

REPORT

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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/m³

> > 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*

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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/m³, 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/m³. The selected sample densities were 150 kg/m³ and 200 kg/m³. 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

|--|

	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	At 25% deformation, 90 kPa At 10% deformation, 65	Pass	
ASTM C209	Tensile strength perpendicular to board surface	kPa ≥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%	Pass	
			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%		
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: 600mm 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 25% deformation, 184 kPa	Pass		
		At 10% deformation, ≥48 kPa	At 10% deformation, 127 kPa			
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:

- 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.
- 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/m³, 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

Saly Xie

Reported by:

Sally Xie Technical Supervisor, Building Product

Jodie Zhou

Reviewed by:

Jodie Zhou Senior Technical Supervisor, Building Product

7 Appendix A: Product Photographs



150 kg/m³





200 kg/m³

8 Appendix B: Test Data

8.1. Report of ISO 1716

(2015) 国认监认字(318)	150001282742	
柞	金验报告	
	Test Report	
	No: <u>FH626-150115</u>	
样品名称 Name of Sample	岩棉 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	BBMG Energy Saving Material & Technology Co. Ltd	
Manufacturer 检验类别 Kinds of Testing	普通送样 Given Specimens	
国家建 China Natio for Buil	筑工程材料质量监督检验中心 mal Inspection and Testing Center ding and Engineering Materials	

		於	验报告		
		1	Testing Report		
段告编号: eport No.: FH626-15	0115			共 2 页,第 1 页 Page 1 of 2	
样品名称 Name of Sample	岩棉rock we rock wool	lool	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 Intertek Tes	上海天祥质量技术服务有限公司 Intertek Testing Services			
生产单位 Manufacturer	BBMG Ener	gy Saving Materia	al & Technology Co. Ltd		
委托单 编号 Consigned No.	FH626-1501	24-1	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 escription of Sample	无异常 No abnormality				
t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 125				
头礼兴了法言	地址	奉贤区大叶公	、路6958号7栋		
安托平位通讯资料 Contact Information	Add. 邮编 Zip.	201405	etta Tel	61136116-304	
备 注 Appendix:	Zip. 1el. 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 and="" building="" combustion="" fire="" for="" heat="" materials="" of="" products-determination="" tests="" the="" to=""> is equal the ISO1716:2002<reaction building="" combustion="" determination="" fire="" for="" heat="" of="" products="" tests="" the="" to="">(English Version).</reaction></reaction>				

		检查	验报告		
告编号		Test	ung Report	共	2页第2页
ort No.	: FH626-150115	检	验结果汇总		Page 2 of 2
序号 No.	It	Test R 检验项目 ems of testing	esults Summary 标准值	检测结果	结果判定
1	燃烧总热 值,PCS Gross Calorific Potential	整体制品,MJ/kg Whole product,MJ/kg	. /	Results	Judgment /
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BBMG Energy Saving Material & Technology Co. Ltd Report Number: 150922002SHF-BP-1

(2015)国认监认字(318)书		
木	金验报告	
	Test Report	
	No: <u>FH626-150116</u>	
样品名称 Name of Sample _	岩棉 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	3BMG Energy Saving Material & Technology Co. Ltd	
检验类别 Kinds of Testing	普通送样 Given Specimens	
国家建约 China Natior for Build	和工程材料质量监督检验中心 mal Inspection and Testing Center ling and Engineering Materials	

	China 1	National Insp Building and	ection and Testing (Engineering Materi	Center for als	
		检	验报告		
		Te	esting Report		
d告编号: eport No.: FH626-150	0116			共 2 页,第 1 贝 Page 1 of 2	
样品名称 Name of Sample	岩棉rock wool rock wool	ol	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 Energ	gy Saving Material	& Technology Co. Ltd		
委托单 编号 Consigned No.	FH626-15012	24-2	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				
	<u> </u>				
委托单位通讯资料 Contact Information	Add. 邮编 Zip	201405	电话 Tel.	61136116-304	
备注 Appendix:	Zip. Tel. 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 and="" building="" combustion?="" english="" fire="" for="" heat="" materials="" of="" products-determination="" td="" tests="" the="" to="" version<=""></reaction>				

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r痈 与: ort No.	: FH626-150116			共	2 页 第 2 页 Page 2 of 2
		位于 Test Re	位结果汇总 sults Summary		
予号 No.	Ite	检验项目 ems 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	1	0.71	7
	(以下空白)				
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		ALL I			

8.2. Report of ASTM C665

DI14000188Z EQ14/DIAL MARK \$(047)5
TEST REPORT WSW No.15111443
ProductRock wool
Client Intertek Shanghai
Test Type <u>Entrusted Testing</u>
Nanjing Fiberglass Research & Design Institute, Testing Laboratory 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 Address of Client Intertek Shanghai client Product Rock wool Specification 150kg/m^3 Sample Trade mark Zhou Wenjing sender Date of Producer ----150922002SHF-BP production Inspections Corrosion test of rock wool on steel plate. required Additional None. information The above information is provided by the client, the Center is not responsible for its truthfulness. Date of sample Test type Entrusted Testing November 24, 2015 received Sample state Earth yellow fibrous board Sample (114×38)mm, 20 pieces Testing period 2015.11.24~2015.12.3 quantity Test ASTM C665-12 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing standard The sample has been tested. The test result is detailed in the annex (page 2 and 3). Testing result Seal for test report December 3, 2015 The test results only represent the technical properties of the samples received. Remark /Technical Chief Checked by: 阵崖峭 Compiled by:2 Approved by: 11 y or

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°C 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.



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.

BBMG Energy Saving Material & Technology Co. Ltd Report Number: 150922002SHF-BP-1



Nanjing Fiberglass Research & Design Institute, Testing Laboratory

China National Fiberglass Product Quality Supervision & Testing Center

Test Report

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 clien	t, the Center is not resp	ponsible 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 Sp Insulation for Light Fram	ecification for Mine e Construction and	eral-Fiber Blanket Thermal Manufactured Housing	
Testing result	The sample has been tests 2 and 3). The test results only repres received.	ed. The test result is ent the technical	detailed in the annex (page Seal for test report December 2, 2015 properties of the samples	
Remark				
proved by:	/Technical Chief Che	ecked by: 陈唐峒	Compiled by: <7, 77	

 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

 1. Test method
 ASTM C665-12

 Il. 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),

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

rinse thoroughly in distilled water, and immediately dry using paper laboratory wipes.

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°C 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.



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



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/m³

> EVALUATION PROPERTY Surface Burning Characteristics

Engineering Evaluation of rock wool insulation panel with density range from 60 to 200 kg/m³ 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.

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1

BBMG Energy Saving Material & Technology Co., LtdApril 20, 2015Report No. 141128001SHJ-BP-2Page 2 of 7

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2	Introduction	3
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6	Conclusion	6
7	Revision Page	7

BBM Repo	G Energy Saving Material & Technology Co., Ltd ort No. 141128001SHJ-BP-2	April 20, 2015 Page 3 of 7
2	Introduction	
		3:

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/m³. 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/m³, and was made of same composition.

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/m³	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-	Non-	60 kg/m ³	38 by 38 by 50 mm	Pass
S114-05	combustibility	200 kg/m ³	38 by 38 by 50 mm	Pass

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

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



BBMG Energy Saving Material & Technology Co., LtdApril 20, 2015Report No. 141128001SHJ-BP-2Page 4 of 7

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

ntertek	

 BBMG Energy Saving Material & Technology Co., Ltd
 April 20, 2015

 Report No. 141128001SHJ-BP-2
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 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/m³.

BBMG Energy Saving Material & Technology Co., Ltd Report No. 141128001SHJ-BP-2

April 20, 2015 Page 6 of 7

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/m³. 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/m³.

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:

Harnison

Harrison Li Project Engineer, Building Products

Manuel Flores

Reviewed by:

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



BBMG Energy Saving Material & Technology Co., Ltd Report No. 141128001SHJ-BP-2

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7 Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	April 20, 2015	First issue	Harrison Li	Juan M. Flores, P.E.
9				

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 #	1
Standard (S):	ASTM E84-14		
Witnesses:	n/a		

TABLE OF TEST EQUIPMENT USED

ltem	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.

rest metriou	Lab ID			Proj	ect #		
ASTM E84	Intertek	Fire La	borator	y 1411	28001		
Date							
22 Dec 2014	Time (T	est Star	+) 3:23	3 PM	Test No.	1	
inacimon ID		obe bear	0.20			<u> </u>	
Rock Wool							
pecimen Descri	ntion						
Rock Wool 200k	р с 1011 J						
Nounting Proced	ure						
Self-supportin	g						
TS Area (ft MAX FS Time	-min) 1.4	72 Maximu 56 Max 1	m FS [[emp <u>61</u> ;	0. 20() 3. E]		<u>.</u>
15-							
15					Fl Spread		
10							
10-							-
5-			_				-
5-0-							
0	200	300	400	500			
10- 5- 0- 100-	200	300	400	500			
10- 5- 0 100 100- 80-	200	300	400	500			
10- 5- 0 100 100- 80- 60-	200	300	400	500	600 Smok	e (%A)	
10- 5- 0- 0 100 100- 80- 60- 40-	200	300	400	500	600 Smok	e (%Å)	
10- 5- 0 100 100- 80- 60- 40- 20-	200	300	400	500	600 Smok	e (%A)	
10- 5- 0- 0 100 100- 80- 60- 40- 20- 0- 10- 10- 100	200	300	400	500		e (%A)	
10- 5- 0- 0 100 100- 80- 60- 40- 20- 0 100 1000- 100- 1000-	0 200	300	400	500	600 500 500	e (%A)	
10- 5- 0 100 100- 80- 60- 40- 20- 0 10 1000- 800- 1000- 800- 1000- 800- 1000-	0 200	300	400	500	600 500	e (%A)	
10- 5- 0- 0 100 100- 80- 60- 40- 20- 0 10 1000- 800- 600- 1000- 800- 600- 100	0 200	300	400	500	600 500 500	e (%Å)	
10- 5- 0- 0 100 100- 80- 60- 40- 20- 0 10 1000- 800- 600- 400- 0 100	0 200	300	400	500	600 600 600	e (%A)	
10- 5- 0 100 100- 80- 60- 40- 20- 0 10 1000- 800- 600- 400- 200- 0 100		300	400	500	600 Smok	e (%A) ft Temp	
10- 5- 0- 0 100 100- 80- 60- 40- 20- 0 10 1000- 800- 600- 400- 200- 0 100		300	400	500	600 600 600 600 600 23	e (%A) ft Temp	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	0 200 0 200 0 200 0 200 Ti=	300 300 300 300 300 300	400	500	600 580k	e (%A) ft Temp	
	0 200 0 200 0 200 0 200 Time	300 300 300 300 300 300 300	400	500	600 500 23 600	e (%A) ft Temp	
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Intertek Testing Services Ltd.

	10	110	Jeci #	
ASTM E84 Inte	ertek Fire La	aboratory 14	1128001	
	01 00M 1 11 0 D.			
Date				
23 Dec 2014 Ti	me (Test Sta	rt) 1:47 PM	Test No. 1	
Specimen ID		1970		
Rock Wool				
Specimen Description	l.			
Rock Wool, 60kg				
Mounting Procedure				
Fuel (CF) Los		EQ 10 Smoke	Area (%A min) [1.150
45.5	JRO SILK Area	09.12 Monto		5. 101
20-				
15-				
10-			F1 Spread	-
5				
0-		6 1 M		
0-100	200 300	400 500	600	
0-100 100-100	200 300	400 500		
0- 0 100 100- 80-	200 300	400 500		
0- 0 100 100- 80- 60-		400 500	600 500 Smoke (%A)	
0 - 100 100 - 100 80 - 60 - 40	200 300	400 500	600 500 Smoke (%A)	
0 - 100 100 - 100 80 - 60 - 60 - 60 - 60 - 60 - 60 - 60 -		400 500	600 500 Smoke (%A)	
		400 500	500	
0 - 100 100 - 100 80 - 60 - 60 - 60 - 60 - 60 - 60 - 60 -	200 300	400 500	<u>боо</u> Smoke (%А)	
0 - 100 100 - 100 80 - 60 - 60 - 60 - 60 - 60 - 60 - 60 -	200 300	400 500	600 Smoke (%A)	
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0 - 100 100 - 100 100 - 100 60 - 100 20 - 100 1000 - 100 1000 - 100 1000 - 100	200 300		600 Smoke (%A) 600 23 ft Tem	p [
			600 Smoke (%A) 600 23 ft Tem	p [
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0 - 100 100 - 100 80 - 60 - 60 - 60 - 60 - 60 - 60 - 60 -	200 300 200 300 200 300 200 300 Time (sec) Final PCI (400 500 400 500 400 500 400 500	600 Smoke (%A) 600 23 ft Tem 600	P 2
0 - 100 100 - 100 80 - 60 - 60 - 60 - 60 - 60 - 60 - 60 -	200 300 200 300 200 300 200 300 7 200 300 Time (sec) Final FSI (400 500 400 500 400 500 400 500 400 500 Final SI	600 Smoke (%Δ) 600 23 ft Tem 600 5	p [

8.5. Test data of other tests

Intertek

Test:	Dimensio	ons
Start Date:	2015.12.	4
Finish Date:	2015.12.	4
Job No:	1509220	02SHF-BP
Sample:	150 kg/m	13 rock wool
Standards:	ASTM C	726-12
Procedure:	ASTM C	209
Conditioning	23°C,50	%R.H.
Equipment It	em	ID
ruler		SH 1016
gage		SH 2280
17.00 70-04		
	I	

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Chaoiman	Length (mm)		Width (mm)			Depth (mm)					
Specimen	L1	12	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		

WSB353-6A 18 May 2015

Test Finish Date:	2015.12.9 1500220025HE RD	Terremet.	
Sample:	150 kg/m3 rock wool	Eng/Tech:	Mason Wang
Standards: Procedure:	ASTM C726-12 ASTM C518-13		
	Equipment Item	ID	
Thermal Cond	luctivity Measuring Instrument	SH1194	

Specimen	en Thickness M		Temperature diference	Thermal conductivity	Thermal resistance
	mm	Ĵ	ĩC	W/(m·K)	(m ² ·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

WSB353-1A 18 May 2015

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 Cond	luctivity Measuring Instrument	SH1194	
10194311.000.000.25440.20032243	Sen unsulation realized where the costs of an owner and		

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
10.10.10.10.10.00.0000000	mm	Ľ	ĩ	W/(m·K)	(m²·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

Thermal Cond	luctivity Measuring Instrument	SH1194	
	Equipment Item	ID	1
Procedure:	ASTM C518-13		
Standards:	ASTM C726-12		
Sample:	150 kg/m3 rock wool	Eng/Tech:	Mason Wang
Job No:	150922002SHF-BP		
Test Finish Date:	2015.12.11		
Test Start Date:	2015.12.1	Reviewer:	Sally Xie
Test:	Thermal conductivity		

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
10.000 BC 10.00000000	mm	Ĵ	Ű	W/(m·K)	(m²·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

WSB353-1A 18 May 2015

Reviewer: Sally Xie

Eng/Tech: <u>Ev yn Cui</u>

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		
Drocedure:	ASTM C303		
rioccuure.	1 (01141 0000		
Conditioning	23°C, 50%R.H.		
Conditioning E	: 23°C, 50%R.H. quipment Item		ID
Conditioning E(Ruler	: 23°C, 50%R.H. quipment Item	SH1016	ID
Conditioning El Ruler Depth guage	: 23°C, 50%R.H. quipment Item	SH1016 SH2280	ID

Specin	nen	1	2	Mean
	L1	1203	1203	
Length (mm)	L2	1204	1204	
	L3	1205	1202	1204
	W1	600	602	
Width (mm)	W2	600	602	
	W3	600	602	601
	D1	98.22	99.27	
Depth (mm)	D2	98.24	98.85	
Deput (fillin)	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

			თ	4	ω	2	-		Specimen	Digital Calipe	Tensile mach	Equipment Itu	Crosshead S	Conditioning:	Procedure:	Standards:	Sample:	Job No:	Finish Date:	Start Date:	Test	Intertek
			150.13	150.18	150.24	150.36	150.37	Ц	LE	100	line	em	peed:	40 hour	ASTM 0	ASTMO	150 kg/i	1509220	2016.1.5	2016.1.5	Compre	
			150.19	150.46	150.18	150.44	150.30	5	ength (mr	SHI	5HS	31	5.1	s at a terr	165	726-12	m3 rock v	D02SHF-I	0	Ű,	ssive Str	
			150.06	150.42	150.42	150.44	150.33	ដ	n	166	122			perature			VOOI	ΨP			ength	
			150.08	150.04	150.26	150.20	150.51	VV1	Ŵ				mm/min	e of 23 ±								
			150.12	150.16	150.04	150.15	150.54	VV2	ʻidth (mrr					2°C and								
			150.08	150.05	150.17	150.27	150.46	SAA	U,					relative t								
			101.70	102.03	102.24	101.65	102.20	D1						numidity								
			101.88	102.04	102.18	101.62	102.24	D2	Depth					of 50 ± 11								
			102.07	102.08	101.96	101.57	101.91	D3	(mm)					0%				Щ			Re	
COV:	StdDev:	Mean:	102.09	102.08	102.07	101.50	102.16	D4										g/Tech:			viewer:	
5.1%	74	1457	1524	1366	1402	1455	1537	(N)	Load at 10% Deformation									Evy			Sal	
5.1%	ی دن	65	67.6	60.5	62.1	64.4	67.9	(kPa)	Compressive Strength									n Cui			у×ie	
4.0%	79.9	2023	2090	1931	1956	2023	2113	(N)	Load at 25% Deformation													
3.9%	3. C.	90	92.8	6.58	86.7	89.5	93.4	(kPa)	Compressive Strength													

WSB353-2A 18 May 2015

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
Equipment Item	ID
Tensile machine	SH1047
Digital Caliper	Sh1009

Reviewer: Sally Xie

Eng/Tech: <u>Ev yn Cui</u>

Specimen	Length (mm)	Width (mm)	Area (mm ²)	Load (N)	Strength (kpa)
া	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			55 X.5		27
Min.	1				24

WSB353-3A 18 May 2015

Test						
	Breaking load					
Start Date:	2016.1.20					
Target Date:	2016.1.20					
Job No:	1509220	150922002SHF-BP				
Sample:	150 kg/r	n3 rock wool				
Standards:	ASTM C	ASTM C726-12				
Procedure:	ASTM C	203 Method I, I	Procedure D			
Conditioning:	23°C,50)%R.H.				
Equipment Item	0.6	ID				
Tensile machine		SH1047				
Digital Caliner		SH1168				

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Crosshead Speed: _____250 mm/min

Span: <u>254</u>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.	1	1	347

WSB353-4A 18 May 2015

Reviewer: <u>Sally xie</u>
Eng/Tech: Evyn Cui

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	r: 23°C, 50%R.H.		
E	quipment Item	ID ID	
Balance		SH1021	

Chaoiman		Constant Weight (23°C, 50% R.H.)										
Specimen	O 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				

7. 	Length	Width	Thickness	Volume
Specimen	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 _____h

	final weight	Volume of water	Water Abs.	
Specimen	(g)	cm ³	(% 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

Test: Start Date:	Dimensiona 2016 1 19	l stability	Review	wer:	Sally Xie	
Target Date: Job No: Sample: Standards: Procedure: Conditioning:	2016.1.26 2016.1.26 1509220029 150 kg/m3 r ASTM C728 ASTM D212	SHF-BP ock wool ⊱12 6	Eng/Ti	ech:	Evyn Cui	
Equipment Item		ID				
Environmental c Digital Caliper	hamber	SH1148 Sh1009				
Temperature:	<u>70</u> °(R.H	<u>97.</u> %	Days	7	
		Initial Meas	surement			

			THE REAL PRICE	asarament			7.0423
Specimen		Length (mr	n)	0	Width (mm)	ŭ.	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 (mr	n)		Width (mm)	5	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					

			Dimension	al Stability			
Specimen		Length (%))	3	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	5 3.5.8005 - 1	10.00	0.2	64 - 1289494 N	0.5
Maximum:		0.3			-0.3		0.3
Minimum:		0.0			0.0		0.0

Digital Caliper		Sh1009				
Oven		SH1046				
Equipment Item		ID				
Conditioning:						
Procedure:	ASTM D2126					
Standards:	ASTM C726-1	2				
Sample:	150 ka/m3 roc	k wool				
Job No:	150922002SH	F-BP	Ena/Te	ech:	Evvn Cui	
Target Date:	2016.1.19					
Start Date:	2016.1.12			22024 2	2494-0396-5550-C	
Test:	Dimensional s	tability	Review	ver:	Sally Xie	

			initia me	asurement			
Specimen		Length (mr	n)		Width (mm)	lá -	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 (mr	n)		Width (mm)	l.	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	

			Dimension	al Stability			
Specimen		Length (%)	0	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:	0.00 .0	0.1	Co	0.2			0.4
Maximum:		0.2			0.2		0.6
Minimum:		0.0			0.0		-0.3

Test:	Dimensio	nal stability			Reviewer		SallyXie	
Start Date:	2016.1.12							
Target Date:	2016.1.19	É.						
Job No:	15092200	2SHF-BP			Eng/Tech	Evyn Cui		
Sample:	150 kg/m3 rock wool							
Standards:	ASTM C7	ASTM C726-12						
Procedure:	ASTM D2126							
Conditioning:								
Equipment Item	ID]				
Environmental chamber		SH	1148	T				
Digital Caliper	Digital Caliper		1009					
Temperature:	-40		R.H.] _/	_%	Days	7	
20 	81 E	2				9552		
	-		initial M	easuremen	t			
Specimen		Length (mm)			Width (mm	0	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 (mr	n)		Width (mm)	6	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	

			Dimensio	nal Stability	1		
Specimen		Length (%)	3	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:	14.47M	0.1	Co. Costorio -	0.455.57	0.2	5	0.2
Maximum:	Maximum: -0.3 Minimum: 0.0		-0.3 0.0			0.3	
Minimum:						0.0	

Test:	Dimensi	ons			
Start Date:	2015.12	.4			
Finish Date:	2015.12	.4			
Job No:	150922002SHF-BP				
Sample:	200 kg/n	n3 rock wool			
Standards:	ASTM C726-12				
Procedure:	ASTM C	209			
Conditioning	23°C,50	1%R.H.			
Equipment It	em	ID	1		
ruler	100114-04	SH 1016			
gage		SH 2280			
		20 MIGLIOLO I ANN 98328-8			

Reviewer: Sally Xie

Eng/Tech: <u>Evyn Cui</u>

Snecimen	Length (mm)			M	/idth (m	mm) Depti			epth (r	th (mm)	
Speciment	L1	12	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

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 Cond	Juctivity Measuring Instrument	SH1194	1

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	Ĵ	Ű	W/(m·K)	(m²·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

WSB353-1A 18 May 2015

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 Cond	Juctivity Measuring Instrument	SH1194	1

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	Ľ	ĩ	W/(m·K)	(m²·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

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 Conc	luctivity Measuring Instrument	SH1194	1
101110100202000000000000000000000000000			

Specimen	Thickness	Mean temperature	Temperature diference	Thermal conductivity	Thermal resistance
	mm	Ľ	ĩC	W/(m·K)	(m²·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

Reviewer: Sally Xie

Eng/Tech: <u>Ev yn Cui</u>

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		
Drocoduro	ACTNA CODO		
Procedure.	ASTNICOUS		
Conditioning	: 23°C, 50%R.H.		
Conditioning E	23°C, 50%R.H.		ID
Conditioning Ei Ruler	23°C, 50%R.H. quipment Item	SH1016	ID
Conditioning El Ruler Depth guage	quipment Item	SH1016 SH2280	ID

Specin	nen	1	2	Mean
	L1	1206	2 1203 1202 1202 600 600 7 80.13 80.04 80.22 3 80.25 11 18	
Length (mm)	12	1205	1202	
	L3	1206	1202	1204
	W1	599	600	
Width (mm)	W2	600	600	
	W3	600	600	600
	D1	79.37	80.13	
Depth (mm)	D2	79.98	80.04	
Deptil (min)	D3	80.19	80.22	
	D4	80.23	1 2 1206 1203 1205 1202 1206 1202 599 600 600 600 600 600 79.37 80.13 79.98 80.04 80.19 80.22 80.23 80.25 11.23 11.18 194.2 193.3	80.1
Weight	(kg)	11.23	11.18	11.20
Density	(kg/m ³)	194.2	193.3	194

WSB353-9A 18 May 2015

		Spec	Digital	Equipr	Crosst	Conditu	Proced	Standa	Sample	Job No	Finish	Start D	Test	Intert
Cherry's		imen	Caliper	marhi	lead Sp	oning:	lure:	rds	10		Date:	ate:		ek
150.30	Ц	Le	ā	83	;paa(40 hours	ASTM C	ASTM 0	200 kg/r	1509220	2016.1.5	2016.1.5	Compre	
150.28	27	ngth (mr	SH	PH ~	ۍ 1	s at a terr	165	726-12	n3 rock v	02SHF-I			ssive Str	
150.40	ដ	n)	166	3		nperature			vool	BP			ength	
150.42	LAA	v	0.05	-972	mm/min	e of 23 ±								
150.52	VV2	vidth (mr				2°C and								
150.50	ENV.	n)				relative								
81.63	D1					humidity								
81.64	D2	Deptr				of 50 ± .								
81.36	D3) (mm)				10%				п			л	
81.60	D4									ng/Tech:			leviewer:	
2670	(N)	Load at 10% Deformation								Evy			Sall	
118.0	(kPa)	Compressive Strength								n Cui			уXie	
4056	(N)	Load at 25% Deformation												
	5.0	-												

			5	4	ω	2	-		Specimen
			150.27	150.35	150.31	150,47	150.30	L1	Le
			150.42	150.43	150.40	150.56	150.28	5	ength (m
			150.27	150.40	150.36	150.51	150.40	ខា	(m
			150.08	150.33	150.43	150,31	150.42	VV1	A
			150.32	150.38	150.33	150.27	150.52	W2	Vidth (mr
			150.13	150.34	150.40	150.30	150.50	SAA.	n)
			81.46	80.45	81.06	80.26	81.63	D1	
			81.66	80.80	80.96	80.24	81.64	D2	Deptr
			81.32	80.63	81.20	80,40	81.36	D3) (mm)
COV	StdDev:	Mean	80.94	80.92	81.20	80.12	81.60	D4	
11.1%	318	2868	2871	3410	2765	2623	2670	(N)	Load at 10% Deformation
11.1%	14.1	127	127.2	150.8	122.3	116.0	118.0	(kPa)	Compressive Strength
8.5%	355.5	4158	4134	4770	3940	3889	4056	(N)	Load at 25% Deformation
%9.8	15.7	184	183.1	211.0	174.2	171.9	179.3	(kPa)	Compressive Strength

WSB353-2A 18 May 2015

Test:	Tensile strength perpendicular to the surface
Start Date:	2016.1.12
Finish Date:	2016.1.18
Job No:	150922002SHF-BP
Sample:	200 kg/m3 rock wool
Standards:	ASTM C726-12
Procedure:	ASTM C209
Conditioning:	23°C, 50%R.H.
Crosshead Speed:	51 mm/min
Equipment Item	ID
Tensile machine	SH1047
Digital Caliper	Sh1009

Reviewer: Sally Xie

Eng/Tech: <u>Ev yn Cui</u>

Specimer	n Length (mm)	Width (mm)	Area (mm²)	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			83 - X33		27
Min.					23

WSB353-3A 18 May 2015

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 E
Conditioning:	23°C, 50%R.H.
Equipment Item	ID
Tensile machine	SH1047
Digital Calinar	SH1168

Reviewer: Sally Xie

Eng/Tech: Evyn Cui

Crosshead Speed: _____250 mm/min

Span: <u>254</u>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.	1	1	352	

WSB353-4A 18 May 2015

Reviewer:	Sally	(xie
	1.0	

Eng/Tech: <u>Evyn Cui</u>

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.		
E	quipment Item	IL)
Balance		SH1021	
		1943/11/2016/D/8/58	

Chaoiman								
Specimen	O 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

The second	Length	Width	Thickness	Volume
Specimen	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 _____h

	final weight	Volume of water	Water Abs.
Specimen	(g)	cm ³	(% 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

Test	Dimensional st	ability	Review	wer:	Sally Xie	
Start Date:	2016.1.19			V21813-04-64-5		
Target Date:	2016.1.26					
Job No:	150922002SHI	F-BP	Eng/T	Evyn Cui		
Sample:	200 kg/m3 rock	(wool				
Standards:	ASTM C726-12	2				
Procedure:	ASTM D2126					
Conditioning:						
Equipment Item		ID				
Environmental ch	amber	SH1148				
Digital Caliper		Sh1009				
Temperature:	<u>70</u> °C	R.H	<u>97</u> %	Days	7	
		Initial Meas	surement		2010	

Specimen		Length (mr	n)]	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	81.3	

<i>0</i> .	After Exposure										
Specimen		Length (mm)			Width (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				

			Dimension	al 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:	0.46 .4	0.1	01 - COSCAD	0.2			0.5
Maximum:	0.2			0.3			0.6
Minimum:		0.0		0.1			0.3

Test	Dimensional st	tability		Review	wert	Sally Xie	
Start Date:	2016.1.12				9076.365-691	a provide distance.	
Target Date:	2016.1.19						
Job No:	150922002SH	F-BP		Eng/T	ech:	Evyn Cui	
Sample:	200 kg/m3 roc	k wool					
Standards:	ASTM C726-11	2					
Procedure:	ASTM D2126						
Conditioning:							
Equipment Item		ID					
Oven		SH1046					
Digital Caliper		Sh1009					
Temperature:	<u>93</u> °C	R.H.	1	%	Days	7	
		Initial	Moseurom	ont			

			initia me	asurement			00000
Specimen		Length (mr	n)	0	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	5	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				

			Dimension	al 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:	0.00 .0	0.2	to esecuto	0.1			0.4
Maximum:		0.2			-0.2		-0.9
Minimum:		0.1		0.0			0.1

Test: Start Date:	Dimensio	nal stability			Reviev	ver:	SallyXie		
Target Date: Job No: Sample: Standards: Procedure: Conditioning:	2016.1.12 2016.1.19 15092200 200 kg/m ASTM C7 ASTM D2	2016.1.19 150922002SHF-BP 200 kg/m3 rock wool ASTM C726-12 ASTM D2126			Eng/Te	ech:	Evyn Cui		
Equipment Item	quipment Item ID								
Environmental cl Digital Caliper	Environmental chamber SH1148 Digital Caliper Sh1009		11148 1009						
Temperature:	40	<u>)</u> •C	R.H.	<u> </u>	_%	Days	7		
	322		Initial M	easuremen	t		(1993)		
Specimen		Length (m	m)]	Width (r	Thickness (mm			
1	304.5	304.5	5 3045 3040		304.5	5 304.5	81.0		

	001.0	001.0	001.0	001.0	001.0	001.0	0.1.0
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 E	xposure			
Specimen		Length (mr	n)		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
2	204.0	204.0	202.0	204.0	204.0	204.0	00.0

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:	Mean: 0.2		0.2		0.7		
Maximum: -0.3		-0.3		-0.3		0.8	
Minimum:	Minimum: 0.0		0.0			0.6	

9 Revision Page

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

END OF DOCUMENT