Vapor Sorption
(Continued)

Rock Wool Insulation, 200 kg/m^3

Specimen No.	Average Dimensions (cm)			Initial Weight (g)	Density (g/cm^3)
	Length	Width	Thickness		
1	15.11	15.15	4.97	213.8	0.1881
2	15.11	15.14	4.91	228.4	0.2034
3	15.14	15.13	4.95	221.2	0.1952
				Average	**0.1956**

Specimen No.	Moisture-Free Weight (g)	After 96 hrs at 49 °C (120 °F) and 95% RH		
		Weight (g)	Water Vapor Sorption by Weight (%)	Water Vapor Sorption by Volume (%)
1	213.6	213.8	0.1	0.0
2	228.1	228.4	0.1	0.0
3	221.0	221.2	0.1	0.0
		Average	**0.1**	**0.0**

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For Intertek-ATI:

Dawn M. Chaney
Digitally Signed by: Dawn M. Chaney

Dawn M. Chaney
Senior Technician
Components / Materials Testing

Gary Hartman
Digitally Signed by: Gary Hartman

Gary Hartman, P.E.
Director
Components / Materials Testing

DMC:dmc/kf

Attachments (pages) This report is complete only when all attachments listed are included.
Appendix A - Photographs (6)
Appendix B - Data Sheets (2)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	03/20/15	N/A	Original report issue

Architectural Testing

E4199.02-106-31

APPENDIX A

Photographs

Intertek | Architectural Testing

E4199.02-106-31

Photo No. 1
Rock Wool Insulation As-Received

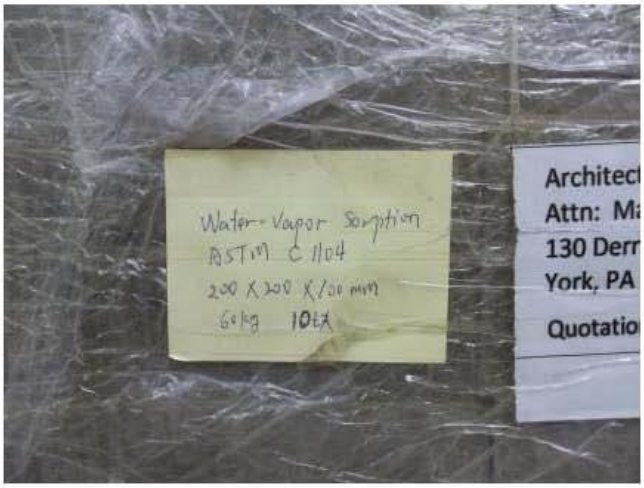

Photo No. 2
Rock Wool Insulation As-Received

Intertek | Architectural Testing

E4199.02-106-31

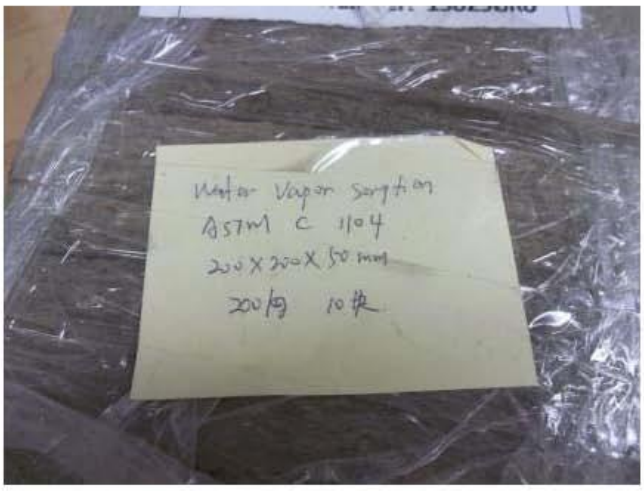

Photo No. 3
Rock Wool Insulation As-Received

Photo No. 4
Rock Wool Insulation As-Received

Intertek | Architectural Testing

E4199.02-106-31

Photo No. 5
Rock Wool Insulation As-Received

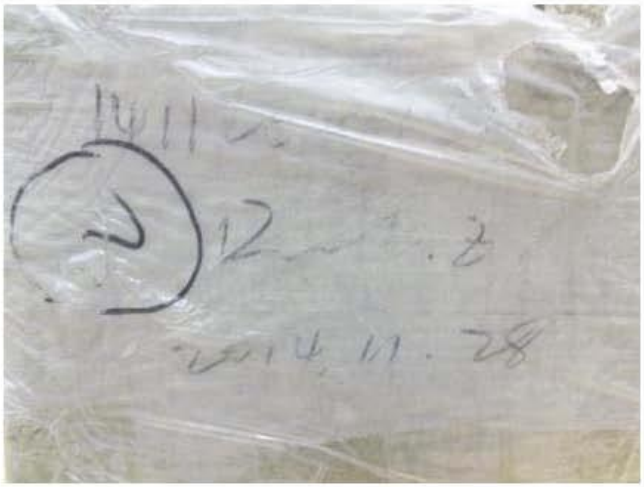

Photo No. 6
Rock Wool Insulation As-Received

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Photo No. 7
Rock Wool Insulation, 60 kg/m^3 As-Received

Photo No. 8
Rock Wool Insulation, 60 kg/m^3 Prior to Testing

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Photo No. 9
Rock Wool Insulation, 200 kg/m^3 Prior to Testing

Photo No. 10
Rock Wool Insulation, 60 kg/m^3
Water Vapor Sorption Specimens After Testing

Intertek | Architectural Testing

E4199.02-106-31

Photo No. 11
Rock Wool Insulation, 200 kg/m^3
Water Vapor Sorption Specimens After Testing

E4199.02-106-31

APPENDIX B

Data Sheets

Architectural Testing

ATSM C 1104 / C 1104M-13a - Procedure A

Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation

ATI Job Number:	E4199.01-106-31
Customer Name:	Intertek - China
Date of Testing:	2/2/15 to 2/6/15
Technician:	DMC

Lab Conditions at Time of Testing	
Temperature:	69.2F
Relative Humidity:	48.6%

Equipment Information	
Name:	Calipers, balance, oven, Espec
ICN:	538-2, 004473, 005317, 64509
Calibration Due:	4/14/15, 3/13/15, N/A, 6/27/15

Material Description:
60 kg/m^3 Rock Wool Insulation

Test Data

Test Specimen Conditioning Before Testing

Duration:	48 hours	Average Temperature:	70.0F	Average Relative Humidity:	44.9%

Specimen	Length (cm)			Width (cm)			Thickness (cm)					Weight (g)
	1	2	Avg.	1	2	Avg.	1	2	3	4	Avg.	
1	15.08	15.13	15.11	15.10	15.10	15.10	9.87	9.92	9.81	9.90	9.88	152.1
2	15.19	15.18	15.19	15.12	15.12	15.12	9.82	9.84	9.84	9.86	9.84	142.8
3	15.13	15.18	15.16	15.16	15.19	15.18	9.81	9.76	9.79	9.77	9.78	142.1

Specimen	Volume (cm^3)	Density (g/cm^3)
1	2252.34	0.0675
2	2259.24	0.0632
3	2249.75	0.0632
Average	2253.78	0.0646

	Dry Weight (g)				
Specimen	Initial	2 hrs	___ hrs	___ hrs	Final
1	152.1	151.8	N/A	N/A	151.8
2	142.8	142.6	N/A	N/A	142.6
3	142.1	141.9	N/A	N/A	141.9

After 96 ±4 hours at 49 ±2 °C (120 ± 3°F) and 95 ±3 % Relative Humidity

Specimen	Weight of Bag (g)	Weight of Bag and Sample (g)	Weight of Sample (g)	Water Vapor Sorption by Weight (%)	Water Vapor Sorption by Volume (%)
1	9.4	161.4	152.0	0.1	0.0
2	9.4	152.0	142.6	0.0	0.0
3	9.3	151.3	142.0	0.1	0.0
			Average	0.1	0.0

Architectural Testing

ATSM C 1104 / C 1104M-13a - Procedure A

Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation

ATI Job Number:	E4199.01-106-31
Customer Name:	Intertek - China
Date of Testing:	2/2/15 to 2/6/15
Technician:	DMC

Lab Conditions at Time of Testing	
Temperature:	69.2F
Relative Humidity:	48.6%

Equipment Information	
Name:	Calipers, balance, oven, Espec
ICN:	538-2, 004473, 005317, 64509
Calibration Due:	4/14/15, 3/13/15, N/A, 6/27/15

Material Description:
200 kg/m^3 Rock Wool Insulation

Test Data

Test Specimen Conditioning Before Testing

Duration:	48 hours	Average Temperature:	70.0F	Average Relative Humidity:	44.9%

Specimen	Length (cm)			Width (cm)			Thickness (cm)					Weight (g)
	1	2	Avg.	1	2	Avg.	1	2	3	4	Avg.	
1	15.11	15.10	15.11	15.16	15.13	15.15	5.00	5.00	4.96	4.91	4.97	213.8
2	15.10	15.11	15.11	15.13	15.15	15.14	4.93	4.93	4.86	4.92	4.91	228.4
3	15.12	15.15	15.14	15.13	15.12	15.13	4.93	4.91	4.99	4.97	4.95	221.2

Specimen	Volume (cm^3)	Density (g/cm^3)
1	1136.39	0.1881
2	1122.87	0.2034
3	1133.14	0.1952
Average	1130.80	0.1956

	Dry Weight (g)				
Specimen	Initial	2 hrs	___ hrs	___ hrs	Final
1	213.8	213.6	N/A	N/A	213.6
2	228.4	228.1	N/A	N/A	228.1
3	221.2	221.0	N/A	N/A	221.0

After 96 ±4 hours at 49 ±2 °C (120 ± 3°F) and 95 ±3 % Relative Humidity

Specimen	Weight of Bag (g)	Weight of Bag and Sample (g)	Weight of Sample (g)	Water Vapor Sorption by Weight (%)	Water Vapor Sorption by Volume (%)
1	9.4	223.2	213.8	0.1	0.0
2	9.4	237.8	228.4	0.1	0.0
3	9.4	230.6	221.2	0.1	0.0
			Average	0.1	0.0

8.8. Report of ASTM C1338

1717 Arlingate Lane
Columbus, OH 43228

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Facsimile: 614-279-4642
www.intertek.com

PERFORMANCE TEST REPORT
101945035COL-001

Client		Intertek Building T52-8, No. 1201 Gui Qiao Road Jinqiao Development Area Pudong District Shanghai, China, SHHP 201206
Project No.		**G101945035**
Sample	Product	Mineral Fiber Cotton
	Model	Rockwool 60 kg/m^3 and 200 kg/m^3
	Identification No.	COL1412181620-001-3
	Date Received	December 18, 2014
	Condition	New/Good
	Production or Prototype	Production
Procedural	Tested By	Lee Moomaw
	Engineer	Lee Moomaw
	Reviewer	Danielle Melaragno
	Dates Tested	December 31, 2014 – January 28, 2015
	Report Date	1/30/15
Standard	ASTM C1338 – 14 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.	

Report Parameters			
Organism Species:	*Aspergillus brasiliensis (*historically known as *Aspergillus niger)*	ATCC No.:	9642
	Penicillium funiculosum)		11797
	Chaetomium globosum		6205
	Aspergillus flavus		9643
	Aspergillus versicolor		11730
Conditioning	December 31, 2014 0700 – December 31, 2014 1100		
Incubation Period:	December 31, 2014 1100 – January 28, 2015 1100		
Sample No.:	Rockwool 60 kg/m^3 - 1	**Growth Rating:**	**< Comparative Material**
	Rockwool 60 kg/m^3 - 2		**< Comparative Material**
	Rockwool 60 kg/m^3 - 3		**< Comparative Material**
	Rockwool 200 kg/m^3 - 1	**Growth Rating:**	No growth
	Rockwool 200 kg/m^3 - 2		No growth
	Rockwool 200 kg/m^3 - 3		No growth

Result Interpretation:

The Rockwool 200 kg/m^3 samples had no growth on them after a 28 day exposure compared to the comparative material used which had copious growth. The Rockwool 60 kg/m^3 samples had less growth on them after the 28 day exposure when compared to the comparative material, which had copious growth. This was confirmed with use of a microscope. The effects of growth on physical, optical, or electrical properties were not evaluated.

INTERTEK REPORT NO: **101945035COL-001** Page 2 of 2

Sample Selection:

Samples were randomly selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8 , Xiaan Road, Dachang County, Hebei Province, R.P.C. The samples were received at evaluation center on December 18, 2014

The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques, and quality assurance procedures.

Photos:

Figure 1. Rockwool 60kg/m^3

Figure 2. Rockwool 200kg/m^3

Figure 3. Comparative Material

Test Performed by:

Lee J. Moomaw
Engineer
Columbus Office

Report Approved by:

Danielle Melaragno
Engineering Team Lead
Columbus Office

8.9. Data of ASTM E90

Intertek

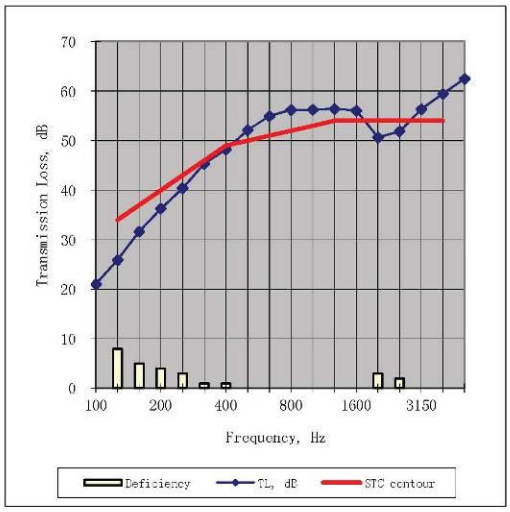
Test:	Airborne Sound Transmission Loss	
Start Date:	2014.12.25	Reviewer: Jodie Zhou
Target Date:	2015.4.1	
Job No:	141128001SHJ-BP	
Client:	BBMG Energy Saving Materials & Technology Co. Ltd.	Eng/Tech: Alvin Zhu
Sample:	15mm standard gypsum boards*2+C100 stud（100mm 140K rock wool）+15mm standard gypsum*2	
Sample ID:	S141128001SHJ-030	
Standards	ASTM E413-10	
Procedure:	ASTM E90-09	

Equipment:

Item	*ID*	*Cal Due Date*
Acoustics Analyzer	SH1109	2014.12.12
Absorption Room	SH1111	2018.1.29

Volume of the source room	Vs, m^3	121	Volume of the receiving room	V_R, m^3	137
Source room temperature	t_s, °C	12	Receiving room temperature	t_R, °C	12
Area of test specimen	S, m^2	12.6	Relative humidity of test rooms	%	80

Frequency (Hz)	TL (dB)
100	21.0
125	25.9
160	31.7
200	36.3
250	40.4
315	45.3
400	48.2
500	52.1
630	54.9
800	56.2
1000	56.2
1250	56.4
1600	56.1
2000	50.7
2500	51.9
3150	56.3
4000	59.5
5000	62.5



Sound Transimission Class (STC)	50

WSB131-1A
21 May 2014

Page _1__ of 1___

9 Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	2015.3.23	First issue	Harrison Li	Jodie Zhou

END OF DOCUMENT