LOW-E

LOW-E HOUSEWRAP

Reduces your carbon footprint.

Low-E Housewrap™ Data and Test Documents

LOW-E HOUSEWRAP
Reduces your carbon footprint.

Table Of Contents

This manual is designed to provide you test data and general information regarding Low-E Housewrap™ A common misconception of reflective insulation is that one standard R-Value is applicable for every application. The following System R-Values you could achieve, are based on test data obtained under controlled conditions, computer calculations by H.F. Poppendiek (GEO Science), Dr. David Yarbrough (Tennessee Technical University), and the ASHRAE Handbook of Fundamentals, using FTC guidelines.

The system R-values in this booklet were calculated using tested results from ASTM C-236 or ASTM C-976 test methods and calculations from the ASHRAE Handbook of Fundamentals, as well as computer calculations. To properly apply the data in this manual to your specific application, we suggest you consult an engineer or architect.

While this information is presented in good faith and believed to be accurate, Environmentally Safe Products, Inc. and its distributors have no control over installation design, installation workmanship, accessories, materials or condition of application.

Environmentally Safe Products, Inc. does not guarantee results from reliance upon such information and disclaims any liability from any loss or damage arising from its uses.

LOW-E HOUSEWRAP
Reduces your carbon footprint.

Testing Overview and Results

R-Value	System R-Value Calculation	R & D Services	R - 4.54 (nom 1/4") R-4.08 (nom 1/8")
Emittance	ASTM C1371	R & D Services	0.03
Emittance	Wet Dry Cycle Evaluation	R & D Services	Unchanged
Vapor Permeance Performance	ASTM E 96-00	ATI	4.65 perms 34.3 g/day m^2
Water Resistance	ASTM D 779-03	SGS	9 hours
Air Infiltration	ASTM 283-99	ATI	15 mph .73 cfm 25 mph 1.1 cfm 50 mph 2.64 cfm
Corrosivity	ASTM D 3310	R & D Services	Exposed Sample Same As Control
Fungi Resistance	ASTM C 1338	R & D Services	5 Fungal Species Passed
Surface Burning Characteristics	ASTM E84-97a	SGS	Flame Spread 0 Smoke Dev 14

Low-E Housewrap™ has been tested in accordance with either the ASTM E-84 Surface Burning Characteristics for Building Materials. Always consult your local building codes and officials before installing Low-E Housewrap™. If there are any questions concerning the building application or concerning which product to use in your specific application, call 800-289-5693 and our representatives will be happy to assist you in choosing the correct product for your building.

MANUFACTURER'S WARNING: Low-E Housewrap™ is intended for use on exterior wall under primary barrier.

ASTM standard test method for surface burning characteristics of building materials:
This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled laboratory conditions. Low-E Housewrap™ is tested within the strict standard of this test method. This test method is not necessarily representative of the manner in which the Low-E Housewrap™ is installed in a typical field installation. The numerical ratings on all Low-E Housewrap™ products or any other materials are not intended to reflect hazards under actual fire conditions.

Warning: Aluminum is an Electrical Conductor. Please use caution when working around electrical sources including overhead power lines.

NOTE: Rolls of insulation shall be packaged in a polyethylene wrapping. Insulation shall be stored in a protected area. Do not allow insulation to come in contact with fresh concrete at any time. Any tears or punctures in the foil shall be repaired with aluminum tape. All seams that require taping must be taped with aluminum tape.

R&D Services

Thermal Evaluation of ESP Wall design

The thermal resistance of a wall design proposed by Environmentally Safe Products (ESP) has been calculated using readily available information. The calculations are based on physical property data published in the ASHRAE Handbook of Fundamentals[1] and a computational procedure published in ASTM STP 1116.[2] The components of the ESP wall are shown below with the corresponding R-values. The bounding temperatures for the calculation were 75^0F inside air temperature and 45^0F outside air temperature. Wood framing that is 16-In OC was assumed.

Wall Component	R-value (ft^2-h^0F/Btu)	Source
Outside air-film resistance	0.17	Ref 1
Vinyl siding	0.10	Estimated
0.375-inch reflective air space	2.03	Ref 2
Low-e reflective insulation (nominal 1/4 in.)	.090	Manufacturer
7/16-in. OSB (Aspen)	.066	Measured
Inside air-film resistance	.068	Ref 1

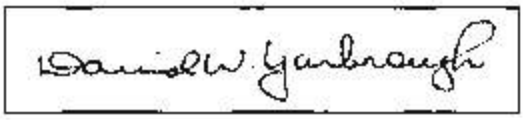
Calculated Thermal Performance of ESP Wall Design

Air-to-Air R-value for horizontal heat flow through cavity	4.54	$ft^2 \cdot h \cdot {}^0F/Btu$

References

[1] 2005 ASHRAE Handbook of Fundamentals, Chapter 25. "Thermal and Water Vapor Transmission Data"

[2] Andre O. Desjarlais and David W. Yarbrough, "Prediction of the Thermal Performance os Single and Multi-Airspace Reflective Insulation Materials", ASTM STP 1116 (1991) pp.24 - 43.



David W. Yarbrough, PhD, PE
December 19, 2007

1B

R&D Services

Thermal Evaluation of ESP Wall design

The thermal resistance of a wall design proposed by Environmentally Safe Products (ESP) has been calculated using readily available information. The calculations are based on physical property data published in the ASHRAE Handbook of Fundamentals[1] and a computational procedure published in ASTM STP 1116.[2] The components of the ESP wall are shown below with the corresponding R-values. The bounding temperatures for the calculation were 75^0F inside air temperature and 45^0F outside air temperature. Wood framing that is 16-In OC was assumed.

Wall Component	R-value (ft^2-h^0F/Btu)	Source
Outside air-film resistance	0.17	Ref 1
Vinyl siding	0.10	Estimated
0.375-inch reflective air space	2.02	Ref 2
Low-e reflective insulation (nominal 1/8 in.)	0.45	Manufacturer
7/16-in. OSB (Aspen)	0.66	Measured
Inside air-film resistance	0.68	Ref 1

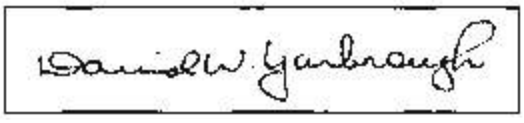
Calculated Thermal Performance of ESP Wall Design

Air-to-Air R-value for horizontal heat flow through cavity	4.08	$ft^2 \cdot h \cdot {}^0F/Btu$

References

[1] 2005 ASHRAE Handbook of Fundamentals, Chapter 25. "Thermal and Water Vapor Transmission Data"

[2] Andre O. Desjarlais and David W. Yarbrough, "Prediction of the Thermal Performance os Single and Multi-Airspace Reflective Insulation Materials", ASTM STP 1116 (1991) pp.24 - 43



David W. Yarbrough, PhD, PE
December 19, 2007

1A

R&D Services

Thermal Evaluation of ESP Wall design

The thermal resistance of a wall design proposed by Environmentally Safe Products (ESP) has been calculated using readily available information. The calculations are based on physical property data published in the ASHRAE Handbook of Fundamentals[1] and a computational procedure published in ASTM STP 1116.[2] The components of the ESP wall are shown below with the corresponding R-values. The bounding temperatures for the calculation were 75^0F inside air temperature and 45^0F outside air temperature.

Wall Component	R-value (ft^2-h^0F/Btu)	Source
Outside air-film resistance	0.17	Ref 1
Vinyl siding	0.10	Estimated
0.375-inch reflective air space	2.07, 2.07, 2.07	Ref 2
Low-e reflective insulation (nominal 1/8 in.)	0.90	Manufacturer
Nominal ½ in. OSB (aspen)	0.66	Measured
Fiberglass batt	11.00, 13.00, 15.00	Manufacturer
1/2-inch gypsum	0.45	Ref 1
Inside air-film resistance	0.68	Ref 1

The R-values listed above were used to calculate the total R-value and U-value shown below. The framing factor (wood fraction) based on nominal 16-inch on-center construction was taken to be 0.136 for the U-value calculation

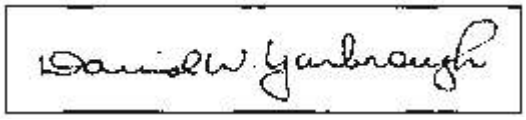
Thermal Performance of ESP Wall Design

Fiberglass batt	R 11	R 13	R15	
Air-to-Air R-value through the cavity	16.0	18.0	20.0	$ft^2 \cdot h \cdot ^0F/Btu$
Surface-to-surface R-value through the cavity	15.2	17.2	19.2	$ft^2 \cdot h \cdot ^0F/Btu$
U-value for clear wall (includes framing)	0.079	0.073	0.068	$Btu/ft^2 \cdot h \cdot ^0F$

References

[1] 2005 ASHRAE Handbook of Fundamentals, Chapter 25. "Thermal and Water Vapor Transmission Data"

[2] Andre O. Desjarlais and David W. Yarbrough, "Prediction of the Thermal Performance os Single and Multi-Airspace Reflective Insulation Materials", ASTM STP 1116 (1991) pp.24 - 43



David W. Yarbrough, PhD, PE
December 19, 2007

Technical Report

Thermal Evaluation of ESP Wall Assemblies

Prepared For:

Mr. Scott Miller
Environmentally Safe Products
313 West Golden Lane
New Oxford, PA 17350

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

Report: RD07169

Reviewed by: David W. Yarbrough
David W. Yarbrough, PhD, PE
President

February 26, 2007

R&D Services

Thermal Evaluation of ESP Wall Design with Two Reflective Air Spaces

The thermal resistance of a wall design proposed by Environmentally Safe Products (ESP) has been calculated using readily available information. The calculations are based on physical property data published in the ASHRAE Handbook of Fundamentals[1] and a computational procedure published in ASTM STP 1116.[2] The components of the ESP wall are shown below with the corresponding R-values. The bounding temperatures for the calculation were 75°F inside air temperature and 45°F outside air temperature.

Wall Component	R-value ($ft^2 \cdot h \cdot °F/Btu$)	Source
Outside air-film resistance	0.17	Ref 1
Vinyl siding	0.10	Estimated
0.30-inch reflective air space	1.67, 1.67, 1.68	Ref 2
Low-e reflective insulation	0.90	Manufacturer
½-inch OSB	0.62	Estimated
Fiberglass batt	11.00, 13.00, 15.00	Manufacturer
Low-e reflective insulation	0.90	Manufacturer
0.75-inch reflective air space	3.56, 3.57, 3.60	Ref 2
½-inch gypsum	0.45	Ref 1
Inside air-film resistance	0.68	Ref 1

The R-values listed above were used to calculate the total R-values and U-value shown below. The framing factor (wood fraction) based on nominal 16-inch on-center construction was taken to be 0.136 for the U-value calculation.

Thermal Performance of ESP Wall Design

Fiberglass batt	R 11	R 13	R 15	
Air-to-air R-value through the cavity	20.1	22.1	24.1	$ft^2 \cdot h \cdot °F/Btu$
Surface-to-surface R-value through the cavity	19.2	21.2	23.3	$ft^2 \cdot h \cdot °F/Btu$
U-value for clear wall (includes framing)	0.057	0.054	0.050	$Btu/ft^2 \cdot h \cdot °F$

References

1 2005 ASHRAE Handbook of Fundamentals, Chapter 25, "Thermal and Water Vapor Transmission Data"

2 Andre O. Desjarlais and David W. Yarbrough, "Prediction of the Thermal Performance of Single and Multi-Airspace Reflective Insulation Materials", ASTM STP 1116 (1991) pp. 24 -43.

David W. Yarbrough, PhD, PE
February 25, 2007

R&D Services

Test Report

Emittance Tests on an Unidentified Sample Received From Environmentally Safe Products on February 27, 2001

Prepared For:

Mr. David Wildasin
Environmentally Safe Products
313 West Golden Lane
New Oxford, PA 17350

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

Report: RD01131

Reviewed by: Ronald S. Graves
Ronald S. Graves
Vice President

February 28, 2001

R&D Services

P.O. Box 2400
Cookeville, Tennessee 38502-2400
Phone: 931-372-8871
Fax: 931-525-3896

Report of Foil Emittance Measurements

IR emittance measurements have been completed for a sample supplied to R & D Services, Inc. by Environmentally Safe Products, 313 West Golden Lane, New Oxford, PA 17350 . One side of the specimen was identified for test purposes. The measurements were made in accordance with ASTM C 1371 using a Model AE emissometer manufactured by Devices and Services Company of Dallas, Texas. The emissometer was calibrated prior to use and calibration was verified at the end of testing. The final reported emittance in each case is the average of three measurements

Material: Unidentified

R & D Indent.	Individual Tests	Average Emittance
1102010227-1	0.03, 0.03, 0.03	0.03

Ronald S. Graves/Vice President
February 28, 2001

Environmentally Safe Products
313 West Golden Lane
New Oxford, PA 17350
Attn: Mr. Cory Groft

July 10,2002

Dear Mr. Groft,

This letter is a follow-on to previous discussions about the thermal resistance of reflective insulations and radiant barriers. Both of these products rely on highly reflective material usually aluminum foil or coating to provide reduced heat flow or R-value. Aluminum foil generally has a reflectance in the range 0.95 to 0.97 (95% to 97%). The corresponding emittance values are 0.05 to 0.03. The sum of the reflectance and the emittance of a material is one. A laboratory instrument is commonly used to measure emittance. The reflectance is then calculated from the preceding relationship.

The emittance is a measure of the efficiency of a surface is giving off heat. A low emittance surface like 0.03 (or 3%) does not give off or radiant very much heat even when it is hot. The reflectance is a measure of the incoming heat that is reflected with 0.97 meaning 97% of the incoming energy is reflected. The terms are complementary.

We recently measured at your request the emittance of the aluminum foil used in your manufacturing process. The foil was then covered with water and allowed to dry. This wetting/drying process was repeated three times with the emittance measured after the third cycle of wetting and drying. The change in emittance due to the three wetting/drying steps was much less than the experimental uncertainly of the measurement. There was not a significant change in the emittance or the reflectance.

Reflective insulations rely on high reflectance and low emittance for their thermal performance. The wetting/drying cycles described above didn't change the reflectance or emittance. The thermal performance of an assemble subjected to such wetting/drying cycles will remain unchanged.

Sincerely,

David W. Yarbrough

David W. Yarbrough, PhD, PE

R&D Services, Inc.

P.O. Box 2403
Cookeville, Tennessee
38502-2400

931-372-8871
931-525-3806 FAX

e-mail: rdserv@usit.net
http://www.rdservices.com

Architectural Testing

VAPOR PERMEANCE PERFORMANCE TEST REPORT

Rendered to:

ENVIRONMENTALLY SAFE PRODUCTS, INC.

PRODUCT: E4H00

Report No:	**01-47417.02**
Report Date:	**11/12/03**
Expiration Date:	**10/22/07**

130 Derry Court
York, PA 17402-9405
phone: 717.764.7700
fax: 717.764.4129
www.archtest.com

Architectural Testing

VAPOR PERMEANCE PERFORMANCE TEST REPORT

Rendered to:

ENVIRONMENTALLY SAFE PRODUCTS, INC.
313 West Golden Lane
New Oxford, Pennsylvania 17350

Report No: 01-47417.02
Test Dates: 10/14/03
Through: 10/22/03
Report Date: 11/12/03
Expiration Date: 10/22/07

Product: E4H00

Project Summary: Architectural Testing, Inc. (ATI) was contracted by Environmentally Safe Product, Inc. to perform Vapor Permeance on the above product. Testing was conducted in accordance with ASTM E 96-00, *Standard Test Method for Water Vapor Transmission of Materials*. Environmentally Safe Products, Inc. provided a 17" x 11" x 3/16" nominal size sheet of the product with perforations every 1-1/4". The permeance of the product was 4.65 perms or 34.3 g/(day·m^2).

Product Description: The material evaluated is described as perforated aluminum skin on closed cell cellular foam measuring approximately 17" long x 11" wide x 3/16" thick.

Test Methods: The test specimen was evaluated with the aluminum surface up (away from the high humidity condition). Test samples were fabricated in accordance with ASTM E 96-00, *Standard Test Method for Water Vapor Transmission of Materials*. Four circular specimens with a nominal size of 2-1/2" in diameter were prepared so that one perforation was centered in each specimen. The samples were then secured over an aluminum test dish with a nominal quantity of water inside. Each sample was numbered and an initial weight measurement taken. The test samples were placed in a Lunaire environmental type test chamber at 23 and 16°C (73°F and 48%RH) and weighed repeatedly over a period of six days. Each weight measurement was taken using a Mettler Toledo Analytical Balance to an accuracy of 0.0001 grams.

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fax: 717.764.4129
www.archtest.com

Test Results: The results are reported in the following table.

Raw Data

Data Point No.	Dry Bulb Temp. (°C)	Wet Bulb Temp. (°C)	Barometric Pressure (in. Hg 60°C)	Weight (0.0001 g)			
				Sample #1	Sample #2	Sample #3	Dummy Sample
Initial Reading	**23.1**	**16.2**	**29.55**	**147.4812**	**148.6189**	**149.3515**	**140.1828**
1	22.9	15.9	29.35	147.4663	148.5991	149.3352	140.1807
2	23.1	16.1	29.88	147.4367	148.5721	149.3160	140.1783
3	23.2	16.1	29.94	147.4029	148.5432	149.2968	140.1782
4	23.3	16.2	30.06	147.2716	148.4544	149.2368	140.1778
5	23.2	16.0	29.47	147.2233	148.4279	149.1958	140.1790
6	23.2	15.8	29.41	147.1584	148.3738	149.0999	140.1788
Average:	**23.2**	**16.0**	**29.68**	**N/A**	**N/A**	**N/A**	**N/A**

Calculated Results

Based on the formulae in ASTM E96, the raw data resulted in a product vapor permeance value of 4.65 perms. This equates to a water vapor transmission rate of 1.43 g/(hr·m^2) or 34.3 g/(day·m^2).

A copy of this report will be retained by ATI for a period of four years. This report is the exclusive property of the client so named herein and is applicable to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without the approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC.:

Digitally Signed by: Ambleton Wray

Ambleton G. Wray, Jr.
Technician I - Component/Materials Testing

Digitally Signed by: Todd D. Burroughs

Todd D. Burroughs
Director - Component/Materials Testing

AGW:agw/nlb
01-47417.02

Attachment
Photographs

DOCUMENT CONTROL ADDENDUM #01-47417.00

Current Issue Date: 11/12/03

Report No.: 01-47417.01

Requested by: Tom Wright, Environmentally Safe Products, Inc.
Purpose: To evaluate E4H00 in compliance with ASTM E 96-00.
Issued Date: 10/31/03
Comments:

Report No.: 01-47417.02

Requested by: Tom Wright, Environmentally Safe Products, Inc.
Purpose: Revise report 01-47417.01 to include alternate units in results.
Issued Date: 11/12/03
Comments:

Photo No. 1
Samples and Fixtures

Photo No. 2
Balance Readout

SGS

ENVIRONMENTAL SAFE PRODUCTS INC.
313 W. Golden Lane
New Oxford, PA 17350

Attn: Tom Miller

TEST REPORT No: 177:007594 **Date: 5 October 2007**

SAMPLE DESCRIPTION: One (1) lot of Foiled Foam 8" x 8", NOI.

DATE OF RECEIPT: 26 September 2007.

TEST PERIOD: 3-4 October 2007.

TEST(S) REQUESTED: The material was tested for Water Resistance by Dry Indicator Method in accordance with ASTM D 779-03.

TEST RESULTS: See Page 2.

PREPARED BY:

DIMITAR DIMOV, PH. D.
PROJECT ENGINEER

SIGNED FOR THE COMPANY BY:

JASON SHERRIER, CPLP
LAB MANAGER, PACKAGING&ENVIRONMENTAL

d

SGS U.S. Testing Company Inc | Consumer Testing Services 291 Fairfield Avenue, Fairfield, NJ 07004 t (973) 575-5252 f (973) 575-7175 www.sgs.com

RESULTS OF TESTS

Test: **WATER RESISTANCE**

Side Facing Water:	Foil		Foam	
	Time			
Event:	First Wet Spot	50% Water Coverage	First Wet Spot	50% Water Coverage
	4 h.	> 24 h.	2 h.	4 h.
	7 h.	> 24 h.	4 h.	22 h.
	10 h.	> 24 h.	5 h.	22 h.
	12 h.	> 24 h.	7 h.	> 24 h.
	12 h.	> 24 h.	7 h.	> 24 h.
Avg.	**9 h.**	**> 24 h.**	**5 h.**	**> 19 h.**

Comment:

Test Method D779 covers the determination of the time required for water to pass through the specimen of paper, paperboard or other Sheet materials. Provided material is Foil/Foam "sandwich" preliminary perforated – 3/32 in. holes approximately, 1-1/4 in. apart throughout the samples. Application of ASTM D 779 test method may not be appropriate due to nature of the material – the water hardly passing through the plain material but it is relatively easy to pass through the perforated holes. This is only the capillary effect allowing the water to wet the opposite side.

We trust the results and our comments will prove useful and informative. Should you have any questions, please feel free to contact us.

****

End of Report

Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

ENVIRONMENTALLY SAFE PRODUCTS, INC.

SERIES/MODEL: E4H00-SS
PRODUCT TYPE: Air Barrier Product

Report No.:	**53734.01-122-44**
Test Date:	**10/21/04**
Report Date:	**01/18/05**
Expiration Date:	**10/21/08**

130 Derry Court
York, PA 17402-9405
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9048

Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

ENVIRONMENTALLY SAFE PRODUCTS, INC.
313 West Golden Lane
New Oxford, Pennsylvania 17350

Report No.:	53734.01-122-44
Test Date:	10/21/04
Report Date:	01/18/05
Expiration Date:	10/21/08

Project Summary: Architectural Testing, Inc. (ATI) was contracted by Environmentally Safe Products, Inc. to perform testing on a Series/Model E4H00-SS, air barrier product. Test specimen description and results are reported herein.

Test Method: The test specimen was evaluated in general accordance with ASTM E 283-99, *Test Method for Determining Rate of Airflow Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.* The method for performing the test was followed, because the air barrier product is not covered under the test method.

Test Specimen Description:

Series/Model: E4H00-SS

Product Type: Air Barrier Product

Overall Wall Panel Size: 4' 0" wide by 8' 0" high

Punched Opening Size: 2' 0" wide by 2' 0" high

Overall Tested Area: 28 ft^2

Product Description: The air barrier product is an aluminum skinned sheet of polyethylene foam. The overall thickness is 3/16". Small perforations were punched into the product.

Panel Construction: The wall panel was constructed from 2x4 wood members with studs spaced 16" on center. A 24" wide by 24" high window opening was utilized in the middle of the panel. The wall panel was then sheathed with 1/2" plywood and utilized one vertical butt joint.

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www.archtest.com

Test Specimen Description: (Continued)

Installation: The air barrier was laid over the wall panel and stapled to the sheathing. At the window opening, the air barrier was cut such that 1/2" of the material was sticking into the opening. The window was then installed into the opening and secured with screws.

Test Results:

General Note: *The air tests were performed without the window leakage included. The window was in place, but sealed as such that no air could pass through it. However, the window installation perimeter was included in the tests.*

Test Method	Title of Test	Results
Test #1: Wall panel without air barrier and sealant under the nailing flange.		
ASTM E 283	Air Infiltration	
	0.56 psf (15 mph)	1.03 cfm
	1.57 psf (25 mph)	1.47 cfm
	6.24 psf (50 mph)	3.05 cfm
Test #2: Wall panel without air barrier and with sealant under the nailing flange.		
ASTM E 283	Air Infiltration	
	0.56 psf (15 mph)	0.91 cfm
	1.57 psf (25 mph)	1.35 cfm
	6.24 psf (50 mph)	2.92 cfm
Test #3: Wall panel with air barrier and without sealant under the nailing flange.		
ASTM E 283	Air Infiltration	
	0.56 psf (15 mph)	0.73 cfm
	1.57 psf (25 mph)	1.10 cfm
	6.24 psf (50 mph)	2.64 cfm
Test #4: Wall panel with air barrier and with sealant under the nailing flange.		
ASTM E 283	Air Infiltration	
	0.56 psf (15 mph)	0.78 cfm
	1.57 psf (25 mph)	1.16 cfm
	6.24 psf (50 mph)	2.55 cfm

Representative samples of the test specimen, and a copy of this report will be retained by ATI for a period of four years from the original test date. This report is the exclusive property of the client so named herein and is applicable to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC:

Digitally Signed by: Adam A. Fodor

Adam Fodor
Supervisor - Product Testing

Digitally Signed by: Steven M. Urich

Steven M. Urich, P.E.
Senior Project Engineer

AF:jld

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	01/18/05	N/A	Original report issue

R&D Services

P.O. Box 2400
Cookeville, Tennessee 38502-2400
Phone: 931-372-8871
Fax: 931-525-3896

Client: Environmentally Safe Products
313 West Golden Lane
New Oxford, PA 17350

Date : September 21, 2001

Specimen: 1102010214-1

Notification Number: RDS01015

Project: Determination of Corrosivity of ESP Reflective Insulation

Test Protocol: ASTM D3310 - "Standard Test Method for Determining of Corrosivity of Adhesive Materials."

Procedure

Samples of the material, one embedded in adhesive and one without adhesive, were placed in a screw cap jar with an inert cap liner. The caps were tightened and the jars placed in a forced draft circulating oven at 71 ± 2°C. These samples were used as controls. A second set of samples, one embedded in adhesive and one without adhesive, were placed in a similar jar each with a small open jar half filled with distilled water. The second jars were also tightly closed and placed in the oven. The samples were removed and examined after intervals of 1, 3, and 7 days in the oven.

Results

	With Glue	Without Glue
1 day	2	2
3 days	2	2
7 days	2	2

There was no evidence of pitting or cracking in either sample after the exposure to high temperature and high humidity. The portion of the sample embedded in adhesive showed no evidence of corrosion.

Rating Scale

1 -Exposed sample less tarnished than control
2 -Exposed sample same as control
3 -Exposed sample slightly worse than control
4 -Exposed sample significantly worse than control
5 -Exposed sample badly corroded

Daniel W Galbraith 5/21/02

Ronald S Snyder

Reviewed By:

05-16-02

Date:

TEST REPORT FOR FUNGI RESISTANCE

Radiant Barrier reflective insulation supplied by R&D Services, Inc. (Environmentally Safe Products 1102010214-1) has been tested for resistance to the growth of fungi in accordance with ASTM C1338. Specimens of the insulation were inoculated with the test fungi listed below and maintained at 30 +/- 2° C and 95 +/- 5% relative humidity for an incubation period of 28 days. At the end of the 28 day incubation period, the insulation and comparative material were examined at 40x magnification. The insulation being tested passes if at least two of the test specimens exposed to particular fungus exhibit growth that is no greater than that exhibited by the comparative material. Since this is a qualitative test, no statement is made concerning any precision or bias in the result.

Comparative Material: Untreated Southern Yellow Pine

Fungal Species	ATCC#	Test Results (pass/fail)
1. *Aspergillus niger*	9642	pass
2. *Aspergillus flavus*	9643	pass
3. *Aspergillus versicolor*	11730	pass
4. *Penicillium funiculosum*	11797	pass
5. *Chaetomium globosum*	6205	pass

Comments: none

S. K. Ballal, Ph.D

July 30, 200

D. W. Yarbrough, Ph.D. P.E.

R&D Services, Inc.

P.O. Box 2400
Cookeville, Tennessee
38502-2400

931-372-8871
931-525-3896 FAX

e-mail: rdserv@usit.net
http://www.rdservices.com

REPORT OF TEST

SGS U.S. Testing Company Inc.

291 Fairfield Avenue
Fairfield, NJ 07004
Tel: 201-575-5252
Fax: 201-575-8271

REPORT NUMBER: 111190-2
DATE: July 16, 1998

CLIENT: Environmentally Safe Products, Inc.
313 W. Golden Lane
New Oxford, PA 17350
Attn: Tom Darber

SUBJECT: Surface Burning Characteristics of Building Materials

AUTHORIZATION: Client's purchase order number ESP1372 dated June 30, 1998.

SAMPLE ID: One (1) sample was submitted on July 01, 1998 and identified by the Client as: "3/16" Foil/Foam Laminate".

TEST PROCEDURE: The submitted sample was tested for Flammability in accordance with the procedures outlined in ASTM E-84-97a.

TEST DATE: July 07, 1998

PREPARED BY:

Arthur D. Fiorino, Technician
Fire Technology

SIGNED FOR THE COMPANY BY:

Hiten Pandya, Manager
Fire Technology

CLIENT: Environmentally Safe Products

REPORT OF TEST

TEST PROCEDURE AND RESULTS

INTRODUCTION:

This report presents test results of Flame Spread and Smoke Developed Values per ASTM E-84-97a. The report also includes Material Identification, Method of Preparation, Mounting and Conditioning of the specimens.

The tests were performed in accordance with the specifications set forth in ASTM E-84-97a, Standard Test Method for Surface Burning Characteristics of Building Materials", both as to equipment and test procedure. This test procedure is similar to UL-723, ANSI No. 2.5, NFPA No. 255 and UBC 42-1.

The test results cover two parameters: Flame Spread and Smoke Developed Values during a 10-minute fire exposure. Inorganic cement board and red oak flooring are used as comparative standards and their responses are assigned arbitrary values of 0 and 100, respectively.

PREPARATION AND CONDITIONING:

One 24" wide x 24 feet long sample was laid on a 2-inch galvanized hexagonal wire mesh supported by steel rods spanning the width of the tunnel such that the foam side would be exposed to the flame. The sample was conditioned at 73° ± 5° Fahrenheit and 50 ± 5% relative humidity.

TEST PROCEDURE:

The tunnel was thoroughly pre-heated by burning natural gas. When the brick temperature, sensed by a floor thermocouple, had reached the prescribed 105° Fahrenheit ± 5° Fahrenheit level, the sample was inserted in the tunnel and test conducted in accordance with the standard ASTM E-84-97a procedures.

The operation of the tunnel was checked by performing a 10-minute test with inorganic board on the day of the test.

REPORT OF TEST

CLIENT: Environmentally Safe Products

TEST RESULTS:

The test results, calculated in accordance with ASTM E-84-97a for Flame Spread and Smoke Developed Values are as follows:

Test Specimen	**3/16" Foil/ Foam Laminate. Foam Side Exposed to flame.**
Flame Spread Index*	0
Smoke Developed Value*	14

*Graphs of the Flame Spread, Smoke Developed and Time-Temperature are shown on the attached charts at the end of this report.

OBSERVATIONS:

Ignition was noted at 45 seconds. Some peeling and flaking was evident. The flamefront did not advance more than one feet over the 10 minute test duration.

RATING:

The National Fire Protection Association Life Safety Code 101, Section 6-5.3, "Interior Wall and Ceiling Finish Classification", has a means of classifying materials with respect to Flame Spread and Smoke Developed when tested in accordance with NFPA 255, "Method of Test of Surface Burning Characteristics of Building Materials", (ASTM E-84).

The classifications are as follows:

Class A Interior Wall & Ceiling Finish	Flame Spread - 0-25 Smoke Developed - 0-450
Class B Interior Wall & Ceiling Finish	Flame Spread - 26-75 Smoke Developed - 0-450
Class C Interior Wall & Ceiling Finish	Flame Spread - 76-200 Smoke Developed - 0-450

Since the sample received a Flame Spread of 0 and a Smoke Developed Value of 14, it would fall into the Class A Interior Wall & Ceiling Finish Category.

****

End of Report

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June 4, 2004

Premium Vinyl Siding, Soffit and Accessories

Premium Vinyl & Aluminum Railing and Fencing Systems

Aluminum Siding, Soffit and Trim Coil Systems

Window, Skylights and Patio Door Systems

Simulated Slate Roofing Tiles

Decorative Shutters, Mounts and Vents

Mr. Tom Wright
ESP, Inc.
313 West Golden Lane
New Oxford, PA 17350

Reference: E4H00-SS Low-E House-Wrap

Dear Mr. Wright

This letter will confirm that E4H00-SS Low-E House Wrap insulation is an acceptable product to be used in conjunction with the installation of Amcraft's vinyl siding products.

The installation of the E4H00-SS must be according to manufacturer's recommended installation procedures.

Sincerely,

Scott Windsor
Amcraft Building Products, Inc.
Product Manager

Amcraft Building Products Co., Inc.
1195 Prince Hall Drive, Suite B
Beloit, WI 53511

Toll-Free 877-AMCRAFT
Fax: 608 362 3682
www.amcraft.com

AMCRAFT BUILDING PRODUCTS CO., INC.

Bringing Home Quality for Generations

Vinyl Building Products Group

CertainTeed

CertainTeed Corporation
Consumer Service Center
873-2 North Hickory
McPherson, KS 67460
800-999-3654

April 22, 1997

Monetta Hoyer
Spec Building Materials
2850 Roe Lane
Kansas City, KS 66003

Reference: Insulation Boards

Dear Ms Hoyer:

The following is to confirm that L40-WO 1/4” ESP Rap insulation is an acceptable product to be used in conjunction with the installation of CertainTeed' s vinyl siding products.

The installation of the 1/4” ESP Rap should be according to manufacturer's recommended installation procedures.

Sincerely,

Larry Weibert

Larry Weibert, Manager
Consumer Services

LW/dl

Doc# 1002

Alcoa Building Products

Exclusive Brands

ALCOA Mastic

October 8, 1999

Ms. Joanna Dauber
Environmentally Safe Products
313 West Golden
New Oxford, PA 17350

Dear Ms. Dauber:

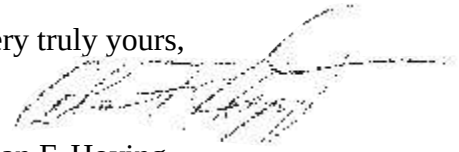
RE: UNDERLAYMENTS

Your concern with regard to the installation of our vinyl siding over various substrates is appreciated. Our vinyi siding products are installed over various wraps and coverings, such as black felt paper, tyvek, foil faced products, breather foil, exterior grade plywood, particle board and wood shake as long as the wall is covered and leveled. When installing vinyl siding directly over wood sheathing, please use proper flashing techniques to alleviate any moisture concerns.

We make no specification as to which backer to use. The choice is up to you, the builder or local building code official. Any of the above mentioned backers are acceptable and will not void the warranty of our products.

Upon review, should you have any questions or need any additional information, please cal! me at (800) 962-3563.

Very truly yours,



Alan F. Hoying
Technical Services Manager

afh

California Bureau of Home Furnishings Registry Listing

Product: ALUMINUM FOIL SYSTEM | Manufacturer or Private Label: ENVIRONMENTALLY SAFE PRODUCTS, INC. | Reg. No. CA-T281(PA) |

BRAND CODE*	PRODUCT ID	MATERIAL	TYPE	PRIMARY USE	DESIGNED FOR EXPOSED APPPLICA-TIONS?	ACTS AS VAPOR BARRIER?	LABELED THERMAL PERFORM-ANCE HEAT FLOW UP	LABELED THERMAL PERFORM-ANCE HEAT FLOW DOWN	LABELED THERMAL PERFORM-ANCE HEAT FLOW LEVEL
ESP	CLASS A WHITE 4EFWT (3)	FOIL/ PE FOAM/ FOIL	COMPOSITE	CLG WALL FLR	YES	YES	7.60	11.74	8.58 R
ESP	ECONO-E 4EFET (4, 2)	FOIL/ PE FOAM/ FOIL	COMPOSITE	CLG WALL FLR	YES	YES	7.55	11.00	7.75 R
ESP	LOW-E HVAC 4EFED (1, 5)	FOIL/ PE FOAM/ FOIL	COMPOSITE	DUCT WRAP	YES	YES			6.41 R
ESP	LOW-E 4LFLT (1, 2)	FOIL/ PE FOAM/ FOIL	COMPOSITE	CLG WALL FLR	YES	YES	7.55	11.00	7.75 R
ESP	THERMA-SHEET HSEWRP (6)	FOIL/ PE FOAM/ FOIL	COMPOSITE	WALL	NO	NO			6.00 R
ESP	VAPOR PLUS 4VFVS (3, 6)	FOIL/ PE FOAM/ FOIL	COMPOSITE	CLG WALL FLR	YES	YES	1.00	1.00	1.00 R
ESP	SLAB-SHIELD 4SFST (6)	PE FOAM/ FOIL/ PE FOAM	COMPOSITE	FLR	NO	YES			1.40 R

(1) = AVAILABLE in 4', 5', 6' widths
(2) = AVAILABLE with staple flange edges or EZ Seal edge
(3) = AVAILABLE with staple flange edges only
(4) = AVAILABLE in 4', 6' widths
(5) = R-value achieved with 1/2” spacer around duct
(6) = AVAILABLE in 4" widths only

* DESCRIPTION OF BRAND CODES
ESP = ENVIRONMENTALLY SAFE PRODUCTS

Low-E Housewrap™

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Low-E Housewrap™ Material.

1. Marketed by Environmentally Safe Products, Inc ; 313 West Golden Lane, New Oxford, PA 17350. Tel: (800) 289-5693 or (717) 624-3581. Fax: (717) 624-7089.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. ASTM C 236 or ASTM C 976 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box (Core Material Test).
B. Calculated R-Value for Representing Low-E HouseWrap[tm]
C. ASTM E 84-97a - Standard Test Method for Surface Burning Characteristics of Building Materials.
D. ASTM E 96-00 Test Methods for Water Vapor Transmission of Materials.
E. ASTM E 1371 - Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
F. ASTM D 779-03 – Water Resistance performance test report.
G. ASTM D 3310 – Corrosivity Test of Surface Materials
H. ASTM C 1338 - Fungal Resistance of Surface Materials
I. ASTM 283-99 - Air Indiltration Permeance Test report

1.4 DEFINITIONS

A. Low-E Housewrap™ System (LEHS):

B. Low-E Housewrap™material is concealed in system by subsequent building finishes; additionally, LEHS incorporates air spaces between the reflective surfaces and building facings.

1.5 SUBMITTALS

A. Manufacturer's descriptive literature for Low-E Housewrap™ material; indicate compliance to specified product characteristics, including documentation of code compliance, if documentation is required.

B. Quality Assurance Submittals: Manufacturer's printed installation instructions for each indicated project condition; include recommended fastening materials and techniques.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation; maintain storage conditions recommended by manufacturer. Store in clean, dry area. Do not expose to rain, dew, or snow while still in roll form. Do Not allow roll goods to come contact with uncured concrete

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Provide Low-E Housewrap™ system (LEHS) in the following locations:

1. Under vinyl / aluminum siding, encapsulated.

2.3 MATERIALS

A. Low-E House-Wrap^{tm} : one layer of closed cell polyethylene foam, laminated to one layer of aluminum foil; perforated fungi-resistant, with the following characteristics:

1. Marketed by Environmentally Safe Products, Inc ; 313 West Golden Lane, New Oxford, PA 17350. Tel: (800) 289-5693 or (717) 624-3581. Fax: (717) 624-7089.
   a. Substitutions: Not permitted
   b. Requests for substitutions will be considered in accordance with provisions set forth by manufacturer.
2. Thickness: Nominal 0.185 inch (5 mm).
3. Weight: .044 pounds per sq. foot (214.85 grams per sq. meter).
4. Surface Burning Characteristics: Flame spread index of 10, maximum; smoke developed index of 10, maximum; when tested in accord with ASTM E 84-98 (NFPA Class A / UBC Class 1).
5. Linear Shrinkage: None.
6. R-Value: 4 (0 .704 square meters Kelvin per watt); when calculated in accordance with ASTM C 976.
7. U-Value: 0.25 (1.42 watts per square meter Kelvin)

8. Emittance: 0.03 to 0.04, when tested in accordance with ASTM C 1371.
9. Reflectivity: 0.96 - 0.97.
10. Degradation: 0.
11. Perm Rating: 4.65 perm (34.3 Grams/(day-m2)based on single sided housewrap, when tested in accordance with ASTM E 96.
12. Fungi Resistance: pass when tested in accordance with ASTM C 1338
13. Roll width: Nominal 4 feet (1.22m) X 125 feet (38.1m)
14. Roll width: Nominal 5 feet (1.52 m) X 100 feet (30.48 m).
15. Approvals: Provide product approved by the following:
    a. Amcraft Building Products Co. Inc.
    b. Alcoa Building Products.
    c. CertainTeed Corporation.
    d. California Bureau of Home Furnishings and Thermal Insulation # CA T281 (PA)
    e. Mark materials to indicate compliance in accordance with requirements of regulating authority before delivery of materials to project site:

C. Fasteners: Type and size recommended by manufacturer for project conditions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Ensure that electrical wiring adjacent to Low-E Housewrap™ material installations is in good condition.

3.2 PREPARATION

A. Turn off electricity in each area of Low-E Housewrap™ material installation until installation in that area is complete.

3.3 INSTALLATION

A. Install Low-E House-Wrap^{tm} insulation material in accordance with drawing details and manufacturer's installation instructions.

B Maintain minimum 3 inches (76 mm) distance from heat-producing devices such as furnaces, chimneys, blowers, and lighting fixtures.

C. Maintain minimum 3/4 inch (19 mm) air space each side of Low-E Housewrap™ material.

END OF SECTION

LOW-E HOUSEWRAP
Reduces your carbon footprint.

Thermal Imaging Test House Project

Summary of Findings

Part 1
Summer Heat Gain

The houses featured in this report are located side by side in Springfield, IL. On the day that the pictures were taken the observed high for the day was 91°F and both houses had their thermostats set at 70°F. The houses are within 100 square feet total size of each other.

All inside pictures will be marked with three temperatures; cavity, stud, and truss (when applicable).

Outside pictures are marked to show low, high, and average temperatures over a total surface area.

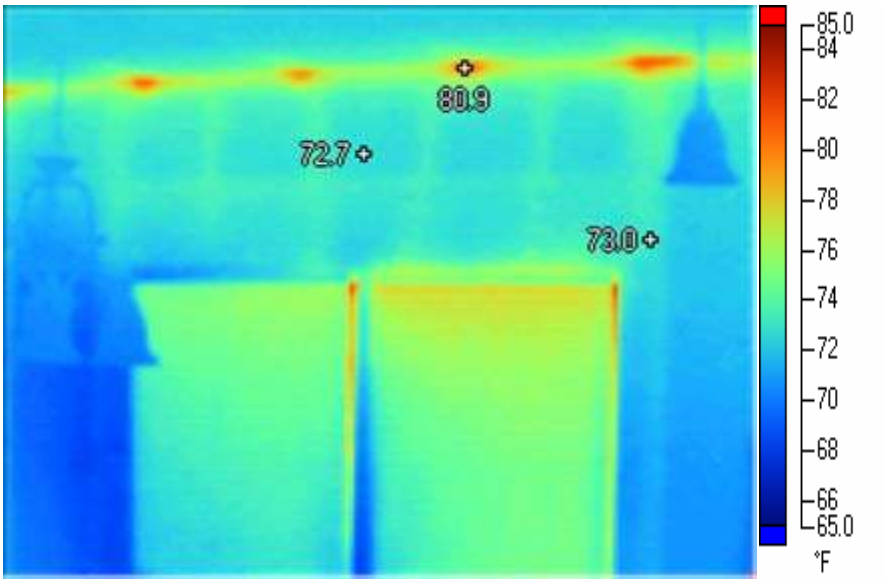
Inside Pictures: The walls of the Low-E protected house are 6°-8°F cooler that the non Low-E house. Over the period of a cooling season this difference would result in less load being placed on the cooling unit and significant energy savings for the home owner.

Control: The North facings walls represent the control in this study. These walls see little direct radiant heat and their temperatures are nearly the same.

Outside Pictures: The walls of the Low-E protected house show high temperatures of 117°-119°F and average temperatures of 114°-115°F. The walls of the non Low-E house show high temperatures of 114°-118°F and average temperatures of 111°-114°F. These pictures re-enforce that Low-E Housewrap does not significantly raise temperatures behind vinyl siding.

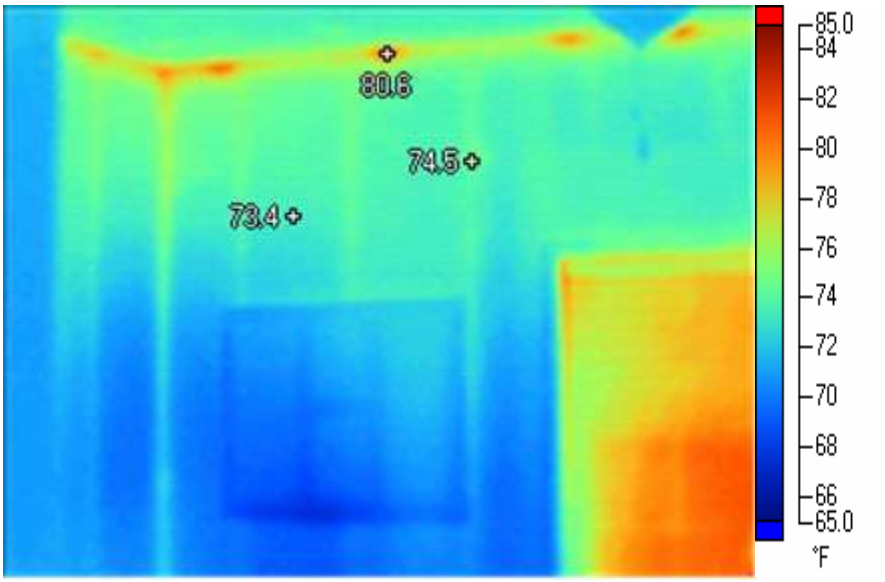
Low-E House

The Low-E House has Low-E Insulation in the attic and it is wrapped with Low-E Housewrap.

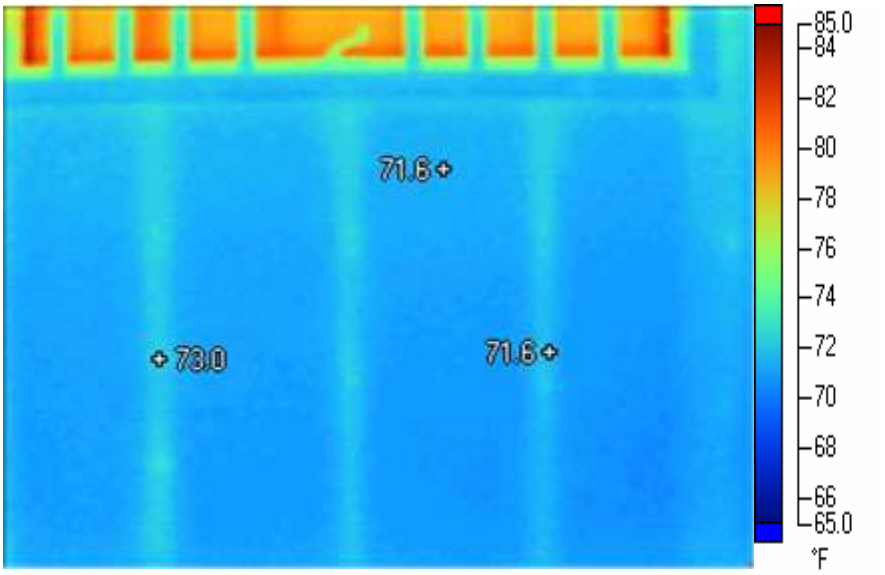


Low-E House Facing North 8/2/2007 4:13:39 PM

This study is meant to provide comparison data in an actual building system. It is not intended to be used in lieu of testing. The images shown demonstrate how Low-E Housewrap™ performs in reducing summer heat gain. These images are one part of a continuing study. Further information/images will be released as they become available.



Low-E House Facing Southwest 8/2/2007 4:16:35 PM



Low-E House Facing South 8/2/2007 4:17:22 PM

With the thermostat set at 70°F the average wall cavity temperature for the South and Southwest walls was 72.5°F a difference of 2.5°F.

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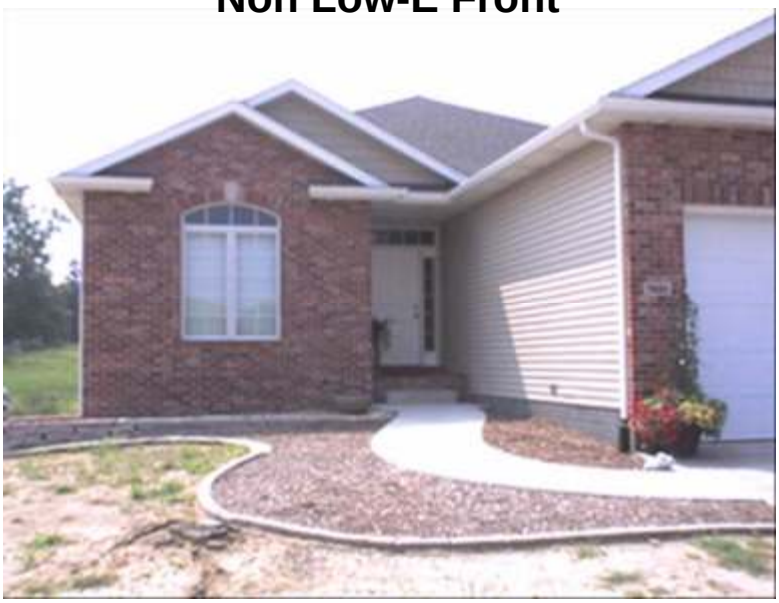
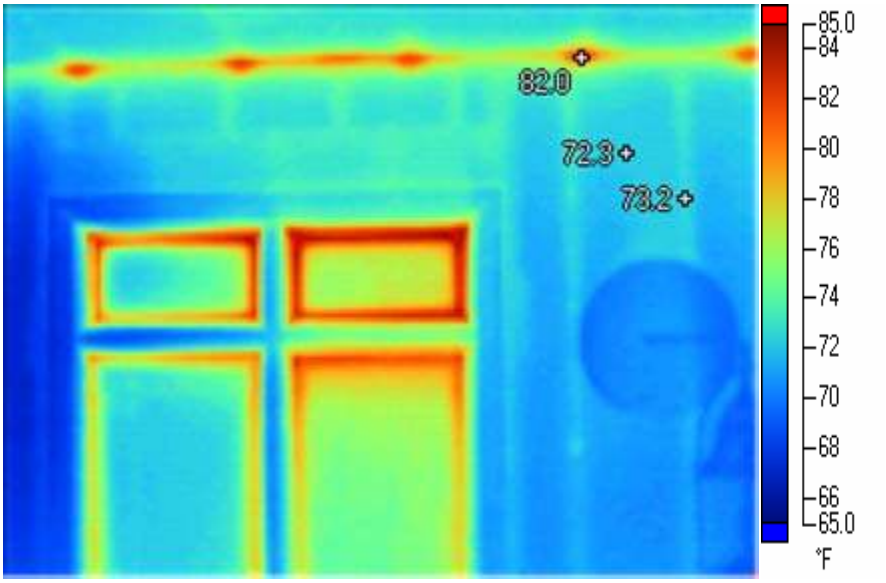
Non Low-E Front



The Non Low-E House is located immediately to the left of the Low-E House.



Non Low-E House Facing North 8/2/2007 4:22:06 PM

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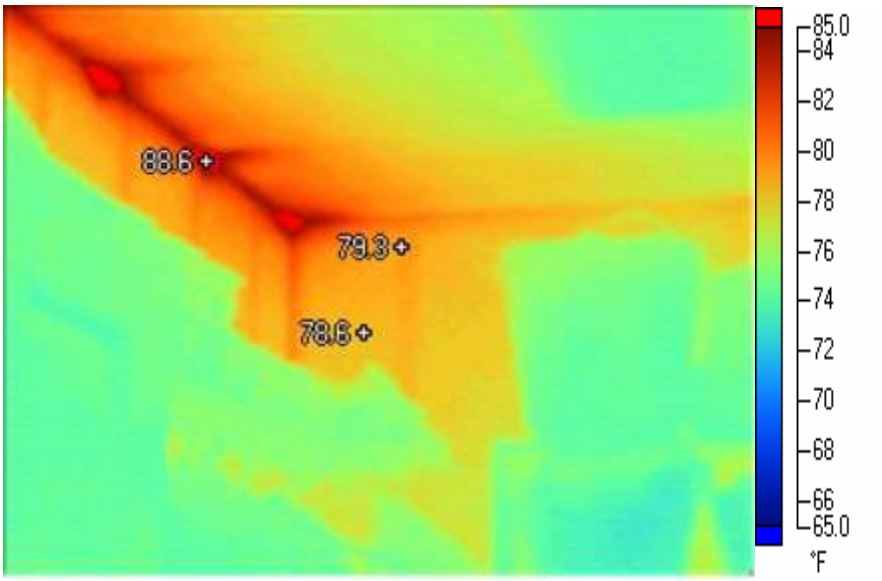
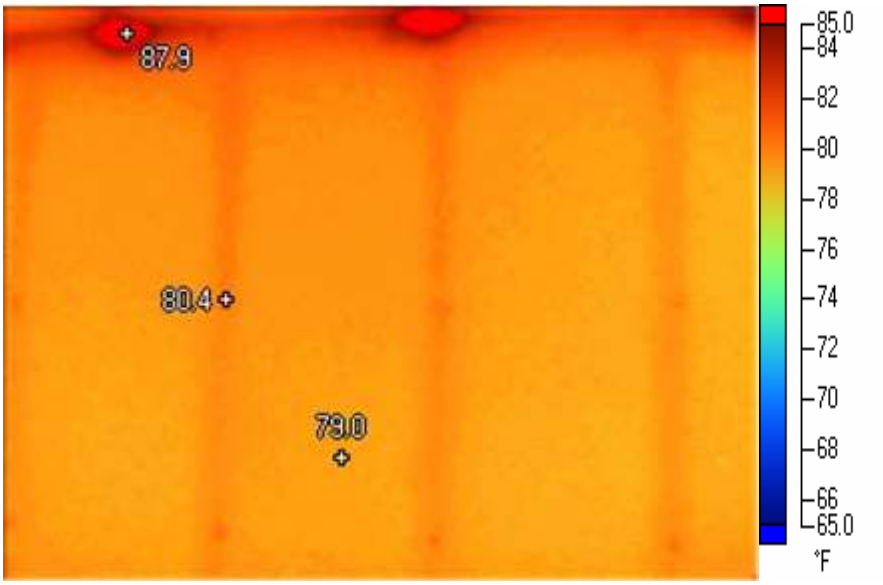


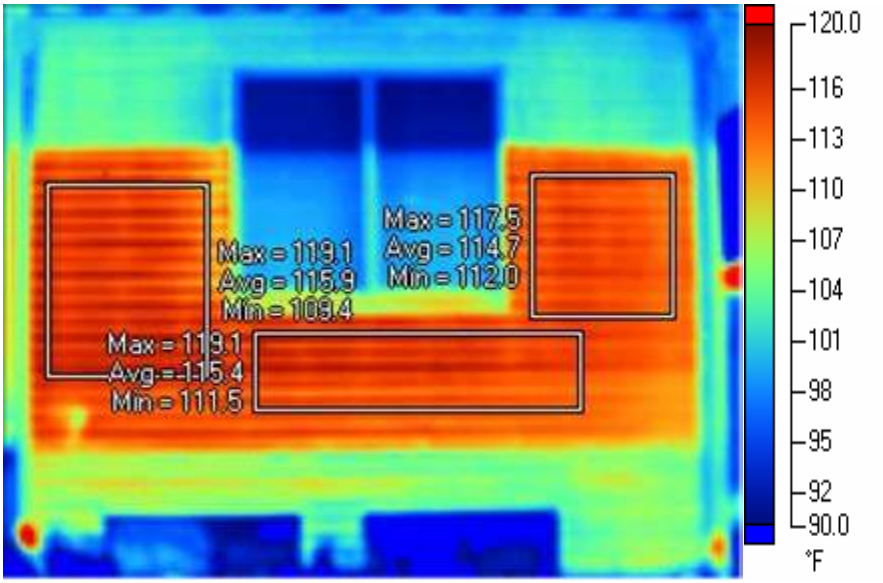
Non Low-E House Facing Southwest 8/2/2007 4:25:10 PM



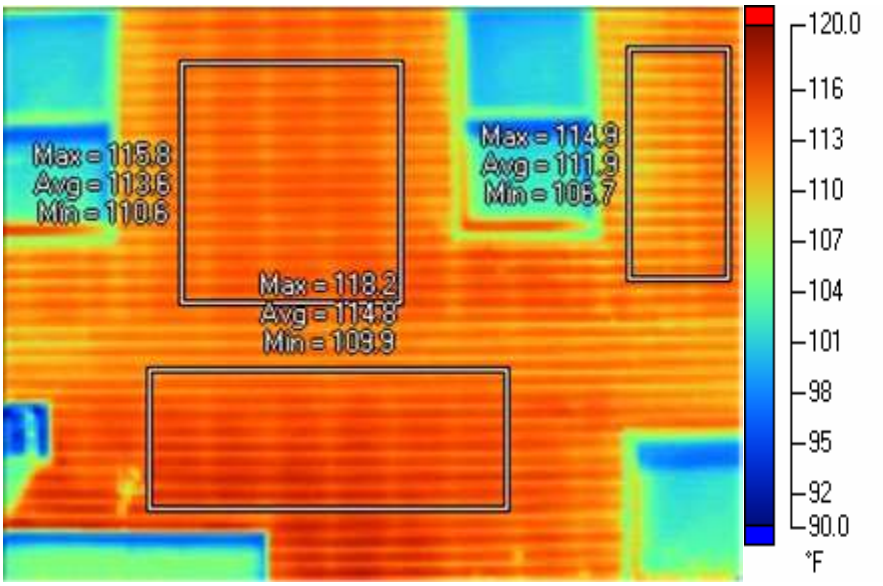
Non Low-E House Facing South 8/2/2007 4:27:42 PM

With the thermostat set at 70°F the average wall cavity temperature for the South and Southwest walls was 78.8°F a difference of 8.8°F.

This study is meant to provide comparison data in an actual building system. It is not intended to be used in lieu of testing. The images shown demonstrate how Low-E Housewrap™ performs in reducing summer heat gain. These images are one part of a continuing study. Further information/images will be released as they become available.



Low-E House West Wall 8/2/2007 3:57:49 PM



Non Low-E House West Wall 8/2/2007 4:02:26 PM

The temperature of the vinyl siding, between the house with the Low-E Housewrap and the house without, does not show a significant difference.

This study is meant to provide comparison data in an actual building system. It is not intended to be used in lieu of testing. The images shown demonstrate how Low-E Housewrap™ performs in reducing summer heat gain. These images are one part of a continuing study. Further information/images will be released as they become available.