TEST REPORT

REPORT NUMBER: 150922002SHF-BP-1
ORIGINAL ISSUE DATE: April 20, 2016

EVALUATION CENTER

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

RENDERED TO

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

PRODUCT EVALUATED
Rock wool with a density from 150 to 200 kg/m^3

EVALUATION PROPERTY
Physical Properties

Report of Testing Rock wool for compliance with the applicable requirements of the following criteria: *ASTM C726-12, Standard Specification for Mineral Wool Roof Insulation Board*

1 Table of Contents

2 Introduction

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on rock wool with a density from 150 to 200 kg/m^3, to evaluate its physical properties according to ASTM C726-12, Standard Specification for Mineral Wool Roof Insulation Board. This evaluation began on November 7, 2015 and was completed on April 20, 2016.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were randomly selected on October 29, 2015 by Intertek representative Harrison Li, at BBMG Energy Saving Material & Technology Co. Ltd manufacturing facility, located at #8 BBMG Industrial Park, Xiaan Road, Dachang Huizu Autonomous County, Langfang, Hebei Province China. The samples were received at evaluation center on November 6, 2015. The sample ID was S150922002SHF.

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 150 to 200 kg/m^3. The selected sample densities were 150 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

The result was used data from Intertek Report 141128001SHJ-BP-2, dated on April 20, 2015. The samples were selected on November 28, 2014 by Intertek representative Daniel Zhang, at BBMG Energy Saving Material &Technology Co. Ltd manufacturing facility. The product was certified to ASTM E84.

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. 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. THERMAL RESISTANCE

The test was conducted in accordance with ASTM C518-15. The mean temperature for testing was 24°C with a temperature difference between plates at 20°C. Additional mean temperatures of -4°C and 43°C were conducted.

4.3. COMPRESSIVE RESISTANCE

The test was conducted in accordance with ASTM C165-07(2012), Procedure A. Crosshead speed was 2.5mm for each 25.4mm of specimen thickness. The average of the results shall not be less than the requirement and any individual specimen shall not be less than 90% of the minimum of the requirement.

4.4. TENSILE STRENGTH PERPENDICULAR TO THE BOARD SURFACE

The test was conducted in accordance with ASTM C209-12, Section 13. The specimen was 150mm by 150mm. The average of the results shall not be less than the requirement and any individual specimen shall not be less than 90% of the minimum of the requirement.

4.5. BREAKING LOAD

The test was conducted in accordance with ASTM C203-05(2012), Method I, Procedure D. The specimen width was 152mm and support span was 254mm. The average of the results shall not be less than the requirement and any individual specimen shall not be less than 90% of the minimum of the requirement.

4.6. WATER ABSORPTION

The test was conducted in accordance with ASTM C209-12, Section 14. The specimen was tested at the manufactured thickness. The submersion was 2 hours.

4.7. DIMENSIONS

The test was conducted in accordance with ASTM C209-12, Section 7 and 8. Thickness and size of finished board were measured.

4.8. DIMENSIONAL STABILITY

The test was conducted in accordance with ASTM D2126-09. The specimen was 300mm by 300mm by full thickness. The environmental conditions were as below. Each condition were exposure for 7 days.

@ 93° C, Ambient R.H.

@-40° C, Ambient R.H.

@70° C, 97% R.H.

4.9. DENSITY

The test was conducted in accordance with ASTM C303-10. The product was type II.

4.10. NONCOMBUSTIBLE CORE

The test was conducted in accordance with ISO 1716:2002. The insulation core shall have a maximum heat of combustion of 2.0 kJ/g. The test was conducted by China National Inspection and Testing Center for Building and Engineering Materials (CNAS L4350).

4.11. CORROSIVENESS

The test was conducted in accordance with ASTM C665-12 for corrosiveness to steel. The products shall conform to the requirements with Specification C665 for steel. The test was conducted by China National Fiberglass Product Quality Supervision & Testing Center (CNAS L0846).

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 ASTM C726-12 Physical Properties of sample 150 kg/m^3

Test Method	Characters	Requirement	Result	Verdict
ASTM C209	Dimensions	Agreed upon between the purchaser and manufacturer	Length: 1204mm Width: 601 mm Thickness: 99mm	NA
ASTM C518	Thermal Resistance	No requirement	@-4°C, 1.647 m^{2}K/W @24°C, 2.026 m^{2}K/W @43°C, 1.829 m^{2}K/W	NA
ASTM C303	Density	≥144 kg/m^3	155 kg/m^3	Type II, Class 1
ASTM C165	Compressive resistance	At 25% deformation, ≥83 kPa At 10% deformation, ≥48 kPa	At 25% deformation, 90 kPa At 10% deformation, 65 kPa	Pass
ASTM C209	Tensile strength perpendicular to board surface	≥22 kPa	27 kPa	Pass
ASTM C203	Breaking load	≥133 N	389 N	Pass
ASTM C209	Water absorption	≤5% by volume	1.2% by volume	Pass
ASTM D2126	Dimensional Stability	Linear change<1%	Linear change @93°C, Thickness: 0.4% Length: 0.1% Width: 0.2% Linear change @70°C and 97%R.H., Thickness: 0.5% Length: 0.2% Width: 0.2% Linear change @-40°C, Thickness: 0.2% Length: 0.1% Width: 0.2%	Pass
ISO 1716[1]	Heat of Combustion	≤2.0 kJ/g	0.66 kJ/g	Pass
ASTM C665[2]	Corrosiveness	Shall meet requirements for steel	Passed the corrosion test for steel	Pass
ASTM E84[3]	Surface Burning Characteristics	Flame Spread≤25 Smoke≤50	Flame Spread=0 Smoke=5	Pass

Table 1 ASTM C726-12 Physical Properties of sample 200 kg/m^3				
Test Method	**Characters**	**Requirement**	**Result**	**Verdict**
ASTM C209	Dimensions	Agreed upon between the purchaser and manufacturer	Length: 1204mm Width: 600 mm Thickness: 80mm	NA
ASTM C518	Thermal Resistance	No requirement	@-4°C, 1.908 m^{2}K/W @24°C, 1.930 m^{2}K/W @43°C, 1.769 m^{2}K/W	NA
ASTM C303	Density	≥144 kg/m^3	194 kg/m^3	Type II, Class 1
ASTM C165	Compressive resistance	At 25% deformation, ≥83 kPa At 10% deformation, ≥48 kPa	At 25% deformation, 184 kPa At 10% deformation, 127 kPa	Pass
ASTM C209	Tensile strength perpendicular to board surface	≥22 kPa	27 kPa	Pass
ASTM C203	Breaking load	≥133 N	383 N	Pass
ASTM C209	Water absorption	≤5% by volume	0.9% by volume	Pass
ASTM D2126	Dimensional Stability	Linear change<1%	Linear change @93°C, Thickness: 0.4% Length: 0.2% Width: 0.1% Linear change @70°C and 97%R.H., Thickness: 0.5% Length: 0.1% Width: 0.2% Linear change @-40°C, Thickness: 0.7% Length: 0.2% Width: 0.2%	Pass
ISO 1716[1]	Heat of Combustion	≤2.0 kJ/g	0.71 kJ/g	Pass
ASTM C665[2]	Corrosiveness	Shall meet requirements for steel	Passed the corrosion test for steel	Pass
ASTM E84[3]	Surface Burning Characteristics	Flame Spread≤25 Smoke≤50	Flame Spread=0 Smoke=5	Pass

Note:

1. The test was conducted by China National Inspection and Testing Center for Building and Engineering Materials (CNAS L4350). Detail information was referred to report No. FH626-150115 and No. FH626-150116 in Appendix B.
2. The test was conducted by China National Fiberglass Product Quality Supervision & Testing Center (CNAS L0846). Detail information was referred to report No. 15111443 and No. 15111444 in Appendix B.
3. The test results were used the data from the Intertek Report 141128001SHJ-BP-1. The products were the same materials and same producing. Different density evaluation was referred to EEV 141128001SHJ-BP-1 in Appendix B.

6 Conclusion

Intertek has conducted testing for BBMG Energy Saving Material & Technology Co. Ltd, on rock wool with a density from 150 to 200 kg/m^3, to evaluate its physical properties according to ASTM C726-12.

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

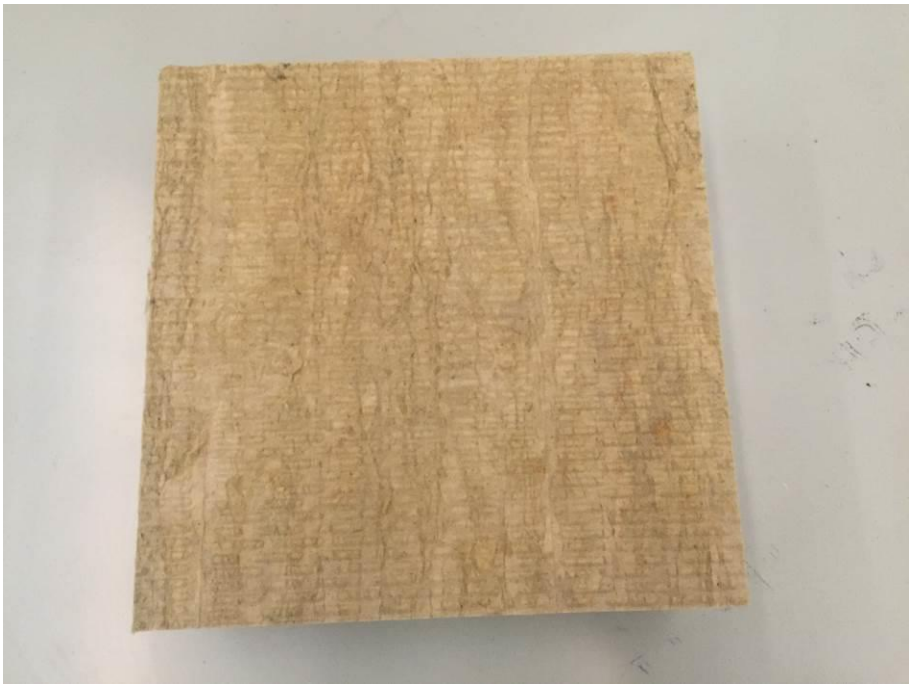
Reported by: Sally Xie

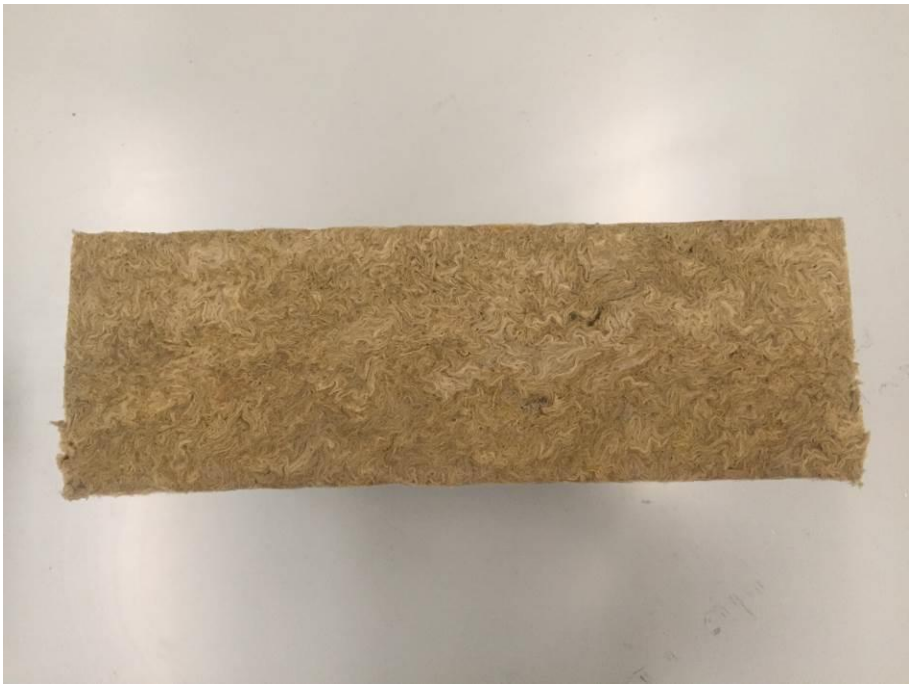
Sally Xie
Technical Supervisor, Building Product

Reviewed by: Jodie Zhou

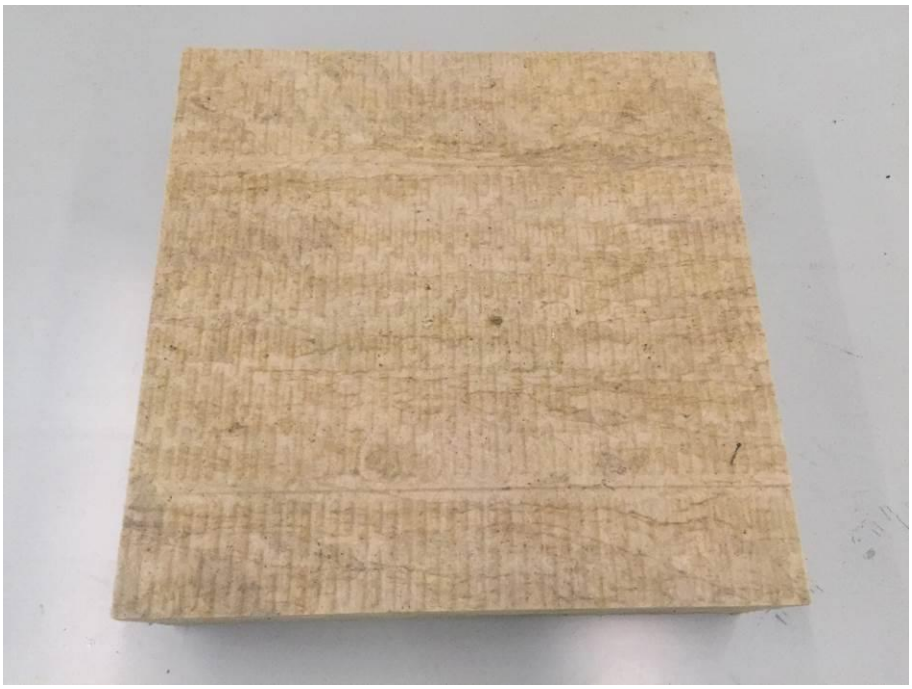
Jodie Zhou
Senior Technical Supervisor, Building Product

7 Appendix A: Product Photographs





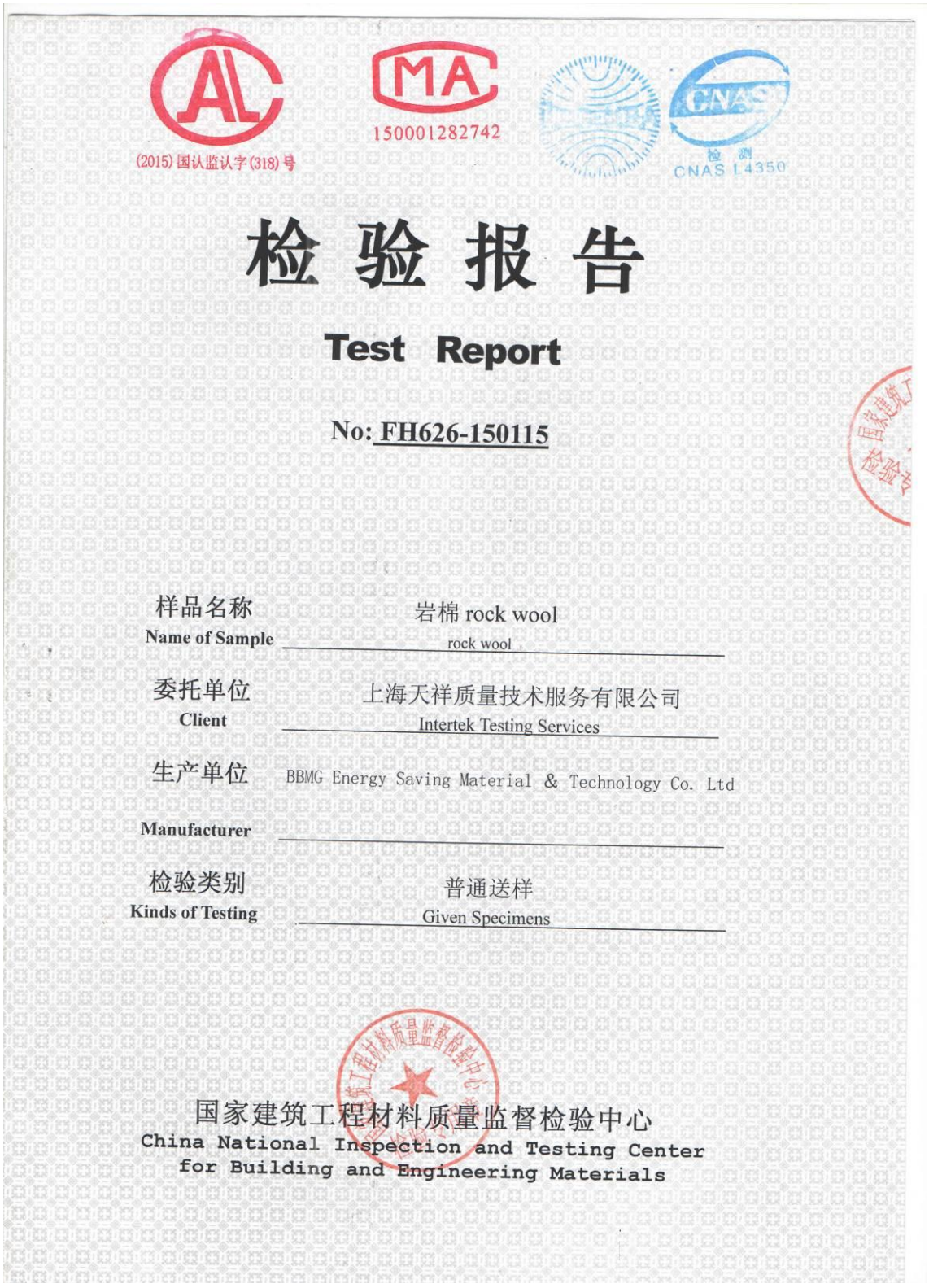
150 kg/m^3



200 kg/m^3

8 Appendix B: Test Data

8.1. Report of ISO 1716



(2015) 国认监认字(318)号

150001282742

CNAS L4350

检 验 报 告

Test Report

No: FH626-150115

样品名称 Name of Sample	岩棉 rock wool / rock wool
委托单位 Client	上海天祥质量技术服务有限公司 / Intertek Testing Services
生产单位 Manufacturer	BBMG Energy Saving Material & Technology Co. Ltd
检验类别 Kinds of Testing	普通送样 / Given Specimens

国家建筑工程材料质量监督检验中心
China National Inspection and Testing Center for Building and Engineering Materials

国家建筑工程材料质量监督检验中心
China National Inspection and Testing Center for Building and Engineering Materials

检 验 报 告
Testing Report

报告编号：
Report No.：FH626-150115

共 2 页，第 1 页
Page 1 of 2

样品名称 Name of Sample	岩棉rock wool rock wool	检验类别 Kinds of Testing	普通送样 Given Specimens
型号规格和/或等级 Type and Class	150kg/m^3	商 标 Trademark	150922002SHF-BP
委托单位 Client	上海天祥质量技术服务有限公司 Intertek Testing Services		
生产单位 Manufacturer	BBMG Energy Saving Material & Technology Co. Ltd		
委托单编号 Consigned No.	FH626-150124-1	送样日期 Date of Delivering	2015-11-25
委托日期 Date of Consigned	2015-11-25	样品数量 Sample Quantity	100g
样品状态说明 Description of Sample	无异常 No abnormality		
检验依据和/或判定原则 Standard of Testing	GB/T14402-2007《建筑材料及制品的燃烧性能 燃烧热值的测定》 Reaction to fire tests for building materials and products-Determination of the heat of combustion.		
检验日期 Date of Testing	2015-11-26		
检验结论 Testing Conclusion	燃烧总热值提供实测数据。 Measured gross calorific potential is provided. 检验机构Testing Organization（盖章） 签发日期Date of Issued：2015-12-3		
委托单位通讯资料 Contact Information	地址 Add.	奉贤区大叶公路6958号7栋 Building 7,No.6958, Da Ye Road, Fengxian District, Shanghai	
	邮编 Zip.	201405	电话 Tel. 61136116-304
备 注 Appendix:	1、未经本检验机构同意，不得部分复制本报告。 This report is not allowed to be duplicated partially without our permission. 2、以上检验结果委托单位如有异议，请在报告收到之日起十五日内提出。 Please contact us within 15 days after receiving the report, if there's any question about the testing result. 3、本报告结论仅对来样负责。 The test results above are only responsible for the delivered samples. 4、本报告以中文为准。 If there is any inconsistency between Chinese and English expression, the chinese one shall prevail. 5、GB/T 14402-2007 等同采用ISO1716:2002 《建筑制品对火反应试验 燃烧热值的测定》 (英文版)。 GB/T14402-2007<Reaction to fire tests for building materials and products-Determination of the heat of combustion> is equal the ISO1716:2002<Reaction to fire tests for building products Determination of the heat of combustion>(English Version).		

批准：
Approved by:

审核：
Checked by:

主检：
Tested by:

国家建筑工程材料质量监督检验中心
China National Inspection and Testing Center for Building and Engineering Materials

检 验 报 告
Testing Report

报告编号：
Report No.：FH626-150115

共 2 页 第 2 页
Page 2 of 2

检验结果汇总
Test Results Summary

序号 No.	检验项目 Items of testing		标准值 Criterion	检测结果 Results	结果判定 Judgment
1	燃烧总热值,PCS Gross Calorific Potential	整体制品,MJ/kg Whole product,MJ/kg	/	0.66	/
-	（以下空白）				
说明 Appendix	/				

(2015)国认监认字(318)号

150001282742

检 测
CNAS L4350

检 验 报 告

Test Report

No: FH626-150116

样品名称 **Name of Sample**	岩棉 rock wool rock wool
委托单位 **Client**	上海天祥质量技术服务有限公司 Intertek Testing Services
生产单位 **Manufacturer**	BBMG Energy Saving Material & Technology Co. Ltd
检验类别 **Kinds of Testing**	普通送样 Given Specimens

国家建筑工程材料质量监督检验中心
China National Inspection and Testing Center
for Building and Engineering Materials

国家建筑工程材料质量监督检验中心
China National Inspection and Testing Center for Building and Engineering Materials

检 验 报 告
Testing Report

报告编号：
Report No.：FH626-150116

共 2 页，第 1 页
Page 1 of 2

样品名称 Name of Sample	岩棉rock wool rock wool	检验类别 Kinds of Testing	普通送样 Given Specimens
型号规格和/或等级 Type and Class	200kg/m^3	商 标 Trademark	150922003SHF-BP
委托单位 Client	上海天祥质量技术服务有限公司 Intertek Testing Services		
生产单位 Manufacturer	BBMG Energy Saving Material & Technology Co. Ltd		
委托单编号 Consigned No.	FH626-150124-2	送样日期 Date of Delivering	2015-11-25
委托日期 Date of Consigned	2015-11-25	样品数量 Sample Quantity	100g
样品状态说明 Description of Sample	无异常 No abnormality		
检验依据和/或判定原则 Standard of Testing	GB/T14402-2007《建筑材料及制品的燃烧性能 燃烧热值的测定》 Reaction to fire tests for building materials and products-Determination of the heat of combustion.		
检验日期 Date of Testing	2015-11-26		
检验结论 Testing Conclusion	燃烧总热值提供实测数据。 Measured gross calorific potential is provided. 检验机构Testing Organization（盖章） 签发日期Date of Issued：2015-12-3		
委托单位通讯资料 Contact Information	地址 Add.	奉贤区大叶公路6958号7栋 Building 7,No.6958, Da Ye Road, Fengxian District, Shanghai	
	邮编 Zip.	201405	电话 Tel. 61136116-304
备 注 Appendix:	1、未经本检验机构同意，不得部分复制本报告。 This report is not allowed to be duplicated partially without our permission. 2、以上检验结果委托单位如有异议，请在报告收到之日起十五日内提出。 Please contact us within 15 days after receiving the report, if there's any question about the testing result. 3、本报告结论仅对来样负责。 The test results above are only responsible for the delivered samples. 4、本报告以中文为准。 If there is any inconsistency between Chinese and English expression, the chinese one shall prevail. 5、GB/T 14402-2007 等同采用ISO1716:2002 《建筑制品对火反应试验 燃烧热值的测定》 (英文版)。 GB/T14402-2007<Reaction to fire tests for building materials and products-Determination of the heat of combustion> is equal the ISO1716:2002<Reaction to fire tests for building products Determination of the heat of combustion>(English Version).		

批准：
Approved by:

审核：
Checked by:

主检：
Tested by:

国家建筑工程材料质量监督检验中心
China National Inspection and Testing Center for Building and Engineering Materials

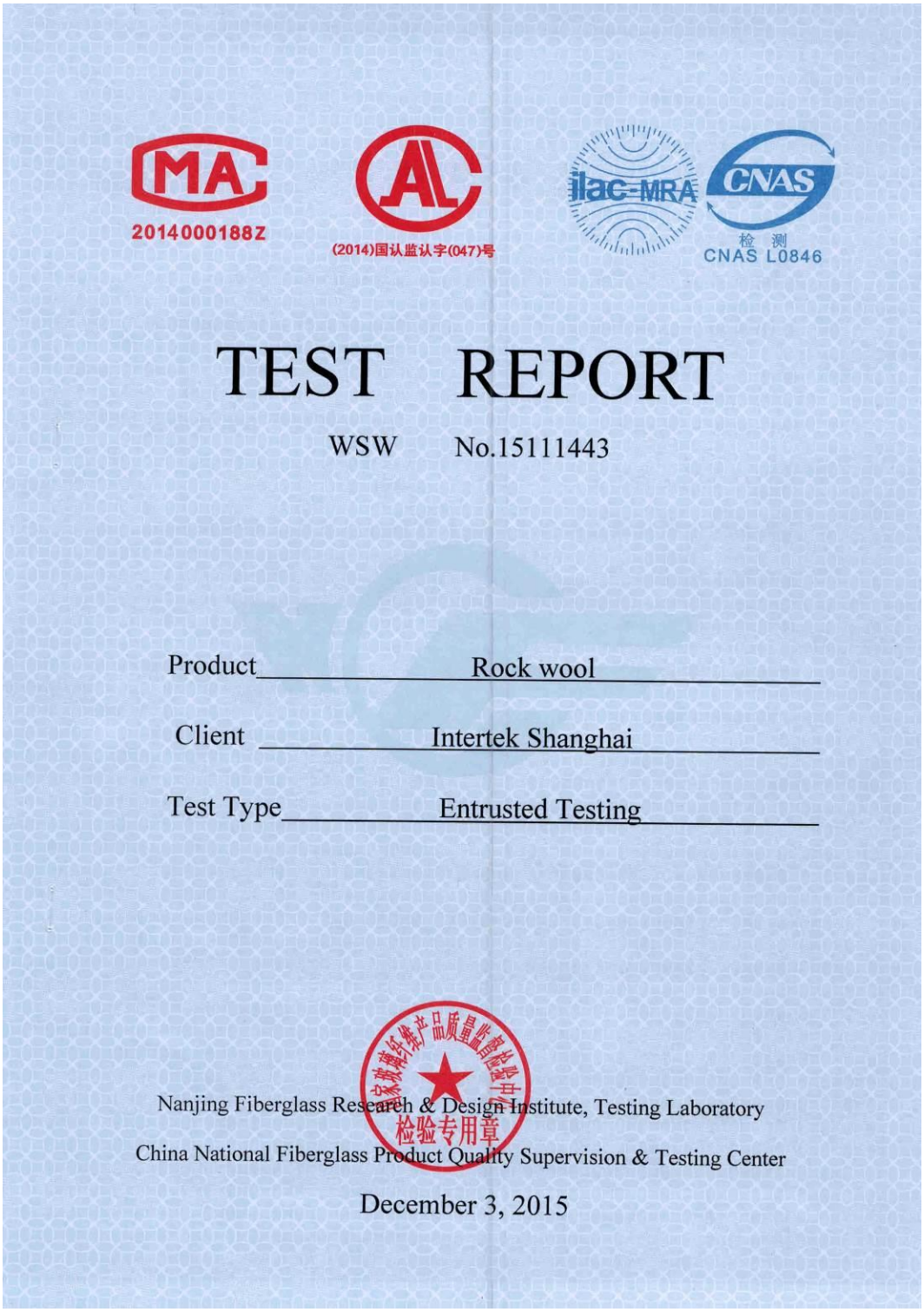
检 验 报 告
Testing Report

报告编号：
Report No.：FH626-150116

检验结果汇总
Test Results Summary

序号 No.	检验项目 Items of testing		标准值 Criterion	检测结果 Results	结果判定 Judgment
1	燃烧总热值,PCS Gross Calorific Potential	整体制品,MJ/kg Whole product,MJ/kg	/	0.71	/
	（以下空白）				
说明 Appendix	/				

8.2. Report of ASTM C665



CMA 2014000188Z

(2014)国认监认字(047)号

ilac-MRA CNAS 检 测 CNAS L0846

TEST REPORT

WSW No.15111443

Product Rock wool

Client Intertek Shanghai

Test Type Entrusted Testing

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

检验专用章

China National Fiberglass Product Quality Supervision & Testing Center

December 3, 2015

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

China National Fiberglass Product Quality Supervision & Testing Center

Test Report

WSW No.15111443 Page 1 of 3

Client	Intertek Shanghai	Address of client	----
Product	Rock wool	Specification	150kg/m^3
Trade mark	----	Sample sender	Zhou Wenjing
Producer	----	Date of production	150922002SHF-BP
Inspections required	Corrosion test of rock wool on steel plate.		
Additional information	None.		
The above information is provided by the client, the Center is not responsible for its truthfulness.			
Test type	Entrusted Testing	Date of sample received	November 24, 2015
Sample state	Earth yellow fibrous board		
Sample quantity	(114×38)mm, 20 pieces	Testing period	2015.11.24~2015.12.3
Test standard	ASTM C665-12 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing		
Testing result	The sample has been tested. The test result is detailed in the annex (page 2 and 3). Seal for test report December 3, 2015 The test results only represent the technical properties of the samples received.		
Remark			

Approved by: /Technical Chief Checked by: 陈建明 Compiled by:

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

China National Fiberglass Product Quality Supervision & Testing Center

WSW No.15111443 Page 2 of 3

Corrosion test of rock wool on steel plate

Ⅰ. Test method

ASTM C665-12

Ⅱ. Specimen preparation

1. The dimensions of each specimen are 114mm×38mm×12.7mm as the same with the sterile cotton.

2. The dimensions of steel plates are 100mm×25mm×0.8mm. Clean the test plates by vapor degreasing for 5min using 1-1-1 trichloroethane or chloroprene. After degreasing, wipe the residue from both sides of the coupons using paper laboratory wipes. Next, immerse for 15min in a hot caustic solution(15% potassium hydroxide (KOH) by weight), rinse thoroughly in distilled water, and immediately dry using paper laboratory wipes.

3. The dimensions of wire screens are 114mm×38mm, the dimension of open-square grid is 11.0mm.

4. Each specimen consists of one piece of metal placed between two pieces of insulation. Next, compress this assembly between two pieces of woven wire screen and secure near each end with rubber band to ensure that the compressed thickness of this assembly measures 25mm. The assembled way of steel plates and sterile cotton is the same.

III. Procedure

1. Vertically suspend the five test specimens and the five control specimens in an atmosphere free of contaminants, having a relative humidity of 95%, and a temperature of 49℃ for 96h. Keep the humidity chamber for the entire test period.

2. After 96h, remove the specimens from the chamber. The ten metal plates (five test, five control) were examined by four judges with experience in corrosion evaluation. Each judge shall independently rank all ten plates in order from least severe corrosion to most severe corrosion. Upon completion of the judges' ratings, the arithmetic sum of all of the rankings for each plate shall be calculated.

3. According to the 90% confidence the rank sum test. If this sum is less than 21, then the control plates are judged to be significantly better than the test plates and the insulation tested is considered to have failed the test. Any sum of the rankings for the five control plates ≥21 indicates that there is no statistical difference between the control and test plates, and the insulation is considered to have passed.

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

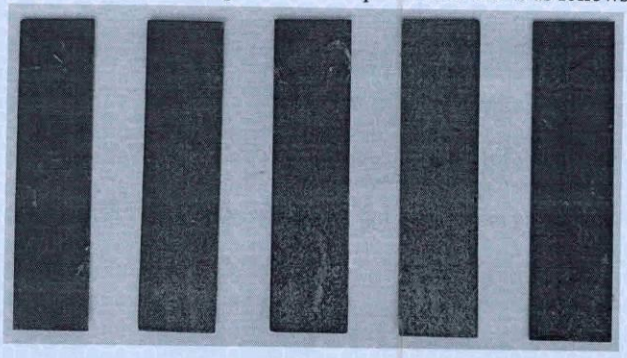
China National Fiberglass Product Quality Supervision & Testing Center

WSW No.15111443 Page 3 of 3

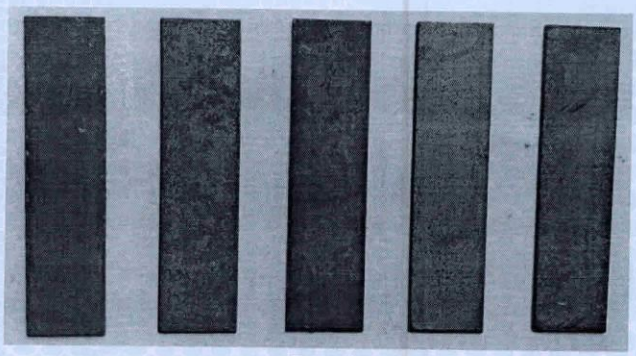
Ⅳ. Test result

Corrosion test of rock wool on steel plate.

1. The appearance of control plates and test plates after test is as follows.



Control plates



Test plates

2. Mix the control plates and test plates, the ten plates were examined by four judges with experience in corrosion evaluation. Each judge shall independently rank all ten plates in order from least severe corrosion to most severe corrosion. The average sum of the rankings of control plates is 32.

3. According to the 90% confidence the rank sum test, the average sum of the rankings of control plates shall not be less than 21. So the sample is considered to have passed the corrosion test.

CMA 20140000188Z

(2014)国认监认字(047)号

ilac-MRA CNAS 检 测 CNAS L0846

TEST REPORT

WSW No.15111444

Product Rock wool

Client Intertek Shanghai

Test Type Entrusted Testing

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

China National Fiberglass Product Quality Supervision & Testing Center

检验专用章

December 2, 2015

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

China National Fiberglass Product Quality Supervision & Testing Center

Test Report

WSW No.15111444 Page 1 of 3

Client	Intertek Shanghai	Address of client	----
Product	Rock wool	Specification	200kg/m^3
Trade mark	----	Sample sender	Zhou Wenjing
Producer	----	Date of production	150922002SHF-BP
Inspections required	Corrosion test of rock wool on steel plate.		
Additional information	None.		
The above information is provided by the client, the Center is not responsible for its truthfulness.			
Test type	Entrusted Testing	Date of sample received	November 24, 2015
Sample state	Earth yellow fibrous board		
Sample quantity	(114×38)mm, 20 pieces	Testing period	2015.11.24~2015.12.1
Test standard	ASTM C665-12 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing		
Testing result	The sample has been tested. The test result is detailed in the annex (page 2 and 3). Seal for test report December 2, 2015 The test results only represent the technical properties of the samples received.		
Remark			

Approved by: /Technical Chief Checked by: 陈建明 Compiled by:

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

China National Fiberglass Product Quality Supervision & Testing Center

WSW No.15111444 Page 2 of 3

Corrosion test of rock wool on steel plate

Ⅰ. Test method

ASTM C665-12

Ⅱ. Specimen preparation

1. The dimensions of each specimen are 114mm×38mm×12.7mm as the same with the sterile cotton.

2. The dimensions of steel plates are 100mm×25mm×0.8mm. Clean the test plates by vapor degreasing for 5min using 1-1-1 trichloroethane or chloroprene. After degreasing, wipe the residue from both sides of the coupons using paper laboratory wipes. Next, immerse for 15min in a hot caustic solution(15% potassium hydroxide (KOH) by weight), rinse thoroughly in distilled water, and immediately dry using paper laboratory wipes.

3. The dimensions of wire screens are 114mm×38mm, the dimension of open-square grid is 11.0mm.

4. Each specimen consists of one piece of metal placed between two pieces of insulation. Next, compress this assembly between two pieces of woven wire screen and secure near each end with rubber band to ensure that the compressed thickness of this assembly measures 25mm. The assembled way of steel plates and sterile cotton is the same.

III. Procedure

1. Vertically suspend the five test specimens and the five control specimens in an atmosphere free of contaminants, having a relative humidity of 95%, and a temperature of 49℃ for 96h. Keep the humidity chamber for the entire test period.

2. After 96h, remove the specimens from the chamber. The ten metal plates (five test, five control) were examined by four judges with experience in corrosion evaluation. Each judge shall independently rank all ten plates in order from least severe corrosion to most severe corrosion. Upon completion of the judges' ratings, the arithmetic sum of all of the rankings for each plate shall be calculated.

3. According to the 90% confidence the rank sum test. If this sum is less than 21, then the control plates are judged to be significantly better than the test plates and the insulation tested is considered to have failed the test. Any sum of the rankings for the five control plates ≥21 indicates that there is no statistical difference between the control and test plates, and the insulation is considered to have passed.

Nanjing Fiberglass Research & Design Institute, Testing Laboratory

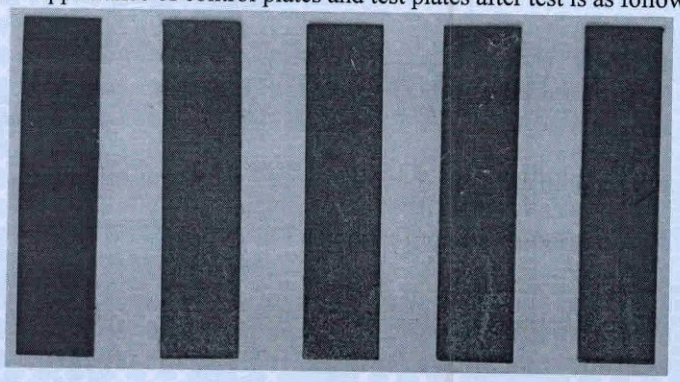
China National Fiberglass Product Quality Supervision & Testing Center

WSW No.15111444 Page 3 of 3

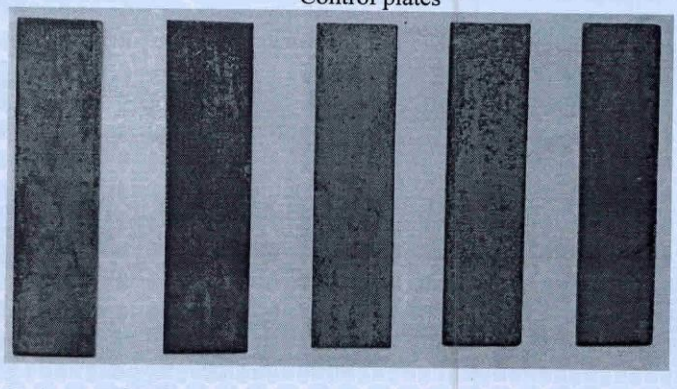
Ⅳ. Test result

Corrosion test of rock wool on steel plate.

1. The appearance of control plates and test plates after test is as follows.



Control plates



Test plates

2. Mix the control plates and test plates, the ten plates were examined by four judges with experience in corrosion evaluation. Each judge shall independently rank all ten plates in order from least severe corrosion to most severe corrosion. The average sum of the rankings of control plates is 25.

3. According to the 90% confidence the rank sum test, the average sum of the rankings of control plates shall not be less than 21. So the sample is considered to have passed the corrosion test.

8.3. Report of ASTM E84 Evaluation

Intertek

ENGINEERING EVALUATION

REPORT NUMBER: 141128001SHJ-BP-2
ORIGINAL ISSUE DATE: April 20, 2015
REVISION AND DATE: Original Issue

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

RENDERED TO

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

PRODUCT EVALUATED:
Rock wool insulation panel with density range from 60 to 200 kg/m^3

EVALUATION PROPERTY
Surface Burning Characteristics

Engineering Evaluation of rock wool insulation panel with density range from 60 to 200 kg/m^3 for compliance with the applicable requirements of the following criteria: *ASTM E84-14 Standard Method of Test for Surface Burning Characteristics of Building Materials and CAN/ULC S102-10 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.*

1 Table of Contents

2 Introduction

Intertek has conducted an engineering evaluation for BBMG Energy Saving Material & Technology Co., Ltd on rock wool insulation panel with density from 60 to 200 kg/m^3. The evaluation is being conducted to evaluate whether surface burning characteristics test results obtained from the specific thickness according to ASTM E84-14 and CAN/ULC S102-10 could be extended to thicker materials.

3 Description

The sample identified in this assessment report is rock wool insulation panel manufactured by BBMG Energy Saving Material & Technology Co., Ltd. Intertek has conducted surface burning characteristic testing according to ASTM E84-14, CAN/ULC S102-10 and non-combustibility according to CAN/ULC S114-5 on this rock wool insulation panel. These 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 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. The rock wool has a density range from 60 to 200 kg/m^3, and was made of same composition.

The test result of the above test method is summarized in the table below:

Test Method	Characters	Sample density	Sample Size	Result
ASTM E84-14 (UL 723, UBC 8-1, NFPA 255)	Surface burning characteristics	60 kg/m^3	3.94ft. long by 23.62 in. wide by 3.23 in. thick, 6 pcs	Flame Spread Index = 0; Smoke Developed Index =5
		200 kg/m^3	3.94ft. long by 23.62 in. wide by 1.97 in. thick, 6 pcs	Flame Spread Index = 0; Smoke Developed Index =5
CAN/ULC S102-10	Surface burning characteristics	60 kg/m^3	3.94ft. long by 23.62 in. wide by 3.23 in. thick, 6 pcs	Flame Spread Rating = 0; Smoke Developed Classification = 0
		200 kg/m^3	3.94ft. long by 23.62 in. wide by 1.97 in. thick, 6 pcs	Flame Spread Rating = 0; Smoke Developed Classification = 0
CAN/ULC-S114-05	Non-combustibility	60 kg/m^3	38 by 38 by 50 mm	Pass
		200 kg/m^3	38 by 38 by 50 mm	Pass

Authorities Having Jurisdiction (AHJ) should be consulted in all cases as to the particular requirements covering the installation and use of Intertek certified products, equipment, systems, devices and materials. The AHJ should be consulted before construction. Fire resistance assemblies and products are developed by the design submitter and have been investigated by Intertek for compliance with specific requirements. The published information (product and

design listings) cannot always address every construction nuance encountered in the field. When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the test standard referenced for each Intertek certified product. The test standard includes specifics concerning alternate materials and alternate methods of construction. Only products which bear Intertek's Mark are considered as certified. The appearance of a company's name or product in Intertek Directory of Listed Building Products does not in itself assure that products so identified have been manufactured under Intertek's Follow-Up Service. Only those products bearing the Intertek Mark should be considered to be Listed and covered under Intertek's Follow-Up Service. Always verify the Mark on the product before using it.

4 Reference Documents

As part of this evaluation, Intertek has directly or indirectly used the following reference documents:

- ASTM E84-14 Standard Test Method for Surface Burning Characteristics of Building Materials
- CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- CAN/ULC-S114-05 Standard Method of Test for Determining Non-Combustibility in Building Materials

Test Reference	Remark
Intertek testing report of BBMG rock wool insulation panel with density range from 60 to 200 kg/m^3	Report Number: 141128001SHJ-BP-1, Issued on March 23, 2015.
Surface burning characteristics test report of BBMG rock wool insulation panel with density range from 60 and 200 kg/m^3	Report Number: 141128001SHJ-BP-1, Issued on March 23, 2015; Report number: 101943447COQ-001a, issued on January 28, 2015; Report number: 101943447COQ-001b, issued on January 28, 2015.
Non-Combustibility test report of BBMG rock wool insulation panel with density range from 60 and 200 kg/m^3	Report number: 101943432MID-001aRev1, issued on January 19, 2015; Report number: 101943432MID-001bRev1, issued on January 19, 2015.

5 Evaluation Method

This evaluation is being conducted solely for the above italicized referenced project or use or both. Due to the variables that exist from project and the fact that each evaluation requires review of the most current existing data and information, this evaluation is not to be used as justification for any other opinion nor used for any other project, without the express written consent of Intertek. This report should serve as Intertek's opinion regarding the use of the certified product in the conditions described herein. The materials used on the project, which are

applied in compliance with Intertek Design Listings, must bear the Intertek listing mark. All certified products must be installed in accordance with the details contained in Intertek's *Directory of Listed Building Products.*

Unless specifically discussed within this evaluation report, all details must remain as tested or verified.

This evaluation is based on the test results of the rock wool insulation panel listed in section 3 of this report. Base on the testing performance of rock wool insulation panel, although the sample has different density and thickness, they still got a same surface burning and non-combustibility performance. Since the rock wool insulation panels with different density and thickness have a consistent result on surface burning performance, it is conclusion of Intertek that the surface burning characteristics of BBMG rock wool insulation panel could be extended to thicker material when the insulation panel has a density range from 60 to 200 kg/m^3.

6 Conclusion

Intertek has conducted an Engineering evaluation for BBMG Energy Saving Material & Technology Co., Ltd on rock wool insulation panel with density from 60 to 200 kg/m^3. The evaluation was based on the test data and result included in section 3 of this assessment report. It is the conclusion of Intertek that the surface burning characteristics of BBMG rock wool insulation panel could be extended to thicker material when the insulation panel has a density range from 60 to 200 kg/m^3.

This evaluation is not valid for any other variation of the rock wool insulation panel indicated in this report.

The conclusions of this engineer evaluation 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
Project Engineer, Building Products

Reviewed by: Juan Manuel Flores

Juan Manuel Flores, P.E.
Assistant Chief Engineer, Building Products

7 Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	April 20, 2015	First issue	Harrison Li	Juan M. Flores, P.E.

END OF DOCUMENT

8.4. Test data of ASTM E84 (from report 141128001SHJ-BP)

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

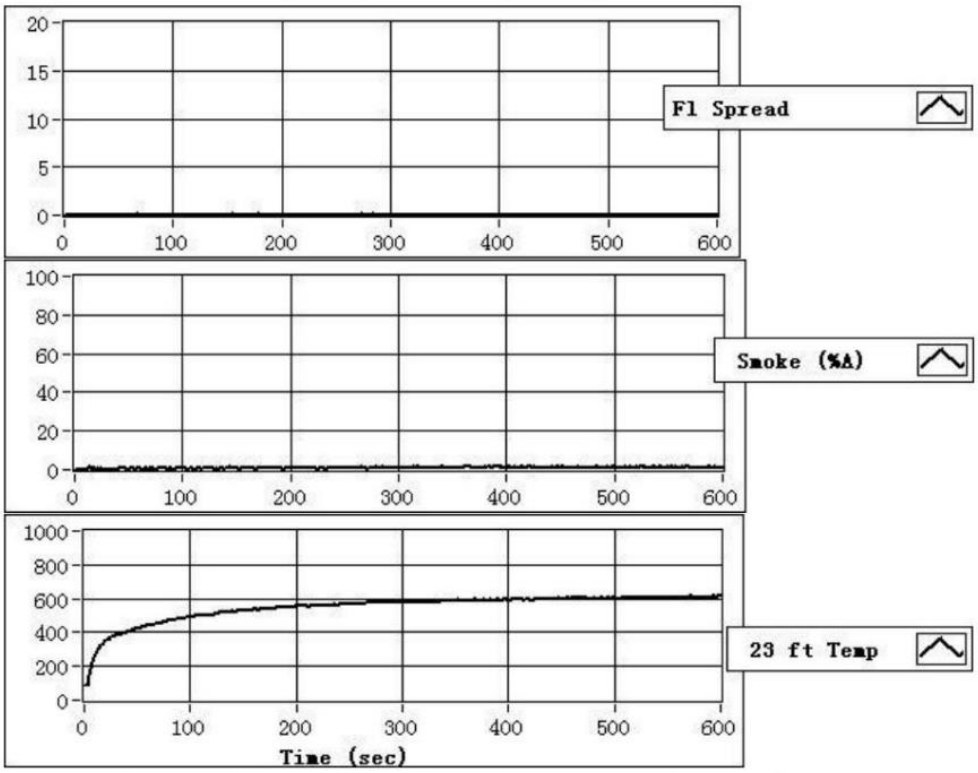
Mounting Procedure

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

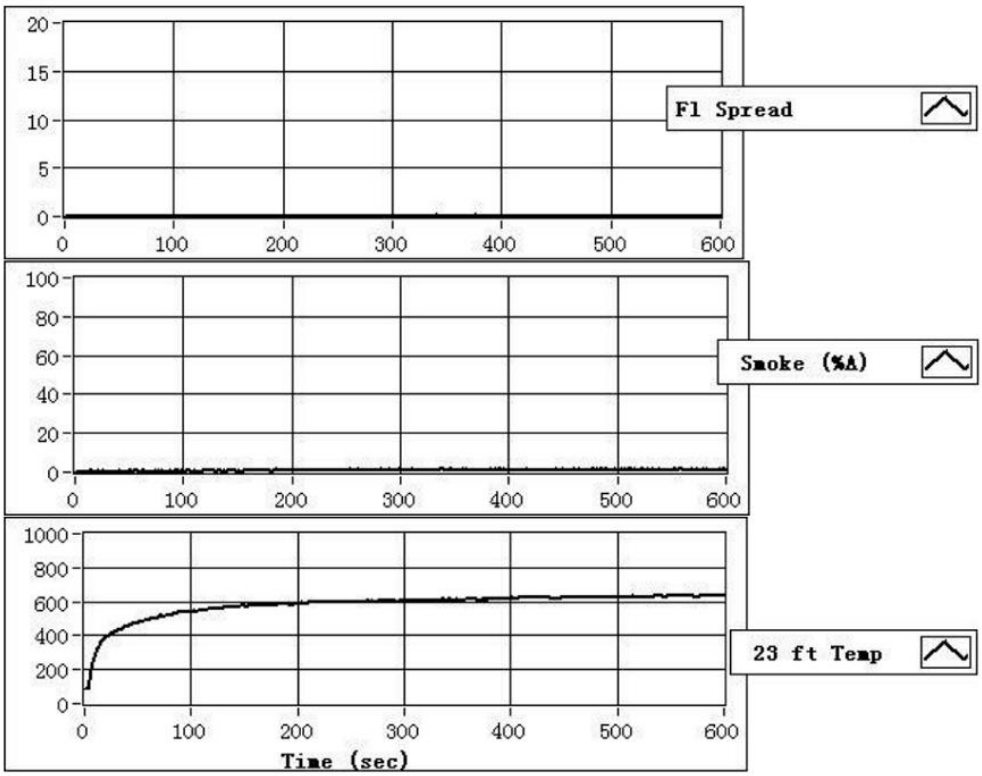
Rock Wool, 60kg

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

8.5. Test data of other tests

Intertek

Test: Dimensions
Start Date: 2015.12.4
Finish Date: 2015.12.4
Job No: 150922002SHF-BP
Sample: 150 kg/mß rock wool
Standards: ASTM C726-12
Procedure: ASTM C209
Conditioning: 23°C, 50%R.H.

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
ruler	SH 1016
gage	SH 2280

Specimen	Length (mm)			Width (mm)			Depth (mm)				
	L1	L2	L3	W1	W2	W3	D1	D2	D3	D4	D5
1	1203	1204	1205	600	600	600	98.22	98.24	98.43	99.05	98.76
2	1203	1204	1202	602	602	602	99.27	98.85	98.66	98.98	99.07
Mean	1204			601			99				

WSE353-6A
18 May 2015

Intertek

Test:	Thermal conductivity		
Test Start Date:	2015.12.4	Reviewer:	Sally Xie
Test Finish Date:	2015.12.9		
Job No:	150922002SHF-BP		
Sample:	150 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards:	ASTM C726-12		
Procedure:	ASTM C518-13		

Equipment Item	ID
Thermal Conductivity Measuring Instrument	SH1194

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	℃	℃	W/(m·K)	$(m^2 \cdot K)/W$
1	82.5	43.4	19.9	0.0462	1.787
2	82.0	43.4	19.8	0.0450	1.824
3	81.9	43.6	19.7	0.0436	1.878
Mean value	82.1	43.5	19.8	0.0449	1.829

Intertek

Test:	Thermal conductivity		
Test Start Date:	2015.12.4	Reviewer:	Sally Xie
Test Finish Date:	2015.12.9		
Job No:	150922002SHF-BP		
Sample:	150 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards:	ASTM C726-12		
Procedure:	ASTM C518-13		

Equipment Item	ID
Thermal Conductivity Measuring Instrument	SH1194

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	℃	℃	W/(m·K)	$(m^2 \cdot K)/W$
1	82.5	23.8	20.2	0.0410	2.013
2	82.0	23.8	20.2	0.0409	2.007
3	81.9	23.6	20.2	0.0398	2.060
Mean value	82.1	23.7	20.2	0.0405	2.026

Intertek

Test:	Thermal conductivity		
Test Start Date:	2015.12.1	Reviewer:	Sally Xie
Test Finish Date:	2015.12.11		
Job No:	150922002SHF-BP		
Sample:	150 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards:	ASTM C726-12		
Procedure:	ASTM C518-13		

Equipment Item	ID
Thermal Conductivity Measuring Instrument	SH1194

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	℃	℃	W/(m·K)	$(m^2 \cdot K)/W$
1	81.6	-4.0	20.2	0.0536	1.522
2	81.3	-4.1	20.2	0.0488	1.664
3	80.7	-4.0	20.2	0.0454	1.778
Mean value	81.2	-4.0	20.2	0.0493	1.647

Intertek

Reviewer: Sally Xie

Test: Density
Start Date: 2015.12.4
Finish Date: 2015.12.4
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C303
Conditioning: 23°C, 50%R.H.

Eng/Tech: Evyn Cui

Equipment Item	ID
Ruler	SH1016
Depth guage	SH2280
Balance	SH1022

Specimen		1	2	Mean
Length (mm)	L1	1203	1203	
	L2	1204	1204	
	L3	1205	1202	1204
Width (mm)	W1	600	602	
	W2	600	602	
	W3	600	602	601
Depth (mm)	D1	98.22	99.27	
	D2	98.24	98.85	
	D3	98.43	98.66	
	D4	99.05	98.98	98.7
Weight	(kg)	11.18	11.00	11.09
Density	(kg/m^3)	157.1	153.5	155

WSB353-9A
18 May 2015

Intertek

Test: Compressive Strength
Start Date: 2016.1.5
Finish Date: 2016.1.5
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C165
Conditioning: 40 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 10%
Crosshead Speed: 5.1 mm/min

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Tensile machine	SH1122
Digital Caliper	SH1166

Specimen	Length (mm)			Width (mm)			Depth (mm)				Load at 10% Deformation	Compressive Strength	Load at 25% Deformation	Compressive Strength
	L1	L2	L3	W1	W2	W3	D1	D2	D3	D4	(N)	(kPa)	(N)	(kPa)
1	150.37	150.30	150.33	150.51	150.54	150.46	102.20	102.24	101.91	102.16	1537	67.9	2113	93.4
2	150.36	150.44	150.44	150.20	150.15	150.27	101.65	101.62	101.57	101.50	1455	64.4	2023	89.5
3	150.24	150.18	150.42	150.26	150.04	150.17	102.24	102.18	101.96	102.07	1402	62.1	1956	86.7
4	150.18	150.46	150.42	150.04	150.16	150.05	102.03	102.04	102.08	102.08	1366	60.5	1931	85.6
5	150.13	150.19	150.06	150.08	150.12	150.08	101.70	101.88	102.07	102.09	1524	67.6	2090	92.8
										Mean:	1457	65	2023	90
										StdDev:	74	3.3	79.9	3.5
										COV:	5.1%	5.1%	4.0%	3.9%

WSB353-2A
18 May 2015

Intertek

Reviewer: Sally Xie

Test: Tensile strength perpendicular to the surface
Start Date: 2016.1.12
Finish Date: 2016.1.18
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C209
Conditioning: 23°C, 50%R.H.
Crosshead Speed: 51 mm/min

Eng/Tech: Evyn Cui

Equipment Item	ID
Tensile machine	SH1047
Digital Caliper	Sh1009

Specimen	Length (mm)	Width (mm)	Area (mm^2)	Load (N)	Strength (kpa)
1	149.69	149.23	22338	525	23.5
2	149.84	149.15	22349	562	25.1
3	149.5	149.54	22356	656	29.3
4	149.33	149.29	22293	633	28.4
Mean					27
Min.					24

WSB353-3A
18 May 2015

Intertek

Test: Breaking load
Start Date: 2016.1.20
Target Date: 2016.1.20
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C203 Method I, Procedure D
Conditioning: 23°C, 50%R.H.

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Tensile machine	SH1047
Digital Caliper	SH1168

Crosshead Speed: 250 mm/min

Span: 254 mm

Specimen	width (mm)	depth (mm)	Load (N)
1	152.49	101.51	407
2	152.45	102.02	402
3	152.31	101.81	401
4	152.73	101.33	347
Mean			389
Min.			347

WSB353-4A
18 May 2015

Intertek

Reviewer: Sally xie

Test: Water Absorption
Start Date: 2016.1.19
Target Date: 2016.1.20
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C209
Conditioning: 23°C, 50%R.H.

Eng/Tech: Evyn Cui

Equipment Item	ID
Balance	SH1021

Specimen	Constant Weight (23°C, 50% R.H.)							
	0 hour (g)	2 hour (g)	%	4 hour (g)	%	6 hour (g)	%	final (g)
1	1417.88	1417.21	0.05%	1416.82	0.03%	1416.41	0.03%	1416.05
2	1441.65	1441.01	0.04%	1440.63	0.03%	1440.25	0.03%	1439.94
3	1421.82	1421.25	0.04%	1420.87	0.03%	1420.53	0.02%	1420.40
4	1393.86	1393.26	0.04%	1392.84	0.03%	1392.44	0.03%	1392.12

Specimen	Length	Width	Thickness	Volume
	cm	cm	cm	cm^3
1	30.45	30.40	10.21	9451.19
2	30.50	30.50	10.21	9497.85
3	30.50	30.50	10.07	9367.62
4	30.35	30.40	10.08	9300.21

Submersion time 2 h

Specimen	final weight (g)	Volume of water cm^3	Water Abs. (% by vol.)
1	1540.27	124.22	1.31
2	1545.96	106.02	1.12
3	1530.3	109.90	1.17
4	1521.49	129.37	1.39
Mean			1.2

WSB353-5A
18 May 2015

Intertek

Test: Dimensional stability
Start Date: 2016.1.19
Target Date: 2016.1.26
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM D2126
Conditioning:

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Environmental chamber	SH1148
Digital Caliper	Sh1009

Temperature: 70 °C R.H. 97 % Days 7

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	303.5	303.5	304.0	304.0	304.0	304.5	101.2
2	304.0	304.5	304.5	304.0	304.0	303.5	100.8
3	305.0	305.0	304.5	303.5	303.5	304.0	101.5

After Exposure							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.5	304.5	304.5	304.5	304.0	304.5	101.8
2	304.5	305.0	304.5	304.5	304.5	304.5	101.0
3	305.0	304.5	304.5	304.5	304.5	304.5	102.0

Dimensional Stability							
Specimen	Length (%)			Width (%)			Thickness (%)
1	0.3	0.3	0.2	0.2	0.0	0.0	0.7
2	0.2	0.2	0.0	0.2	0.2	0.3	0.3
3	0.0	-0.2	0.0	0.3	0.3	0.2	0.5
Mean:	0.2			0.2			0.5
Maximum:	0.3			-0.3			0.3
Minimum:	0.0			0.0			0.0

WSB353-8A
18 May 2015

Intertek

Test: Dimensional stability
Start Date: 2016.1.12
Target Date: 2016.1.19
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM D2126
Conditioning:

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Oven	SH1046
Digital Caliper	Sh1009

Temperature: 93 °C R.H. / % Days 7

Initial Measurement

Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.0	304.0	303.5	304.0	303.5	304.0	101.2
2	304.0	304.5	304.5	305.0	305.0	304.5	101.8
3	305.0	305.0	304.5	304.5	304.5	304.5	100.6

After Exposure

Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.0	304.5	304.0	304.5	303.5	304.5	100.8
2	304.5	305.0	304.5	304.5	304.5	304.5	101.5
3	305.0	305.0	304.5	304.5	305.0	305.0	101.3

Dimensional Stability

Specimen	Length (%)			Width (%)			Thickness (%)
1	0.0	0.2	0.2	0.2	0.0	0.2	-0.4
2	0.2	0.2	0.0	-0.2	-0.2	0.0	-0.3
3	0.0	0.0	0.0	0.0	0.2	0.2	0.6
Mean:	0.1			0.2			0.4
Maximum:	0.2			0.2			0.6
Minimum:	0.0			0.0			-0.3

WSB353-8A
18 May 2015

Intertek

Test: Dimensional stability
Start Date: 2016.1.12
Target Date: 2016.1.19
Job No: 150922002SHF-BP
Sample: 150 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM D2126
Conditioning:

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Environmental chamber	SH1148
Digital Caliper	Sh1009

Temperature: -40 °C R.H. / % Days 7

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	305.0	305.0	305.0	304.5	304.0	304.5	101.2
2	304.5	303.0	303.5	304.5	304.5	304.5	101.3
3	304.0	303.5	303.5	304.5	303.5	303.0	100.9

After Exposure							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	305.0	305.0	304.5	304.0	304.0	304.0	101.2
2	304.5	304.0	303.0	303.5	303.5	304.0	101.6
3	303.0	303.0	303.0	304.0	303.0	303.5	101.1

Dimensional Stability							
Specimen	Length (%)			Width (%)			Thickness (%)
1	0.0	0.0	-0.2	-0.2	0.0	-0.2	0.0
2	0.0	0.3	-0.2	-0.3	-0.3	-0.2	0.3
3	-0.3	-0.2	-0.2	-0.2	-0.2	0.2	0.2
Mean:	0.1			0.2			0.2
Maximum:	-0.3			-0.3			0.3
Minimum:	0.0			0.0			0.0

WSB353-8A
18 May 2015

Intertek

Test: Dimensions
Start Date: 2015.12.4
Finish Date: 2015.12.4
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C209
Conditioning: 23°C, 50%R.H.

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
ruler	SH 1016
gage	SH 2280

Specimen	Length (mm)			Width (mm)			Depth (mm)				
	L1	L2	L3	W1	W2	W3	D1	D2	D3	D4	D5
1	1206	1205	1206	599	600	600	79.37	79.98	80.19	80.23	80.07
2	1203	1202	1202	600	600	600	80.13	80.04	80.22	80.25	80.14
Mean	1204			600			80				

WSB353-6A
18 May 2015

Intertek

Test:	Thermal conductivity		
Test Start Date:	2015.12.4	Reviewer:	Sally Xie
Test Finish Date:	2015.12.9		
Job No:	150922002SHF-BP		
Sample:	200 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards:	ASTM C726-12		
Procedure:	ASTM C518-13		

Equipment Item	ID
Thermal Conductivity Measuring Instrument	SH1194

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	℃	℃	W/(m·K)	$(m^2 \cdot K)/W$
1	82.7	43.7	19.5	0.0463	1.787
2	82.3	43.1	19.9	0.0450	1.830
3	82.3	43.3	19.9	0.0487	1.691
Mean value	82.4	43.4	19.8	0.0466	1.767

Intertek

Test:	Thermal conductivity		
Test Start Date:	2015.12.4	Reviewer:	Sally Xie
Test Finish Date:	2015.12.9		
Job No:	150922002SHF-BP		
Sample:	200 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards:	ASTM C726-12		
Procedure:	ASTM C518-13		

Equipment Item	ID
Thermal Conductivity Measuring Instrument	SH1194

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	℃	℃	W/(m·K)	$(m^2 \cdot K)/W$
1	82.7	23.6	20.3	0.0437	1.891
2	82.3	23.7	20.2	0.0424	1.942
3	82.3	23.7	20.2	0.0420	1.959
Mean value	82.4	23.7	20.2	0.0427	1.930

Intertek

Test:	Thermal conductivity		
Test Start Date:	2015.12.1	Reviewer:	Sally Xie
Test Finish Date:	2015.12.11		
Job No:	150922002SHF-BP		
Sample:	200 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards:	ASTM C726-12		
Procedure:	ASTM C518-13		

Equipment Item	ID
Thermal Conductivity Measuring Instrument	SH1194

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	℃	℃	W/(m·K)	$(m^2 \cdot K)/W$
1	83.6	-4.3	20.3	0.0405	2.066
2	83.2	-4.0	20.2	0.0517	1.607
3	83.5	-4.3	20.3	0.0389	2.143
Mean value	83.4	-4.2	20.3	0.0437	1.908

Intertek

Reviewer: Sally Xie

Test: Density
Start Date: 2015.12.4
Finish Date: 2015.12.4
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C303
Conditioning: 23°C, 50%R.H.

Eng/Tech: Evyn Cui

Equipment Item	ID
Ruler	SH1016
Depth guage	SH2280
Balance	SH1022

Specimen		1	2	Mean
Length (mm)	L1	1206	1203	
	L2	1205	1202	
	L3	1206	1202	1204
Width (mm)	W1	599	600	
	W2	600	600	
	W3	600	600	600
Depth (mm)	D1	79.37	80.13	
	D2	79.98	80.04	
	D3	80.19	80.22	
	D4	80.23	80.25	80.1
Weight	(kg)	11.23	11.18	11.20
Density	(kg/m^3)	194.2	193.3	194

WSB353-9A
18 May 2015

Intertek

Test: Compressive Strength
Start Date: 2016.1.5
Finish Date: 2016.1.5
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C165
Conditioning: 40 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 10%
Crosshead Speed: 5.1 mm/min

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Tensile machine	SH1122
Digital Caliper	SH1166

Specimen	Length (mm)			Width (mm)			Depth (mm)				Load at 10% Deformation	Compressive Strength	Load at 25% Deformation	Compressive Strength
	L1	L2	L3	W1	W2	W3	D1	D2	D3	D4	(N)	(kPa)	(N)	(kPa)
1	150.30	150.28	150.40	150.42	150.52	150.50	81.63	81.64	81.36	81.60	2670	118.0	4056	179.3
2	150.47	150.56	150.51	150.31	150.27	150.30	80.26	80.24	80.40	80.12	2623	116.0	3889	171.9
3	150.31	150.40	150.36	150.43	150.33	150.40	81.06	80.96	81.20	81.20	2765	122.3	3940	174.2
4	150.35	150.43	150.40	150.33	150.38	150.34	80.45	80.80	80.63	80.92	3410	150.8	4770	211.0
5	150.27	150.42	150.27	150.08	150.32	150.13	81.46	81.66	81.32	80.94	2871	127.2	4134	183.1
										Mean:	2868	127	4158	184
										StdDev:	318	14.1	355.5	15.7
										COV:	11.1%	11.1%	8.5%	8.6%

WSB353-2A
18 May 2015

Intertek

Reviewer: Sally Xie

Test: Tensile strength perpendicular to the surface
Start Date: 2016.1.12
Finish Date: 2016.1.18
Job No: 150922002SHF-BP
Sample: 200 kg/mß rock wool
Standards: ASTM C726-12
Procedure: ASTM C209
Conditioning: 23°C, 50%R.H.
Crosshead Speed: 51 mm/min

Eng/Tech: Evyn Cui

Equipment Item	ID
Tensile machine	SH1047
Digital Caliper	Sh1009

Specimen	Length (mm)	Width (mm)	Area (mm^2)	Load (N)	Strength (kpa)
1	149.63	149.64	22391	610	27.2
2	149.62	149.61	22385	618	27.6
3	149.19	149.44	22295	523	23.5
4	149.42	149.27	22304	644	28.9
Mean					27
Min.					23

WSB353-3A
18 May 2015

Intertek

Test: Breaking load
Start Date: 2016.1.20
Target Date: 2016.1.20
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C203 Method I, Procedure D
Conditioning: 23°C, 50%R.H.

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Tensile machine	SH1047
Digital Caliper	SH1168

Crosshead Speed: 250 mm/min

Span: 254 mm

Specimen	width (mm)	depth (mm)	Load (N)
1	152.46	81.83	352
2	152.51	82.02	371
3	152.23	81.68	444
4	152.23	81.6	366
Mean			383
Min.			352

WSB353-4A
18 May 2015

Intertek

Reviewer: Sally xie

Test: Water Absorption
Start Date: 2016.1.19
Target Date: 2016.1.20
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM C209
Conditioning: 23°C, 50%R.H.

Eng/Tech: Evyn Cui

Equipment Item	ID
Balance	SH1021

Specimen	Constant Weight (23°C, 50% R.H.)							
	0 hour (g)	2 hour (g)	%	4 hour (g)	%	6 hour (g)	%	final (g)
1	1443.03	1442.64	0.03%	1442.34	0.02%	1442.02	0.02%	1441.78
2	1437.95	1437.35	0.04%	1436.89	0.03%	1436.67	0.02%	1436.48
3	1478.64	1478.19	0.03%	1477.84	0.02%	1477.71	0.01%	1477.65
4	1422.98	1422.51	0.03%	1422.18	0.02%	1421.86	0.02%	1421.61

Specimen	Length	Width	Thickness	Volume
	cm	cm	cm	cm^3
1	30.40	30.45	8.23	7618.35
2	30.45	30.45	8.15	7556.70
3	30.45	30.50	8.16	7578.40
4	30.50	30.45	8.24	7652.69

Submersion time 2 h

Specimen	final weight (g)	Volume of water cm^3	Water Abs. (% by vol.)
1	1506.31	64.53	0.85
2	1511.76	75.28	1.00
3	1544.93	67.28	0.89
4	1494.24	72.63	0.95
Mean			0.9

WSB353-5A
18 May 2015

Intertek

Test: Dimensional stability
Start Date: 2016.1.19
Target Date: 2016.1.26
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM D2126
Conditioning:

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Environmental chamber	SH1148
Digital Caliper	Sh1009

Temperature: 70 °C R.H. 97 % Days 7

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.0	304.0	303.5	303.5	304.0	304.0	80.5
2	304.0	304.5	304.0	304.0	304.0	304.0	80.7
3	304.5	304.0	304.0	304.5	304.5	304.0	81.3

After Exposure							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.5	304.5	304.0	304.5	305.0	305.0	80.9
2	304.0	304.5	304.0	304.5	304.0	304.0	81.0
3	304.5	304.0	304.5	304.5	304.5	304.5	81.8

Dimensional Stability							
Specimen	Length (%)			Width (%)			Thickness (%)
1	0.2	0.2	0.2	0.3	0.3	0.3	0.5
2	0.0	0.0	0.0	0.2	0.0	0.0	0.3
3	0.0	0.0	0.2	0.0	0.0	0.2	0.6
Mean:	0.1			0.2			0.5
Maximum:	0.2			0.3			0.6
Minimum:	0.0			0.1			0.3

WSB353-8A
18 May 2015

Intertek

Test:	Dimensional stability	Reviewer:	Sally Xie
Start Date:	2016.1.12		
Target Date:	2016.1.19		
Job No:	150922002SHF-BP	Eng/Tech:	Evyn Cui
Sample:	200 kg/m3 rock wool		
Standards:	ASTM C726-12		
Procedure:	ASTM D2126		
Conditioning:			

Equipment Item	ID
Oven	SH1046
Digital Caliper	Sh1009

Temperature: 93 °C R.H. / % Days 7

Initial Measurement

Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	303.5	303.5	304.0	304.5	305.0	305.0	80.7
2	304.0	304.0	304.0	302.5	303.0	303.0	81.8
3	302.5	302.5	302.0	304.5	305.0	305.0	81.6

After Exposure

Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.0	304.0	304.5	304.5	305.0	305.0	80.4
2	304.5	304.5	304.0	302.5	303.0	303.0	81.8
3	302.5	302.5	302.5	304.5	304.5	304.5	80.9

Dimensional Stability

Specimen	Length (%)			Width (%)			Thickness (%)
1	0.2	0.2	0.2	0.0	0.0	0.0	-0.3
2	0.2	0.2	0.0	0.0	0.0	0.0	0.1
3	0.0	0.0	0.2	0.0	-0.2	-0.2	-0.9
Mean:	0.2			0.1			0.4
Maximum:	0.2			-0.2			-0.9
Minimum:	0.1			0.0			0.1

WSB353-8A
18 May 2015

Intertek

Test: Dimensional stability
Start Date: 2016.1.12
Target Date: 2016.1.19
Job No: 150922002SHF-BP
Sample: 200 kg/m3 rock wool
Standards: ASTM C726-12
Procedure: ASTM D2126
Conditioning:

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Equipment Item	ID
Environmental chamber	SH1148
Digital Caliper	Sh1009

Temperature: -40 °C R.H. / % Days 7

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.5	304.5	304.0	304.5	304.5	304.5	81.0
2	303.5	303.5	304.0	304.5	304.0	303.5	81.8
3	304.0	304.0	303.5	304.0	304.0	304.0	79.7

After Exposure							
Specimen	Length (mm)			Width (mm)			Thickness (mm)
1	304.0	304.0	304.0	304.0	304.0	304.0	81.7
2	304.0	303.5	303.0	303.0	304.0	304.0	81.1
3	304.0	304.0	303.0	304.0	304.0	304.0	80.2

Dimensional Stability							
Specimen	Length (%)			Width (%)			Thickness (%)
1	-0.2	-0.2	0.0	-0.2	-0.2	-0.2	0.8
2	0.2	0.0	-0.3	-0.5	0.0	0.2	-0.8
3	0.0	0.0	-0.2	0.0	0.0	0.0	0.6
Mean:	0.2			0.2			0.7
Maximum:	-0.3			-0.3			0.8
Minimum:	0.0			0.0			0.6

WSB353-8A
18 May 2015

9 Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	2016.3.31	First issue	Sally Xie	Jodie Zhou

END OF DOCUMENT