R&D Services

ACCREDITED
Testing Laboratory

Test Report

Quarterly Quality-Control Tests on ThermShield Loose-Fill (BA/AS) and ThermShield Stabilized (BA/AS) Cellulose Insulation Selected by R&D Services at the Erie Energy Facility on December 8, 2016

Prepared For:

Mr. Richard Koppelman
Erie Energy Products, Inc.
1400 Irwin Drive
Erie, PA 16505

R & D Services, Inc.
P.O. Box 2400
Cookeville, Tennessee 38502-2400

Report: RD17026

Stuart Ruis
President

January 13, 2017

R&D Services

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Fax: 931-525-3896

January 13, 2017

Mr. Richard Koppelman
Erie Energy Products, Inc.
1400 Irwin Drive
Erie, PA 16505

Dear Mr. Koppelman,

R & D Services randomly selected ThermShield Loose-Fill (BA/AS) and ThermShield Stabilized (BA/AS) cellulose insulation for quarterly, quality-control evaluation during the December 8, 2016 visit to the Erie Energy facility in Erie, PA. Single tests were run on the products at Erie Energy when the products were selected. R & D Services received the material on December 12, 2016. After receipt of the material at R & D the products were blown, conditioned and appropriate tests were performed. The test results are summarized in the following table.

QC Tests: (ThermShield Loose-Fill (BA/AS))	R & D Results	Erie Energy Results * Mfg 12-01-16
Density (PCF)	1.86	1.83
Critical radiant flux (electric)		0.20,0.20
Critical radiant flux (gas)	0.20	
Smoldering combustion (max %)	0.98	1.0
Corrosiveness (all metals)		
Moisture vapor sorption (%)		
Thermal resistivity	3.747 @ 1.89 PCF	
Fungi resistance		
Odor emission	Pass	
pH	7.35	7.28
QC Tests: (ThermShield Stabilized (BA/AS))	R & D Results	Erie Energy Results * Mfg 12-08-16
Density (PCF)	1.59	1.52
Critical radiant flux (electric)		0.11, 0.15
Critical radiant flux (gas)	0.15	
Smoldering combustion (max %)	1.25	1.0
Corrosiveness (all metals)		
Moisture vapor sorption (%)	12.78	
Thermal resistivity		
Fungi resistance		
Odor emission		
pH	6.34	6.71

*** Tests on unconditioned material.**

The ThermShield Loose-Fill (BA/AS) and ThermShield Stabilized (BA/AS) cellulose products meet the requirements of 16CFR Part 1209 and ASTM C739.

We appreciate your business,

Stuart Ruis

R&D Services

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Design Density Test Report

Test Number: RD170061DD

Date of Test: December 26, 2016

Specimen Number: 1562161212-115

Date of Manufacture: December 1, 2016

Description of Test Specimen: ThermShield Loose-Fill (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 °F and 50 +/- 5 % RH

Test Method: ASTM C 739-11, Section 8 "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

	Test 1	Test 2	Test 3	Test 4
Specimen Mass (g)	127.04	127.64	126.27	125.49
Container Area (m^2)	0.018385	0.018385	0.018385	0.018385
Specimen Depth (mm)	230	230	228	228
	231	232	230	229
	232	234	232	230
	231	232	230	229
Average Depth (mm)	231.00	232.00	230.00	229.00
Design Density (kg/m^3)	29.9133	29.9251	29.8613	29.8064
Design Density (lb/ft^3)	1.8672	1.8680	1.8640	1.8606

Average Design Density: 1.86 lb/ft^3

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Critical Radiant Flux (Gas) Test Report

Test Number: RD170062CR

Date of Test: December 27, 2016

Specimen Number: 1562161212-115

Date of Manufacture: December 1, 2016

Description of Test Specimen: ThermShield Loose-Fill (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 °F and 50 +/- 5 % RH

Test Method: ASTM C 739-11, Section 10, "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation" and ASTM E 970-14, "Test Method for Critical Radiant Flux of Exposed Attic Floor Using a Radiant Heat Energy Source".

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Density (lb/ft^3)	Length of Burn (cm)	Critical Radiant Flux (W/cm^2)	Pass / Fail
1.86	69.5	0.19	Pass
1.86	67.0	0.20	Pass
1.86	64.0	0.22	Pass

The average CRF is: 0.20 W/cm^2
The standard deviation is: 0.02
The coefficient of variation for repeatability is: 10.00 %

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Smoldering Combustion Test Report

Test Number: RD170063SC

Date of Test: January 9, 2017

Specimen Number: 1562161212-115

Date of Manufacture: December 1, 2016

Description of Test Specimen: ThermShield Loose-Fill (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 °F and 50 +/- 5% RH; Tested at 1.87 PCF

Test Method: ASTM C 739-11, Section 14, "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Initial Mass (grams)	Final Mass (grams)	% Loss	Pass / Fail
123.50	122.29	0.98	Pass
123.50	122.56	0.76	Pass
123.50	122.50	0.81	Pass

Average % Loss: 0.85

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Thermal Resistance Test Report

Test Number: RD170065TR

Date of Test: January 4 - 6, 2017

Specimen Number: 1562161212-115

Date of Manufacture: December 1, 2016

HFM File Number: 17-7165

Description of Test Specimen: ThermShield Loose-Fill (BA/AS) Cellulose Insulation

Test Method: ASTM C 518-15, "Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Sample Conditioning: Minimum 24 hours at 70 ± 3 °F and 50 ± 5 %RH

The results in this report were obtained with a heat-flow meter built and operated in accordance with ASTM C 518-15.

Heat Flow Meter	24 by 24	inch by inch
Specimen Thickness (as received)	n/a	inch
Tested Specimen Thickness	4.000	inch
Specimen density	1.89	lb/ft^3
Cold plate temperature	55.04	°F
Hot plate temperature	95.04	°F
Average specimen temperature	75.04	°F
Apparent thermal conductivity	0.2669	$Btu \cdot in./ft^2 \cdot hr \cdot °F$
Thermal resistivity (R-per-inch)	3.747	$ft^2 \cdot hr \cdot °F/Btu \cdot in.$
Thermal resistance of specimen	15.0	$ft^2 \cdot hr \cdot °F/Btu$

Notes:

Calibration factor used for manual calculation:	NA
Heat Flow Direction:	Up
Edge guards or cabinet temperature satisfactory:	Yes
Excessive moisture on cold plate:	No
Length of time for test (hours):	44.7

The precision of this test is estimated to be 2.5 % (Section 10.8, ASTM C 518-15)

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*Abridged ASTM C518 Test Report.

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Odor Emission Test Report

Test Number: RD170064OE

Date of Test: January 9, 2017

Specimen Number: 1562161212-115

Date of Manufacture: December 1, 2016

Description of Test Specimen: ThermShield Loose-Fill (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 ºF and 50 +/- 5 % RH

Test Method: ASTM C 739-11, Section 13, "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Judge	1	2	3	4	5
Odor (Yes/No)	Yes	Yes	Yes	Yes	Yes
Odor (Objectionable/Pleasant/ Neutral)	Neutral	Neutral	Neutral	Neutral	Neutral
Odor (Weak/Strong)	Weak	Weak	Weak	Weak	Weak

Pass / Fail: Pass

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pH Test Report

Test Number: RD170060PH

Date of Test: January 6, 2017

Specimen Number: 1562161212-115

Date of Manufacture: December 1, 2016

Description of Test Specimen: ThermShield Loose-Fill (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6°F and 50 +/- 5% RH

Test Method: ASTM D778, "Test Methods for Hydrogen Ion Concentration (pH) of Paper Extracts (Hot-Extraction and Cold-Extraction Procedure)."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

pH= 7.35

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Design Density Test Report

Test Number: RD170068DD

Date of Test: December 26, 2016

Specimen Number: 1562161212-116

Date of Manufacture: December 8, 2016

Description of Test Specimen: ThermShield Stabilized (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 °F and 50 +/- 5 % RH

Test Method: ASTM C 739-11, Section 8 "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

	Test 1	Test 2	Test 3	Test 4
Specimen Mass (g)	104.49	104.12	105.25	105.46
Container Area (m^2)	0.018385	0.018385	0.018385	0.018385
Specimen Depth (mm)	220	221	223	225
	223	223	225	227
	226	225	227	229
	223	223	225	227
Average Depth (mm)	223.00	223.00	225.00	227.00
Design Density (kg/m^3)	25.4863	25.3960	25.4434	25.2696
Design Density (lb/ft^3)	1.5909	1.5853	1.5882	1.5774

Average Design Density: 1.59 lb/ft^3

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Critical Radiant Flux (Gas) Test Report

Test Number: RD170067CR

Date of Test: December 27, 2016

Specimen Number: 1562161212-116

Date of Manufacture: December 8, 2016

Description of Test Specimen: ThermShield Stabilized (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 °F and 50 +/- 5 % RH

Test Method: ASTM C 739-11, Section 10, "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation" and ASTM E 970-14, "Test Method for Critical Radiant Flux of Exposed Attic Floor Using a Radiant Heat Energy Source".

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Density (lb/ft^3)	Length of Burn (cm)	Critical Radiant Flux (W/cm^2)	Pass / Fail
1.57	74.0	0.16	Pass
1.57	83.0	0.12	Pass
1.57	73.0	0.17	Pass

The average CRF is: 0.15 W/cm^2
The standard deviation is: 0.03
The coefficient of variation for repeatability is: 20.00 %

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Smoldering Combustion Test Report

Test Number: RD170069SC

Date of Test: January 9, 2017

Specimen Number: 1562161212-116

Date of Manufacture: December 8, 2016

Description of Test Specimen: ThermShield Stabilized (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6 °F and 50 +/- 5% RH; Tested at 1.59 PCF

Test Method: ASTM C 739-11, Section 14, "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Initial Mass (grams)	Final Mass (grams)	% Loss	Pass / Fail
104.99	103.68	1.25	Pass
104.99	104.03	0.91	Pass
104.99	103.97	0.97	Pass

Average % Loss: 1.04

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Moisture Vapor Sorption Test Report

Test Number: RD170070MS

Date of Test: January 2 – 5, 2017

Specimen Number: 1562161212-116

Date of Manufacture: December 8, 2016

Description of Test Specimen: ThermShield Stabilized (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6°F and 50 +/- 5% RH; Tested 1.59 PCF.

Test Method: ASTM C 739-11, Section 12, "Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

Initial Mass (grams)	Final Mass (grams)	% Gain	Pass / Fail
267.6	301.8	12.78	Pass

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pH Test Report

Test Number: RD170066PH

Date of Test: January 6, 2017

Specimen Number: 1562161212-116

Date of Manufacture: December 8, 2016

Description of Test Specimen: ThermShield Stabilized (BA/AS) Cellulose Insulation; Blown Using a Krendl Machine and Conditioned for > 72 hours at 69.8 +/- 3.6°F and 50 +/- 5% RH

Test Method: ASTM D778, "Test Methods for Hydrogen Ion Concentration (pH) of Paper Extracts (Hot-Extraction and Cold-Extraction Procedure)."

Report Prepared For: Erie Energy Products, Inc. / Mr. Richard Koppelman

pH= 6.34

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