INTERNATIONAL
Insulation Products, LLC

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Suite 108
Orlando, FL 32809
O: 678.646.1251

June 4, 2020

W. Justin Vogel
Chief Legal Counsel
Florida Building Commission, Office of Codes & Standards
Department of Business and Professional Regulation
2601 Blair Stone Road
Tallahassee, FL 32399-2202

Dear Mr. Vogel:

I am writing to submit a formal written complaint against The International Association of Plumbing and Mechanical Officials (IAMPO) in their capacity as an Florida approved product evaluation company, and Fi Foil Company, Inc. to be considered by the Product Approval Program Oversight Committee, and the Florida Building Commission. It is my assertion, as an affected party in this matter, that these two companies are in violation of rules in sections 61G20-3.013 and 61G20-3.014 of the Florida Administrative Code.

Included herein you will find substantial evidence and data that illustrates the fraudulent actions of these two companies.

I look forward to your response and am available to answer any questions you may have.

Sincerely,

Dermot Ennis
President

Cc: Mr. Mo Madani

In 2015, International Insulation Products entered the Florida market and decided to develop a masonry wall insulation product. As development took place, we studied the Florida Building Code and reviewed existing products marketing and data sheets to determine criteria for insulation products in Florida.

Upon reviewing one competitor's data sheets and evaluation reports it came to our attention that there were several inconsistencies related to the Florida Building Code.

WITHDRAWN THERMAL TEST – ASTM C236

The first issue we noticed was Fi Foil listed thermal test ASTM C236 for their AA2 data sheets revised 11/2014 (Exhibit 1).

This test had been withdrawn by ASTM in 2005 and The Federal Trade Commission followed suit and passed their 2005 FTC 16 CFR Part 460 Labeling and Advertising of Home Insulation: Trade Regulation Rule. See (Exhibit 2) Final Rule

The Florida Building Code clearly states in Section R303 Material, Systems and Equipment Section R303.1.1Building thermal building envelope insulation R303.1.1.1 Insulation product rating. (Exhibit 3). The product must follow the FTC rule.

IAMPO UES 0291: Changes to language of report to achieve R- Value without substantiating data

The IAMPO UES 0291 evaluation report has been continuously revised with language as to how their R-Value is achieved with no substantiating data to back it up. It has been revised in 2015, 2018, 2019 and now again in 2020.

(Exhibit 4) IAMPO UES evaluation report 0291 Originally issued 05/03/2013 Revised 05/29/2015 Valid Through 05/31/2016.

In 2015, the report was revised to read:

4.0 Design and Installation
4.1.1 AA2 Vapor Shield at 3/4 inch(19.1 mm) thick nominal 1 inch (25.4mm)x 2 inch (50.8) furring strips 16 inches (406 mm) on center for the non-perforated type yielded an R-Value of 4.2 hr ft2 F/Btu and the perorated type yielded an R value of 4.1 hr ft2 F/Btu at a mean temperature of 75F (24C when tested in accordance with ASTM 1363

This section is very important as IAMPO changes its stance on how this 4.1 r value was achieved in later revised evaluation reports. (This same language is repeated in the corresponding statements for R values of various products for perforated types of AA2 in larger air spaces and for VR Plus Shield.)

In 2017 I was informed that ICC Evaluation Service LLC had started a lawsuit against IAMPO for copyright infringement for willful and unauthorizing copying ICC-ES copyrighted works. (Exhibit 5)

This is interesting because every IAMPO O291 evaluation report state in Section 1.2 "Evaluated in accordance with ICC -ES AC 02 Acceptance Criteria for Reflective Insulation, approved June 11, editorially revised March 2017."

In Section 6 SUBSTANTIATING DATA.
"6.2 Data in accordance with ICC-ES Acceptance Criteria for reflective Insulation (AC02) approved June 2011 editorially revised March 2017."

This was published while a lawsuit had been started relating to these actions. As both these areas are vitally important to the validity of information in this report and shows disregard for the lawsuit and complaint.

The ICC Evaluation Service clearly states on their Acceptance Criteria For Reflective Insulation AC 02, copyright 2011, "*that acceptance criteria are developed for use solely by ICC-ES for the purposes of issuing ICC-ES evaluation reports*". (Exhibit 6)

On April 9th 2018 I contacted IAMPO via email questioning a very significant change in language to IAMPO Evaluation Report 0291 (Exhibit 7).

I did not receive a response from IAMPO regarding my letter or concerns even though I followed their complaint instructions. Finally, over a year later July 8th 2019, I received an email from IAMPO (Exhibit 8)

The email stated that the report was revised to address my concerns and "accepted this action as resolution of the issues raised. Therefore, complaint is closed."

What this did, was allow Fi FOIL to use the IAMPO 0291 Revised 04/05/2018 (Exhibit 9) which was revised two days after FiFoil was denied use in a home by building code official in Deland, Florida because the code official agreed the product and the report was not valid because it did not list 24 OC testing and insulation alone to achieve the stated R values.

On May 30th 2019, IAMPO UES revised the Fi Foil Evaluation Report 0291 (Exhibit 10) once again. In Section 4 Design and Installation, the language again was modified and now separated the non-perforated type and the perforated type.

What is significant about this language is it goes back to an ICC ES Legacy report 2133A for Fi Foil from back in 2003. It also again totally changes the thermal testing area of the report. In past reports, IAMPO has listed both the perforated type and non-perforated types as having achieved R values by ASTM tests or standards. Now with this report they write the non-perforated types were tested using valid ASTM tests which are approved by the Florida Building Commission but now they are stating that the perforated product R value was now *calculated*.

Is IAMPO reviewing testing and is Fi Foil retesting each year?

Why is this section always changing as is relates to how R values are achieved?

These language changes are very suspect and seem to be written just to address issues or complaints without any substantiating data to address these changes.

Due to this latest change I brought my findings to both the Attorney General's office and to the Department of Business and Professional Regulation (DBPR). After investigating my findings on April 7th, 2020 I was informed by Mr. Mo Madani of DBPR that IAMPO had canceled the Fi Foil evaluation report 0291. Mr. Madani also said I should call Mr. Richard Beck at IAMPO which I did. Mr. Beck stated that IAMPO had suspended the report 0291 four months earlier. This would have coincided with the time frame the Florida AG had contacted them and he did confirm this. I asked if it was suspended, why was it still listed on their website, I was not given an answer. Mr. Beck then told me that after the DBPR inquiry he confirmed what Mr. Madani had told me, that they were in fact canceling the FiFoil report 0291 for lack of testing data. Later that day I wrote Richard a letter (Exhibit 11).

On April 9th IAMPO did issue a cancelation notice on Fi Foil report 0291 (Exhibit 12)

On April 26th I emailed a letter to several county building code officials informing them of the cancelation of the Fi Foil report 0291. (Exhibit 13)

On April 28th IAMPO sent an email to Fi Foil which they in turn distributed to numerous people stating that the report was inadvertently canceled even though both myself and Mr. Madani had spoken to Mr. Beck from IAMPO and he confirmed that it was canceled because of lack of test data.

I immediately went to the IAMPO website and the cancelation notice was removed and when you typed in 0291 in IAMPO UES directory you get this message "No data available in table" (Exhibit 14).

I then contacted Richard Beck again but never received a call back relating to the change in stance, even though he also told me the report had been suspended four months earlier and had been listed as cancelled on their website and then subsequently removed.

The IAMPO website has a FAQ section which states "How do I know a report is still valid? Answer: All current reports are displayed on the IAMPO Uniform ES online director" IMAPO does not even follow its own set of rules. (Exhibit 15)

The last six set of documents are for you review to determine Fi Foil has been using current testing.

Exhibit 16 and 17 are ICC ES Legacy Reports from 2003 and an SBCCI report for FiFoil.

These are significant because they were issued before the FTC changed the testing criteria from ASTM C 236 to ASTMC1363. You will notice the R values and language are the same as the R values attained using ASTM C 236 are identical to the R values on the IAMPO reports where they claim they tests were conducted using ASTM C1363 and the language in some cases is the same.

This is significant because thermal results achieved when using ASTM C1363 are significantly lower than when using ASTM C236. (Exhibits 18 and 19)

(Exhibit 20) is a spreadsheet put together to compare the Fi Foil Thermal Performance Evaluation History

(Exhibit 21) Is an independent test on Fi Foils AA2 product. This test followed ASTM C1224 standard for reflective insulation in accordance with FBC and used the C1363 test method. The results we in line with previous data that states thermal results achieved when using C1363 are significant different then when using C236

(Exhibit 22) As of 6/4/20 IAMPO has no valid evaluation report for UES 0291

Exhibit 1

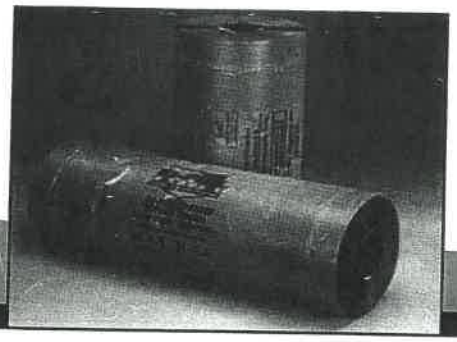


EXHIBIT 1

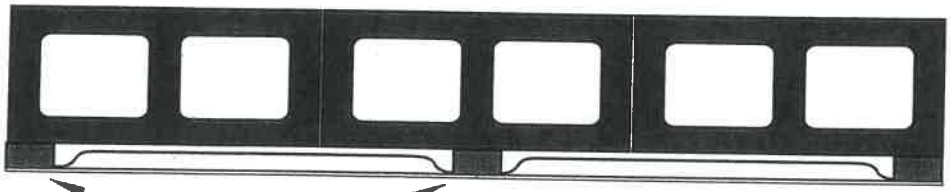
1

AA2 Shield

Reflective Insulation

Specification Sheet

Fi-Foil AA2 Vapor Shield™ is a reflective insulation intended for use on furred-out masonry walls. The inside layer is aluminum foil. The outer layer is natural Kraft paper coated with polyethylene, laminated to flange boards or expanders that separate paper from foil creating a reflective air space. When installed on furring strips spaced 16" or 24" on center, a second reflective air space is formed. This air space is dependent upon the thickness of the furring strip selected. The Hi-Perm version includes small perforations for applications not requiring a vapor retarder. Available in both staple tab (for wood furring) and tape tab (for metal framing).



Product Information

Furring/Stud	16" O.C.	24" O.C.
Width Expanded	17.5"	25.5"
Diameter	10"	8"
Lineal Footage	375'	250'
Coverage	500 sq. ft.	500 sq. ft.
Weight	21 lbs.	19 lbs.

Definition of Reflective Insulation

Reflective insulation is used to reduce the transport of energy across air spaces in a building envelope and consists of one or more low emittance surfaces (0.10 or less), bounding one or more enclosed air spaces. Reflective insulation can also use other layers of materials such as paper or plastic to form enclosed air spaces as part of the system. The performance of the reflective insulation system is determined by the emittance of the material(s), the lower the better, and the size of the enclosed air spaces. The smaller the enclosed air space, the less heat will transfer by convection. Reflective insulation is recognized by ASTM, The Federal Trade Commission and Code Bodies as an accepted insulation technology. R-values can be both tested or calculated using established ASTM standards.

R-Values

Heat Flow Horizontal

	Standard	Hi-Perm
3/4" Cavity	R-4.2	R-4.1
7/8" Cavity	R-4.5	R-4.6
1-1/2" to 1-5/8" Cavity	R-5.2	R-5.1

ASTM C -236 R -Value Test. The R-values of AA2 Vapor Shield™ increase with the thickness of furring strips. With the use of AA2 Vapor Shield™, the thickness of furring strips are slightly increased because it is applied to the surface of the strips and overlaps. Therefore all measurements are considered nominal.

Test Data

Product Version	Perforated	Non-Perforated
ASTM E 96 Water Vapor Permeance	4.72	0.802
ASTM E 84-94 Flammability.		
Flame Spread Rating	45	45
Smoke Developed Rating	10	10
National Fire Protection Association Rating	Class B	Class B
ASTM D 3310 Corrosivity	None	
ASTM C 1224/Section 9 Adhesive Performance		
Bleeding	None	
Delamination	None	
Pliability	No signs of cracking or delamination	
ASTM C 1338 Mold & Mildew	Pass	
ASTM C 1371 Foil Emittance	0.03	

Compliance and Approvals

- Meets: ASTM C1224
- Compliance with the following code *
  - 2012, 2009, and 2006 International Building Code (IBC)
  - 2012, 2009, and 2006 International Residential Code (IRC)
  - 2012, 2009, and 2006 International Energy Consevation Code (IECC)
  - 2010 and 2007 Florida Building Code (FBC)
  - 2010 and 2007 Florida Residential Code (FRC)
  - 2010 and 2007 Florida Energy Conservation Code (FECC)
- Evaluated in accordance with *
  - ICC-ES AC 02 - Acceptance Criteria for Reflective Insulation, approved June 2011
- State of California Bureau of Home Furnishings and Thermal Insulation License #T1390, Registry #CA-T390 FL

* See IAMPO-ES Report #0291

High Recycled Content

Certified by a third party testing and inspection service(R&D Services, Inc.), Reflective Insulation has more than 44 percent recycled content, with at least 42 percent being post-consumer content.

16" AA2	More than 44% Recycled Content
24" AA2	More than 44% Recycled Content

Read This Before You Buy

The label shows the R-value of the insulation. R means resistance to heat flow. The higher the R-value, the greater the insulating power. Compare insulation R-values before you buy. There are other factors to consider. The amount of insulation you need depends mainly on the climate you live in. Also, your fuel savings from insulation will depend on the climate, the type and size of your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you will save on fuel. To get the marked R-value, it is essential that this insulation be installed properly.

PO Box 800, Auburndale, FL 33823
(800) 448-3401 F: (863) 967-0137

Fi-FOIL COMPANY

FiFoil.com

Exhibit 2

Federal Register

Tuesday,
May 31, 2005

Part IV

Federal Trade Commission

16 CFR Part 460

Labeling and Advertising of Home Insulation: Trade Regulation Rule; Final Rule

FEDERAL TRADE COMMISSION

16 CFR Part 460

Labeling and Advertising of Home Insulation: Trade Regulation Rule

AGENCY: Federal Trade Commission.

ACTION: Final rule.

SUMMARY: The Federal Trade Commission ("Commission") amends its Trade Regulation Rule Concerning the Labeling and Advertising of Home Insulation ("R-value Rule" or "Rule") to streamline and increase the benefits of the Rule to consumers and sellers, minimize its costs, and respond to the development and utilization of new technologies to make American homes more energy efficient and less costly to heat and cool. This document provides background on the R-value Rule and this proceeding; discusses the public comments the Commission received; and describes the amendments the Commission is making based on the record.

DATES: These amendments will become effective November 28, 2005. The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of November 28, 2005.

ADDRESSES: Requests for copies of this document are available from: Public Reference Branch, Room 130, Federal Trade Commission, 600 Pennsylvania Avenue, NW., Washington, DC 20580. The complete record of this proceeding is also available at that address. Relevant portions of the proceeding, including this document, are available at *http://www.ftc.gov*.

FOR FURTHER INFORMATION CONTACT: Hampton Newsome, (202) 326–2889, Division of Enforcement, Bureau of Consumer Protection, Federal Trade Commission, 600 Pennsylvania Avenue, NW., Washington, DC 20580.

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Introduction

The R-value Rule specifies substantiation and disclosure requirements for thermal insulation products used in the residential market, and prohibits certain claims unless they are true.[1] The primary disclosure required is the insulation product's "R-value." R-value is the numerical measure of the ability of an insulation product to restrict the flow of heat and, therefore, to reduce energy costs—the higher the R-value, the better the product's insulating ability. To assist consumers, the Rule requires sellers (including insulation manufacturers, professional installers, new home sellers, and retailers) to disclose the insulation product's R-value and related information, before retail sale, based on uniform, industry-adopted standards.[2] This information enables consumers to evaluate how well a particular insulation product is likely to perform, to determine whether the cost of the insulation is justified, and to make meaningful, cost-benefit based purchasing decisions among competing products.

II. Overview Of The Rule

A. Products Covered

The R-value Rule covers all "home insulation products." Under the Rule, "insulation" is any product mainly used to slow down the flow of heat from a warmer area to a cooler area, for example, from the heated inside of a house to the outside during the winter through exterior walls, attic, floors over crawl spaces, or basement. "Home insulation" includes insulation used in all types of residential structures. The Rule automatically covers new types or forms of insulation marketed for use in the residential market, whether or not the Rule specifically refers to them. The Rule does not cover pipe insulation, or any type of duct insulation except for duct wrap. The Rule does not cover insulation products sold for use in commercial (including industrial) buildings. It does not apply to other products with insulating characteristics, such as storm windows or storm doors.

Home insulation includes two basic categories: "mass" insulations and "reflective" insulations. Mass insulations reduce heat transfer by conduction (through the insulation's mass), convection (by air movement within and through the air spaces inside the insulation's mass), and radiation. Reflective insulations (primarily aluminum foil) reduce heat transfer when installed facing an airspace by increasing the thermal resistance of the airspace and reducing radiative heat transfer. Within these basic categories,

[1] The Commission promulgated the R-value Rule on August 29, 1979 under section 18 of the Federal Trade Commission Act ("FTC Act"), 15 U.S.C. 57a. The Rule became effective on September 30, 1980. See Final Trade Regulation Rule ("Statement of Basis and Purpose" or "SBP"), 44 FR 50218 (1979).

[2] Home insulation sellers should be aware that additional Commission rules or guides may also apply to them. For example, the Commission's Rules concerning Disclosure of Written Consumer Product Warranty Terms and Conditions, and the Pre-sale Availability of Written Warranty Terms, 16 CFR parts 701 and 702, specify requirements concerning warranties; the Commission's Guides for the Use of Environmental Marketing Claims, 16 CFR part 260, address the application of section 5 of the FTC Act, 15 U.S.C. 45, to environmental advertising and marketing claims (*e.g.*, claims concerning the amount of recycled material a product contains). Further, section 5 of the FTC Act declares that unfair or deceptive acts or practices are unlawful, and requires that advertisers and other sellers have a reasonable basis for advertising and other promotional claims before they are disseminated. See *Deception Policy Statement*, Letter from the Commission to the Honorable John D. Dingell, Chairman, Committee on Energy and Commerce, U.S. House of Representatives (Oct. 14, 1983), reprinted in *Cliffdale Assocs., Inc.*, 103 F.T.C. 110 (1984); *Statement of Policy on the Scope of the Consumer Unfairness Jurisdiction*, Letter from the Commission to the Honorable Wendell H. Ford, Chairman, Consumer Subcommittee, Committee on Commerce, Science, and Transportation, U.S. House of Representatives, and the Honorable John C. Danforth, Ranking Minority Member, Consumer Subcommittee, Committee on Commerce, Science and Transportation, U.S. Senate (Dec. 17, 1980), *reprinted in International Harvestor Co.*, 104 F.T.C. 949 (1984); and *Policy Statement Regarding Advertising Substantiation*, 49 FR 30999 (1984), *reprinted in Thompson Medical Co.*, 104 F.T.C. 839 (1984).

home insulation is sold in various types ("type" refers to the material from which the insulation is made, *e.g.*, fiberglass, cellulose, polyurethane, aluminum foil) and forms ("form" refers to the physical form of the product, *e.g.*, batt, dry-applied loose-fill, spray-applied, boardstock, multi-sheet reflective).

B. Parties Covered

The Rule applies to home insulation manufacturers, professional installers, retailers who sell insulation to consumers for do-it-yourself installation, and new home sellers (including sellers of manufactured housing). It also applies to testing laboratories that conduct R-value tests for home insulation manufacturers or other sellers who use the test results as the basis for making R-value claims about home insulation products.

C. Basis for the Rule

The Commission issued the R-value Rule to prohibit, on an industry-wide basis, specific unfair or deceptive acts or practices. When it issued the Rule, the Commission found that the following acts or practices were prevalent in the home insulation industry and were deceptive or unfair, in violation of section 5 of the FTC Act, 15 U.S.C. 45: (1) Sellers had failed to disclose R-values, and caused substantial consumer injury by impeding the ability of consumers to make informed purchasing decisions; (2) the failure to disclose R-values, which varied significantly among competing home insulation products of the same thickness and price, misled consumers when they bought insulation on the basis of price or thickness alone; (3) sellers had exaggerated R-values, often failing to take into account factors (*e.g.*, aging, settling) known to reduce thermal performance; (4) sellers had failed to inform consumers about the meaning and importance of R-value; (5) sellers had exaggerated fuel bill savings that consumers could expect, and often failed to disclose that savings will vary depending on the consumer's particular circumstances; and (6) sellers had falsely claimed that consumers would qualify for tax credits through the purchase of home insulation, or that products had been "certified" or "favored" by federal agencies. (44 FR at 50222–50224).

D. Requirements of the Rule

The Rule requires that manufacturers and others who sell home insulation determine and disclose each product's R-value and related information (*e.g.*, thickness, coverage area per package) on package labels and manufacturers' fact sheets. R-value ratings vary among different types and forms of home insulations and among products of the same type and form. The Rule requires that R-value claims to consumers about specific home insulation products be based on R-value test procedures that measure thermal performance under "steady-state" (*i.e.*, static) conditions.[3] Mass insulation products may be tested under any of the test methods the Rule specifies. The tests on mass insulation products must be conducted on the insulation material alone (excluding any airspace). Reflective insulation products must be tested according to tests that can determine the R-values of insulation systems (such as those that include one or more air spaces). The tests must be conducted at a mean temperature of 75 °F.

When it promulgated the Rule, the Commission found that certain factors, such as aging or settling, affect the thermal performance of home insulation products. (44 FR at 50219–50220, 50227–50228). To ensure that R-value claims take these factors into account, the Rule mandates that the required R-value tests for polyurethane, polyisocyanurate, and extruded polystyrene insulation products be conducted on test specimens that fully reflect the effect of aging, and for loose-fill insulation products on test specimens that fully reflect the effect of settling.

Specific disclosures must be made: (1) By manufacturers on product labels and manufacturers' fact sheets; (2) by professional installers and new home sellers on receipts or contracts; and (3) by manufacturers, professional installers, and retailers in advertising and other promotional materials (including those on the Internet) that contain an R-value, price, thickness, or energy-saving claim, or compare one type of insulation to another. Manufacturers and other sellers must have a "reasonable basis" for any energy-saving claims they make.[4]

[3] Section 460.5 of the Rule requires that the R-values of home insulation products be based on one of the test procedures specified in the Rule. Most of the test procedures in the Rule specify American Society for Testing and Materials ("ASTM") standards.

[4] Although the Rule does not specify how energy-saving claims must be substantiated, the Commission explained that scientifically reliable measurements of fuel use in actual houses or reliable computer models or methods of heat flow calculations would meet the reasonable basis standard. (44 FR at 50233–50234). Sellers other than manufacturers can rely on the manufacturer's claims unless they know or should know that the manufacturer does not have a reasonable basis for the claims.

III. Procedural History

On April 6, 1995, as part of its ongoing regulatory review program, the Commission solicited public comments about the economic impact of and current need for the R-value Rule.[5] (60 FR 17492). At the same time, the Commission solicited comments on a petition ("Petition") from Ronald S. Graves, who at that time was a Research Staff Member, Materials Analysis Group, Martin Marietta Energy Systems, Inc. (which operated Oak Ridge National Laboratory ("ORNL") for the U.S. Department of Energy ("DOE")). The Petition requested that the Commission approve an additional (fifth) ASTM R-value test procedure as an optional test procedure for determining the R-value of home insulation under the Rule.

Based on the comments in response to the 1995 Notice, the Commission determined that there was a continuing need for the Rule, published its determination to retain it, and adopted the test method suggested by Mr. Graves and several technical, non-substantive amendments to allow the use of the most current testing procedures available and to streamline the Rule.[6] (61 FR 13659, at 13659–13662, 13665 (March 28, 1996)). In 1999, the Commission published an Advance Notice of Proposed Rulemaking ("ANPR") proposing limited amendments and requesting comments on other issues related to the Rule. (64 FR 48024 (Sept. 1, 1999)).

Based on information obtained in response to the ANPR, on July 15, 2003, the Commission published a Notice of

[5] The Commission previously reviewed the Rule in 1985 under the Regulatory Flexibility Act, 5 U.S.C. 610, to determine the economic impact of the Rule on small entities. Based on that review, the Commission determined that: There was a continuing need for the Rule; there was no basis to conclude that the Rule had a significant economic impact on a substantial number of small entities; there was no basis to conclude that the Rule should be amended to minimize its economic impact on small entities; the Rule did not generally overlap, duplicate, or conflict with other regulations; and technological, economic, and other changes had not affected the Rule in any way that would warrant amending the Rule. (50 FR 13246).

[6] These amendments: (1) Revised § 460.5 of the Rule to allow the use of an additional ASTM test procedure as an optional, but not required, test procedure to determine the R-value of home insulation; (2) revised § 460.5 to require the use of current, updated versions of other ASTM R-value test methods cited in the Rule; (3) added an Appendix summarizing the exemptions from specific requirements of the Rule that the Commission previously granted for certain classes of persons covered by the Rule; and (4) revised § 460.10 of the Rule to cross-reference the Commission's enforcement policy statement for foreign language advertising in 16 CFR 14.9 and deleted the previous Appendix to the Rule because it merely repeated the text of 16 CFR 14.9.

Proposed Rulemaking ("NPR") requesting comment on proposed amendments to the rule. (68 FR 41872). The proposed amendments were designed to: (1) Require disclosure of the same R-value information for all types of loose-fill insulation products; (2) specify the use of current ASTM or other recognized procedures for preparing R-value test specimens of spray-applied insulations and for conducting R-value tests of reflective insulation products; (3) require manufacturers of loose-fill insulation to provide installers with information about the initial installed thickness required to yield certain R-values; (4) delete specific disclosure requirements for urea formaldehyde insulation; (5) eliminate affirmative disclosure requirements for radio ads; and (6) exempt retailers from certain disclosure requirements (*i.e.*, making available to consumers separate manufacturers' fact sheets) under certain circumstances.

The NPR also discussed numerous additional issues raised by commenters in response to the ANPR. These issues included whether the Commission should revise the Rule to: (1) Cover additional products (*i.e.*, residential pipe and duct insulations, and insulation sold for use in commercial buildings); (2) require the disclosure of in-use performance values, as opposed to values based on laboratory tests under static, uniform conditions, or of the performance of building systems; (3) adopt additional test specimen preparation requirements to account for various factors that affect R-values; (4) adopt additional or updated testing requirements; and (5) revise the disclosure requirements for manufacturers' labels and fact sheets, advertisements and other promotional materials, and for professional installers, new home sellers, and retailers. The NPR explained why the Commission did not propose amending the Rule to address these issues. The NPR also raised specific questions for comment to provide the Commission with additional information on the issues.

IV. Section-by-Section Description of Final Amendments

The following is a brief summary of the amendments to the R-value Rule the Commission is adopting in response to the comments received. The Commission believes that these amendments will help to update and improve the Rule to ensure that it continues to prohibit, on an industry-wide basis, specific unfair or deceptive acts or practices the Commission has previously identified.

Section 460.1 (What This Regulation Does)

Penalties: The Commission is amending the monetary penalty amount from $10,000 to $11,000 to reflect the current requirements of § 1.98 of the Commission's rules, which in turn, reflect statutory changes to the Commission's authority to obtain civil penalties (*see* 15 U.S.C. section 45(m)(1)(A)). This is a technical, conforming change.

Section 460.5(a) (R-value Tests)

Temperature Differential: The Commission is amending § 460.5, R-value Tests, to specify that tests conducted under § 460.5(a) must be done with a temperature differential of 50° F plus or minus 10° F in addition to the mean temperature requirement currently in the Rule [*see* section V.D.1. of this document].

Update Test Procedures: The Commission is updating references for many of the test procedures incorporated into the Rule. The affected procedures are listed in section V.F. of this document. In addition, the references to ASTM C 236–89 and ASTM C 976–90 have been eliminated and replaced with ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus."

Section 460.5(a)(3) (R-value Tests)

Loose-Fill Settling: The Commission is amending § 460.5(a)(3) to eliminate the obsolete reference to the Government Services Administration ("GSA") specifications for measuring the settling of loose-fill insulation and to insert language indicating that industry members must take into account the effects of settling on the R-value for loose-fill mineral wool, self-supported spray-applied cellulose and stabilized cellulose products [*see* section V.C.2. of this document].

Section 460.5(a)(4) (R-value Tests)

Tests for Spray-Applied Cellulose Insulation: The Commission is adding a new paragraph, § 460.5(a)(4), which requires that tests for self-supported spray-applied cellulose be conducted at the settled density determined pursuant to ASTM C 1149–02 ("Self-supported Spray Applied Cellulosic Thermal Insulation") [*see* section V.C.2. of this document].

Section 460.5(a)(5) (R-value Tests)

Loose-Fill Initial Installed Thickness: A new provision (§ 460.5(a)(5)) requires loose-fill insulation manufacturers to determine initial installed thickness for their product pursuant to ASTM C 1374–03, "Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation," for R-values of 13, 19, 22, 30, 38, 49, and any other R-values provided on the product's label pursuant to § 460.12 [*see* section V.C.2.c. of this document].

Section 460.5(b) and Section 460.5(c) (R-value Tests)

The sections applicable to reflective insulations have been reorganized and amended as follows:

Tests for Single Sheet Aluminum Foil Systems: Section 460.5(c) is redesignated as § 460.5(b) and amended to require that single sheet systems of aluminum foil be tested under ASTM C 1371–04a [*see* section V.D.3. of this document].

Tests for Multiple Sheet Aluminum Foil Systems: Section 460.5(b) is redesignated as § 460.5(c) and amended to indicate that aluminum foil systems with more than one sheet, and single sheet systems of aluminum foil that are intended for applications that do not meet the conditions specified in the tables in the most recent edition of the ASHRAE Handbook, must be tested with ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus," in a test panel constructed according to ASTM C 1224–03, "Standard Specification for Reflective Insulation for Building Applications," and under the test conditions specified in ASTM C 1224–03. Further, to obtain the R-value from the results of those tests, sellers must use the formula specified in ASTM C 1224–03. This amendment eliminates the references to ASTM C 236–89 and ASTM C 976–90 that are currently applicable to these products [*see* section V.D.3. of this document].

Section 460.5(d) (R-value Tests)

Insulation Material With Foil Facings and Air Space: Section 460.5(d)(1) is amended to eliminate references to ASTM C 236–89 and ASTM C 976–90 and replace them with ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus" [*see* section V.D.3. of this document].

Section 460.5(e) (R-value Tests)

Incorporation by Reference: A new paragraph (e) is added to consolidate information regarding incorporation by reference approvals provided by the Office of the Federal Register [*see* section V.F. of this document].

Section 460.8

R-Value Tolerances for Manufacturers: The Rule's tolerance provision is amended to clarify that manufacturers of home insulation are prohibited from selling individual specimens of insulation with an R-value more than 10% below the R-value shown in a label, fact sheet, ad, or other promotional material for that insulation [*see* section V.D.2. of this document].

Section 460.12 (Labels)

Labels for Batts and Blankets: The Commission is amending the paragraph at § 460.12(b)(1) to indicate that it applies to batts and blankets of any type, not just to those made of mineral fiber [*see* section V.E.1.a. of this document].

Loose-Fill Labels: The Commission is amending § 460.12 to eliminate certain information requirements on charts for loose-fill cellulose insulation. The amendment requires charts for all forms of loose-fill insulation to show the minimum thickness, maximum net coverage area, number of bags per 1,000 square feet, and minimum weight per square foot at R-values of 13, 19, 22, 30, 38, and 49. The amendment also requires the labels for loose-fill insulation to display initial installed thickness information, determined pursuant to ASTM C 1374, "Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation," which installers must use for loose-fill products [*see* section V.E.1.b. of this document].

Section 460.13 (Fact Sheets)

Urea-Based Foam Insulations: Section 460.13 is amended to eliminate the requirements related to urea-based foam insulation [*see* section V.E.1.c. of this document].

Section 460.14 (How Retailers Must Handle Fact Sheets)

Retailers' Responsibilities for Fact Sheets: The Commission is amending this section to exempt retailers from making fact sheets available to customers, if they display insulation packages (containing the same information required in fact sheets) on the sales floor where insulation customers are likely to notice them [*see* section V.E.4. of this document].

Section 460.17 (What Installers Must Tell Their Customers)

Initial Installed Thickness: This section is amended to require installers to provide customers with initial installed thickness information for loose-fill insulation [*see* section V.C.2.c. of this document].

Sections 460.18 (Insulation Ads) and 460.19 (Savings Claims)

Affirmative Disclosures for Radio Ads: The Commission is eliminating the affirmative disclosure requirements for radio ads in §§ 460.18 and 460.19 [*see* section V.E.2. of this document].

Urea-Based Foam Insulations: Section 460.18 is amended to eliminate paragraph (e) which addresses urea-based insulation [*see* section V.E.1.c. of this document].

Section 460.23(a) (Other Laws, Rules, and Orders)

The Commission amends paragraph (a) to correct a typographical error.

V. Discussion of Comments and Final Amendments

The Commission received 16 comments in response to the NPR.[7] These comments and the final amendments are discussed below:

A. Disclosing Thermal Performance of Non-Residential Insulations

Background

In the NPR, the Commission indicated that it did not plan to extend the Rule to cover the sales of insulation products in the commercial market. (68 FR at 41876–41877). The Commission pointed out that professionals in the commercial field have greater knowledge than residential customers. In addition, there was no evidence indicating unfair and deceptive practices are prevalent in these markets. Accordingly, the Commission found that the potential benefits to commercial users would not justify the additional burdens that an extension of the Rule would impose.

[7] AFM Corporation; ASTM International; Advanced Foil Systems, Inc. ("AFS"); Cellulose Insulation Manufacturers Association ("CIMA"); ConsultMort, Inc. ("ConsultMort"); Expanded Polystyrene Molders Association ("EPSMA"); Extruded Polystyrene Foam Alliance ("XPSA"); U.S. Green Fiber (late-filed comment); Honeywell Chemicals; Insulation Contractors Association of America ("ICAA"); North American Insulation Manufacturers Association ("NAIMA") (including initial comment and late-filed comment); Pactiv Building Products; Polyisocyanurate Insulation Manufacturers Association ("PIMA"); R&D Services, Inc. (including initial comment and late-filed comment); Rockwool International; and Spray Polyurethane Foam Alliance ("SPFA"). These comments are on the public record and are available online at *www.ftc.gov/energy*. Paper versions are also available for public inspection in accordance with the Freedom of Information Act, 5 U.S.C. 552, and the Commission's Rules of Practice, 16 CFR 4.11, at the Consumer Response Center, Public Reference Section, Room 130, Federal Trade Commission, 600 Pennsylvania Avenue, NW., Washington, DC. The comments are organized under the Labeling and Advertising of Home Insulation Rule ("The R-value Rule"), Matter No. R811001.

Comments

Two commenters urged the Commission to reconsider expanding the Rule's coverage to include insulation sold for commercial and industrial use. XPSA (pp. 4–5) recommended that the issue be reserved for a separate rulemaking in the future. XPSA believes that building professionals and architects mostly rely on manufacturers' claims and fact sheet information when preparing specifications involving foundation, wall or roof systems and do not necessarily understand the issue of long-term R-value. XPSA believes it is nearly impossible for an architect or specifier to keep up to date with the technical data underlying such R-value claims. Rockwool (p. 1) also supported the Rule's extension suggesting that the increased uniformity from such a change would be beneficial.

Discussion

For reasons detailed in the NPR, the Commission continues to believe that it is not appropriate to extend the Rule to the commercial or industrial market. The Commission will continue to consider developments in the market and has not foreclosed the possibility of revisiting this issue in the future. The Commission will continue to address concerns in this area as they arise pursuant to its general authority under the FTC Act.

B. Performance of Insulations in Actual Use

Background

In the ANPR, the Commission discussed earlier comments relating to seasonal factors and other variables that can affect the R-value of insulation products in actual use. (64 FR at 48027). Specifically, previous commenters identified factors that affect performance in attics during winter conditions and stated that the Rule does not sufficiently account for these factors. Some comments pointed to ORNL research that demonstrates a reduction in R-value of very low-density fibrous insulations installed in open or vented attics when the temperature difference between the heated area of a home and its cold attic becomes particularly great. This can occur during the most severe winter conditions in some portions of the United States. In the NPR, the Commission indicated that it did not plan to amend the Rule to address these concerns but explained that sellers may use advertising to distinguish their product's performance from others. (68 FR at 41877–41879).

Comments

Although the Commission did not specifically invite comments on this issue, two industry members submitted comments disagreeing with the Commission's position in the NPR. Both CIMA (p. 2) and Rockwool urged that the Rule be amended to account for the performance of insulation material in very cold climates. Rockwool acknowledged that the technical issues involved are very complex, but suggested that the Rule require insulations to be marked with a warning, "Do not use below X °F." Rockwool explained that this "cut off" temperature could be calculated by a simple equation or measured according to ASTM practice. CIMA suggested that the Commission specifically acknowledge the existence of this phenomenon and require manufacturers to provide cold weather design information for their products. According to CIMA, ASTM C 1373 ("Standard Practice for Determination of Thermal Resistance of Attic Insulation Systems Under Simulated Winter Conditions") can be used to assess the effect of cold weather on actual installed R-value. CIMA indicated that the State of Minnesota requires insulation manufacturers to provide cold weather design information for their products.

The Commission notes that, in response to the ANPR, NAIMA and PIMA opposed amendments to the Rule addressing the insulation performance at high temperature differentials. (*See* 68 FR 41877–41878). NAIMA contended that it would be impossible to specify new requirements to take these factors into account. It also believed that such disclosures would create consumer confusion rather than clarity. NAIMA asserted that past analysis on this issue suggests that very low temperatures rarely last long enough to result in significant energy loss or economic cost. Both NAIMA and PIMA indicated that ASTM C 1373 lacks application to a real home setting where conditions are variable and unpredictable.

Discussion

As discussed in detail in the NPR, the Commission understands that there are variables for which the uniform test methods specified in the Rule may not account, such as the design characteristics and geographical location of the building, the specific application in which the product is installed, outside and inside temperatures, air and moisture movement, installation technique, and others. (68 FR at 41877–41879). The Commission believes that accounting for variables (such as low temperature performance) in the Rule's requirements would significantly complicate both compliance and communication to consumers, without necessarily providing a commensurate level of benefit. Accordingly, the Commission again has concluded that the Rule should not be expanded to address on-site variables that might affect insulation performance.

Manufacturers and other sellers may voluntarily provide to consumers additional, truthful, substantiated information voluntarily to consumers about the manner in which their products (or their competitors' products) perform in actual use. If a product exhibits better performance at high temperature differentials than competing products, the manufacturer may provide that information to consumers as long as the claims are truthful and substantiated and otherwise consistent with the Rule.

C. Disclosing R-Values That Account for Factors Affecting R-Value

1. Aging of Cellular Plastics Insulations

Background

Certain types of cellular plastics insulations (polyurethane, polyisocyanurate, and extruded polystyrene boardstock insulations) are manufactured in a process that results in a gas other than normal air being incorporated into voids in the products. This gas gives the product an initial R-value that is higher than it would have if the product contained normal air. The aging process causes the R-value of these insulations to decrease over time as the gas is replaced by normal air through diffusion. The length of this process depends on whether the product is faced or unfaced, the permeability of the facing, the thickness of the product, and other factors.

The current Rule addresses this aging process by requiring that R-value tests be performed on specimens that "fully reflect the effect of aging on the product's R-value." Section 460.5(a)(1) of the Rule allows the use of the "accelerated aging" procedure in paragraph 4.6.4 of GSA Purchase Specification HH–I–530A (which was in effect at the time the Commission promulgated the Rule) as a permissible "safe harbor" procedure, but also allows manufacturers to use "another reliable procedure." (*See* 44 FR at 50227–50228). The "accelerated" procedure was designed to age these insulations in a shorter period than they would age under normal usage conditions. Under the "accelerated aging" method in the GSA specification, test specimens are aged for 90 days at 140 °F dry heat.

GSA amended its specification in 1982 to allow the use of an optional aging procedure (in addition to the "accelerated" method) under which test specimens are aged for six months ("180 days") at 73 °F ± 4 °F and 50% ± 5% relative humidity (with air circulation to expose all surfaces to the surrounding environmental conditions). An industry group, the Roof Insulation Committee of the Thermal Insulation Manufacturers Association ("RIC/TIMA"), specified the use of similar conditions in a technical bulletin it adopted at about the same time. In response to GSA and RIC/TIMA adopting the alternative 180-day aging procedure, the Commission's staff advised home insulation sellers that the alternative procedure appeared to be reliable and could be used to age cellular plastics insulations. The staff cautioned, however, that manufacturers of insulations faced with materials that significantly retard aging may need to age test specimens for a longer period of time, and that the staff would consider whether the alternative procedure was acceptable for specific products on a case-by-case basis.[8]

As discussed in the NPR, some industry members have urged the Commission to incorporate two relatively new "slicing and scaling" test procedures into the Rule. (*See* 68 FR 41879–41882). These procedures are ASTM C 1303–00 "Estimating the Long-Term Change in the Thermal Resistance of Unfaced Rigid Closed Cell Plastic Foams by Slicing and Scaling Under Controlled Laboratory Conditions" and CAN/ULC–S 770 "Standard for Determination of Long Term Thermal Resistance of Closed Cell Thermal Insulating Foams." Unlike the traditional accelerated aging tests, these newer procedures use specimens of reduced thickness (*i.e.*, slices of material) to measure the effects of aging. The measurements for these slices are then coupled with a scaling factor to estimate the R-value of full thickness boards. According to ASTM C 1303–00, the test is designed to avoid problems identified with the accelerated aging tests, namely that elevated temperatures may not significantly accelerate the aging process and that these higher temperatures may damage the cellular structure of these foams. ASTM C 1303–00 applies only to unfaced, homogenous materials. Its Canadian counterpart,

[8] See, *e.g.*, staff opinion letter dated May 5, 1983, to Manville Corporation. GSA thereafter rescinded its specification (along with other insulation specifications) and now requires that federally purchased insulations comply with ASTM insulation material specifications.

CAN/ULC S770, applies to permeably-faced polyisocyanurate (polysio), polyurethane, and extruded polystyrene foam plastic insulations.

The comments submitted in response to the Commission's ANPR identified disagreements within the industry regarding the incorporation of ASTM C 1303 in the Rule. Some critics believe the relatively narrow scope of the test was a continuing concern while others criticized its cost and efficacy. In contrast, supporters argued it would improve the accuracy of the R-values calculated for products it covers.

In the NPR, the Commission did not propose to amend § 460.5(a)(1) of the Rule to require the use of ASTM C 1303 for homogeneous, unfaced, rigid closed cell polyurethane, polyisocyanurate, and extruded polystyrene insulations. Because ASTM C 1303 applies only to unfaced, homogenous material, the Commission observed that similar products (*e.g.*, insulation boards with paper facing) would have to continue to be tested under the older approach (the 180-day accelerated aging test). In essence, because it was unclear whether C 1303 is sufficiently broad and adequately developed, the Commission concluded it did not warrant incorporation into the Rule. Nevertheless, the NPR sought comments on this issue asking, in particular, about the scope of these standards and their likely impact on products sold in the residential market.

Although the Commission did not propose to incorporate ASTM C 1303 into the Rule, it proposed to amend the Rule to require tests for aging other types of polyurethane, polyisocyanurate, and extruded polystyrene insulation. These tests include ASTM C 1029–96 ("Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation"), ASTM C 591–94 ("Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation"), and ASTM C 578–95 ("Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation").[9] For all other polyurethane, polyisocyanurate, and extruded polystyrene insulation subject to aging but not specifically covered by one of the procedures listed above, the NPR proposed that industry members use the procedure in paragraph 4.6.4 of GSA Specification HH–I–530A or another reliable procedure. The Commission sought comment on whether incorporating these procedures into the Rule would be appropriate and whether these procedures raise concerns like those associated with ASTM C 1303, as discussed above.

Comments

The comments on aging tests for cellular plastic insulations reveal continued divisions among industry members. Some commenters urged the Commission to incorporate the newer slicing and scaling tests (*i.e.*, ASTM C 1303–00 or Can/ULC–S 770), while others urged the Commission not to do so because of concerns with the adequacy and scope of the new procedures. As for the additional procedures (ASTM C 578, C 1029, and C 591) proposed by the Commission, one commenter questioned their inclusion in the Rule because they contain the traditional accelerated aging tests (*i.e.*, the 90 or 180-day tests).

Commenters urging the inclusion of ASTM C 1303 or CAN/ULC S770 in the Rule contended that the older accelerated aging methods, presently required by the Rule, are outdated and fail to provide accurate information about the effects of aging on R-value.[10] One commenter suggested that existing requirements have created inconsistencies in testing and data reporting.[11] Some of these commenters supported the adoption of CAN/ULC S770 while others urged the use of ASTM C 1303. Those advocating CAN/ULC S770 believe it will reduce confusion and provide a uniform method for all cellular plastics manufacturers.[12] Advocates of ASTM C 1303 argued that it is an appropriate method to use for plastics insulation, and its scientific basis has been established for decades.[13]

One commenter recommended that the Commission designate CAN/ULC S770 as an "alternate method" for all permeably faced and unfaced foam insulation. Like other advocates of the Canadian test, this commenter believes the procedure provides a significant, technically supported improvement over the 180-day test. Polyisocyanurate manufacturers currently use this test for permeably faced polyisocyanurate boards, some of which are sold in the residential market. In addition, the Canadian test is now an annex to ASTM C1289–02 ("Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board") for permeably-faced polyisocyanurate insulation products. Accordingly, this commenter supports the incorporation of ASTM C 1289 into the Rule.[14]

Several commenters opposed any amendments that would require use of C 1303 or S770 either as a requirement or as an "alternative method." These commenters agreed with the Commission's decision not to adopt these tests at this time.[15] They noted ongoing efforts to reexamine these newer tests and recommended that the FTC retain existing requirements until ASTM C 1303 and Canadian standard CAN/ULC S770 gain broader acceptance and are widely considered to be technically sound.[16] One commenter (ConsultMort) opposed the incorporation of ASTM C 1303 because it applies only to *unfaced* homogeneous materials, does not take into account all relevant factors, and does not establish a specific time frame for making product comparisons. The slicing and scaling methods, in ConsultMort's view, are better left to research, engineering and systems design professionals who are

[9] The Commission did not propose to require ASTM C 1289 ("Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board") as suggested by some commenters. The current version of this test procedure, ASTM C 1289–02, requires the use of the Canadian test procedure for aging (S770), which appears in C 1289 as an annex. Because the Commission did not propose to include C 1303 (or S 770) in the Rule at this time, the Commission refrained from proposing to require the same or equivalent aging procedure through C 1289.

[10] AFM (p. 1); Rockwool (p. 1); and EPSMA (pp. 1–2).

[11] EPSMA (pp. 1–2).

[12] EPSMA (pp. 1–2); Honeywell (pp. 2–3); and AFM (p. 1). AFM stated, however, that the Rule should not require this procedure for foam plastics or non-permeable faced insulations because these materials do not exhibit aging.

[13] Rockwool (pp. 1–2); and R&D (pp. 1–2). According to R&D, the new test stems from twenty years of expensive government and industrial research. R&D recommended that the Commission specify a time period or product life span for reporting R-values pursuant to the test. R&D also noted that although the test is expensive, it has to be conducted only once for a specific product design.

[14] PIMA urged the Commission to adopt the Canadian test despite its limited coverage to unfaced products. In contrast, XPSA (pp. 4–5) opposed the adoption of the current version ASTM C 1289 due to its incorporation of CAN/ULC S770. PIMA (p. 18) did not support adding ASTM C 1303 to the Rule because this test method, which is limited to unfaced material, does not apply to most insulation products used in the market today. PIMA explained that polyiso products always have facings, either permeable (organic or glass facers) or impermeable (aluminum foil facers or facers with gas barriers).

[15] NAIMA (p. 3); XPSA (pp. 4–5); ConsultMort; and Pactiv (pp. 1–2). SPFA (pp. 1–2) cautioned against the improper use of the ASTM C–1303 and S770 procedures for spray polyurethane foam because there is no data to indicate these methods accurately predict aged R-values for that product.

[16] See discussion in NPR at 68 FR 41881. Pactiv (pp. 1–2) stated that an ASTM Task Group is working to resolve various technical issues associated with ASTM C 1303. Pactiv also said that the CAN/ULC S770 Task Group has revised S770 to provide information about a positive bias associated with the method. Pactiv concluded that there is still significant work to be done on both tests. XPSA (pp. 2–3) also stated that bias issues related to S770 are under examination by industry members and emphasized that such issues should be fully addressed before the test is incorporated into the Rule.

qualified to consider the exceptions referenced in these procedures.

Several commenters addressed the new tests' potential impact on the R-values of products commonly sold in the residential market. According to one commenter, ASTM C 1303 and CAN/ULC S770 cover products that encompass only a small percentage of residential products.[17] Another commenter reported that the various tests yield minimal differences in values for permeably faced polyiso boards at up to one inch thickness, but differences are apparent in thicker products.[18] The comments also suggested that the costs for performing C 1303 or S770 are significant, running about $5,000 to $6,000 per sample and that only two or three third-party test laboratories are capable of performing them.[19]

Several commenters also addressed the other aging tests the Commission proposed. These procedures, ASTM C 578, C 1029, and C 591, incorporate the traditional accelerated aging tests. NAIMA supported their incorporation, contending they are sufficiently developed to justify their incorporation and reflect testing improvements that will provide consumers with accurate information.[20] R&D Services (pp. 1–2), however, took issue with the three proposed tests. It stated that none of them are adequate for determining the long-term thermal resistance of the products covered because, in part, the time period for aging in these tests is not sufficient. In addition, R&D argued that C 1029 does not have specific controls on aging and testing. R&D also commented that ASTM C 1289, a test which applies to polyisocyanurate boards, is not adequate for determining long-term thermal resistance for these products if they have permeable facers.

Discussion

The Commission has considered the comments received on the issue of aging and determined not to amend the Rule with respect to this issue. Accordingly, the Commission is not adding *any* new tests governing the aging of cellular plastics to the Rule. The comments demonstrate that significant disagreement continues to exist regarding the newer long-term aging tests (ASTM C 1303 and CAN/ULC S770). The Commission understands that these tests are intended to address limitations with the traditional methods. The Commission does not believe, however, that requiring the use of these new methods is appropriate at this time. The comments highlight many concerns about the tests, including accuracy issues (potential bias in test results) and the need for more development with regard to the tests' specificity. In addition, several commenters suggested that their incorporation would have limited impact on the claimed R-value for products commonly sold in the residential market because the tests would make a difference in reported R-values for only a portion of the cellular plastic boards available. The Commission understands that the existing requirements do not specify uniform procedures under which cellular plastics insulation products must be tested. As a result, the Rule allows manufacturers of different products to base their R-values on different aging procedures and therefore they may not be fully comparable. The Commission recognizes that new slicing and scaling methods have the potential to improve the accuracy of required R-value disclosures. It is premature, however, to mandate the use of these tests as legal requirements until ongoing work on them is completed and existing problems are resolved. At the same time, the Commission does not find that these newer tests (ASTM C1303 and CAN/ULC S770) are "unreliable" under the Rule (despite the need for improvements). Therefore, industry members already using them may continue to do so, and others may use them if they choose. The Commission will continue to monitor efforts in this area as more research is conducted and the existing standards are further developed and may revisit this matter in the future.[21]

In addition, the Commission has decided not to include the three additional test procedures contained in the proposed rule, ASTM C 578,[22] C 1029, and C 591 for particular product types. Incorporation of the proposed tests would codify the traditional aging methods for specific products covered by these tests. This could limit the ability of manufacturers of these products to use newer, improved tests in the future. Accordingly, the Commission has determined not to amend the Rule with regard to aging tests at this time.

Similarly, the Commission has decided not to amend the Rule to require ASTM C 1289 for polyisocyanurate boards, which includes a version of CAN/ULC S770 as an annex. Although some industry members currently use this procedure for certain product types (namely, permeably faced polyisocyanurate boards), the Commission believes it would be inappropriate to *require* its use under the Rule (whether by itself or as part of another test or standard) and sees little benefit from identifying it as an alternative method in the Rule text at this time.

2. Loose-Fill and Stabilized Insulations

In the original rulemaking proceeding, the Commission determined that all dry-applied loose-fill insulation products tend to settle after installation in open (or unconfined) areas such as attics. (44 FR at 50228). Settling reduces the product's thickness, increases its density, and affects its total R-value. The amount of settling depends on several factors, including the raw materials and manufacturing process used, and the installer's application techniques (which affect the insulation's initial thickness and density).

To ensure that claims made to consumers are based on long-term thickness and density after settling, § 460.5(a)(2) of the Rule requires that the R-value of dry-applied loose-fill home insulations be determined at their "settled density." Manufacturers of dry-applied loose-fill cellulose insulation for attic applications must test and disclose the R-value (as well as coverage area and related information) at the long-term, settled density determined according to paragraph 8 of ASTM C 739, commonly referred to as the "Blower Cyclone Shaker" ("BCS") test.[23] Due to the lack of a consensus-based test procedure for the settled density of loose-fill mineral-fiber insulation, the Rule requires that industry members base the R-values for this product type on long-term thickness and density after settling, but does not specify how to determine a specimen's density. Since the Commission promulgated the Rule, new forms of

[17] XPSA (pp. 2–3). Pactiv (pp. 1–2).

[18] PIMA (p. 17).

[19] XPSA (p. 2); and Pactiv (p. 2). PIMA (p. 17), however, asserted that C 1303 is twice as expensive to perform as S770.

[20] NAIMA (pp. 3–4) also noted that because the GSA Specification HH–I–530A referenced in the Rule is no longer available, the Commission should not continue to use it as an R-value test standard.

[21] The Commission understands that GSA Specification HH–I–530A may have limited availability. the R-value Rule, however, only references one paragraph which states: "4.6.4 *Thermal conductivity.* The thermal conductivity of insulation board shall be determined by the guarded hot plate method described in ASTM C 177 or by the heat flow method described in ASTM C 518. Tests shall be conducted on a 1-inch thick product at a mean temperature of 75 degrees F (23.8 degrees C) after 30 days and 90 days of conditioning at 140 degrees F (60 degrees C) dry heat."

[22] The 2003 version of ASTM C 578 directs the use of a 90 or 180 day aging period but also states that ASTM C 1303 may be used if the blowing agent is intended to be retained for longer than 180 days.

[23] "Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation" (ASTM C 739).

home insulation products have been introduced including "stabilized" cellulose and self-supported spray-applied cellulosic insulation.

a. Settling

In the NPR, the Commission addressed several issues related to the settling of loose-fill insulation in attics and stated it intended to retain the requirement that industry members use the BCS test to determine the settled density of cellulose loose-fill. (68 FR 41882–41886). The Commission proposed to update the current reference to ASTM C 739 in § 460.5(a)(2) to reflect the most current version (which is now the 2003 version). The Commission also stated that manufacturers who can demonstrate that the BCS procedure is inappropriate for their products can apply for an exemption that would allow them to determine their product's settled density under a more appropriate method (the exemption procedures are found in the Appendix to 16 CFR part 460).

Section 460.5(a)(2) of the Rule does not specify procedures for determining the settled density of loose-fill mineral fiber insulation products but instead requires that R-values for dry-applied loose-fill mineral fiber insulations be based on tests that take the adverse effects of settling into account. The Commission indicated in the ANPR that ORNL studies conducted during the 1980's demonstrate that certain loose-fill mineral fiber insulation products can settle following installation, resulting in a reduction of R-value. (64 FR at 48033). The settling results differed in amount and effect, depending on the type of mineral fiber insulations studied (*e.g.*, fiberglass versus rock wool products).

In the NPR, the Commission did not propose any specific test for measuring the settling of this insulation type because there is no consensus standard available. In its comments on the NPR, R&D (p. 3) asserted that a settled density test for fiberglass and rock wool insulations is needed to address the settling that is known to occur. The Commission understands R&D's concerns and reiterates that industry members must have a reasonable basis for their R-value claims and take into account the effects of settling when applicable. Although the Commission cannot require industry members to develop consensus standards, it will monitor practices and R-value claims related to settling.

The NPR proposed, however, to amend the Rule to eliminate the reference to an unnamed, future GSA procedure in § 460.5(a)(3) because GSA never issued such a procedure. The Commission also proposed to amend the Rule to specify that tests for self-supported, spray-applied cellulose insulation and stabilized cellulose must be done on samples that fully reflect the effect of settling on the products' R-value. The Commission received four comments favoring these amendments and none opposing. The Commission has incorporated these amendments into the final rule (*see* § 460.5(a)(3)).

b. Self-Supported Spray Applied Cellulose Insulation

Background

Self-supported spray applied cellulose insulations are generally sprayed onto walls, and are able to support themselves as applied. Such insulations are most often used on exposed walls. In the NPR, the Commission proposed to require the use of ASTM C 1149 ("Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation") for this type of insulation. The procedures in paragraph 5.1 of ASTM C 1149 require the use of the manufacturer's recommended equipment, procedures, and maximum thickness when preparing test specimens. The Commission solicited comments regarding this proposed requirement.

Comments

The Commission received four comments favoring the proposed requirement related to self-supported spray applied cellulose insulation. Three commenters[24] supported the incorporation of ASTM C 1149 into the Rule but suggested replacing the term "settled density" with the term "density" because the former term is not applicable to this product. NAIMA (p. 4) agreed with the proposal to require ASTM C 1149 but urged the Commission also to address the impact of settling on wet cellulose.[25] It also suggested moisture problems may degrade the settled density of the cellulose insulation and, thus, affect R-value. NAIMA strongly recommended that the Commission require each cellulose manufacturer to provide consumers with reliable drying guidelines since this issue directly impacts R-value and settled density.

Discussion

The Commission has reviewed the comments and has decided to amend the Rule by adding § 460.5(a)(4) to require the use of ASTM C 1149 ("Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation") for deriving the R-value of such insulation. The Commission agrees with the commenters that this is an appropriate method to apply to these products. The term "settled" has been eliminated from this part as it does not apply to this material. The Commission has also considered NAIMA's concerns regarding moisture and has decided not to amend the Rule with regard to this issue. The Commission is not willing to prescribe detailed requirements in this area absent further information and the opportunity for other industry members to address specific proposals on this issue. Further, if moisture damage is a problem if the material is not properly installed, manufacturers should provide installation instructions as a matter of good practice.[26]

c. Initial Installed Thickness

Background

As discussed in the NPR, the Commission is aware of industry concerns about the installation of loose-fill insulation. (68 FR 41891–41893). For loose-fill insulations, the Rule currently requires: (1) That each manufacturer determine the R-value of its home insulation product at settled density and construct coverage charts showing the minimum *settled* thickness, minimum weight per square foot, and coverage area per bag for various total R-values; and (2) that installers measure the area to be covered and install the number of bags (and weight of insulation material) indicated on the product's coverage chart for the total R-value desired. The Insulation Contractors Association of America ("ICAA") has long believed that the Rule's requirements make it very difficult for contractors to ensure that they have installed the correct amount of insulation. (68 FR at 41891–41893). In the NPR, the Commission

[24] R&D (p. 2); CIMA (p. 1); and PIMA (p. 8).

[25] In initial comments and a late-filed comment (March 26, 2004), NAIMA submitted information suggesting that insulation installed in walls without proper drying times may lead to faster corrosion, more mold, and lower R-values.

[26] In the NPR, the Commission did not propose any specific test methods for determining the long-term density of *stabilized* cellulose insulation, a product usually used in attic applications. (68 FR 41884–41885). One commenter, R&D (p. 3), suggested that the Commission require the use of ASTM C 1497–01 ("Standard Specification for Cellulosic Fiber Stabilized Thermal Insulation") for determining the R-value for stabilized cellulose insulation. Because the Commission did not seek comment on this method, we decline to include it in the final amendments. The Commission, however, agrees with R&D that this test appears to be an appropriate method to apply in deriving R-values for this type of insulation.

recognized that contractors may fail to install sufficient insulation either because they apply material at the minimum *settled* thickness by mistake or they simply provide an inadequate amount. (68 FR at 41892). In other instances, some installers inappropriately or inadvertently "fluff" their insulation by applying it with more air at a lower density. This practice increases thickness, at least initially, but reduces the necessary density and total R-value. It has been difficult for consumers to determine whether the correct insulation amount has been installed because they cannot rely on the installed thickness alone to assure they obtain the contracted-for R-value.

To address these concerns, the Commission proposed to require a relatively new procedure, ASTM C 1374 ("Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation"). This procedure was specifically developed to aid manufacturers in determining a product's *initial* installed thickness, which in turn ensures that, long-term, consumers receive the claimed R-value. The Commission proposed to incorporate this procedure into the Rule and sought comments on the test. Specifically, the Commission proposed to:

- Amend § 460.5(a) to add a new subsection (5) that would require manufacturers of loose-fill insulation to determine the initial installed thickness of their product at certain R-values using ASTM C 1374 ("Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation").
- Amend § 460.12 (Labels) to require this initial installed thickness information on product labels.
- Amend § 460.5(a) to require manufacturers of loose-fill insulation to determine the blowing machine adjustments and feed rates necessary to achieve the initial installed thicknesses and indicate such information on the product label.
- Amend § 460.17 to require installers to comply with the initial installed thickness directions on product labels and to use the blowing machine adjustments and feed rates specified by the manufacturer.

Under the proposal, manufacturers would provide initial installed thickness information on labels and fact sheets pursuant to §§ 460.12 and 460.13. Pursuant to § 460.17, installers would have to follow the initial installed thickness information on the label to ensure the appropriate amount of insulation has been installed. They also would have to follow the manufacturer's instructions for blowing machine settings. The Rule would continue to require installers to show fact sheets to consumers (§ 460.15) and provide the consumer with initial installed thickness and R-value information for specific jobs (§ 460.17). To improve the clarity of existing language in the Rule, the Commission also sought comment on changing the term "minimum thickness" in § 460.12(b)(2) to "minimum settled thickness."

Although the Commission proposed to add disclosure requirements for initial installed thickness information, it indicated specifically that it did not plan to eliminate any of the existing disclosure requirements related to loose-fill, such as bag count and coverage area. The Commission indicated that this information is necessary to provide consumers and inspectors with an additional means to verify that installers have provided an appropriate amount of material. Under the proposed rule, loose-fill cellulose insulation manufacturers would continue to conduct their R-value tests at the settled density using ASTM C 739, as specified by § 460.5(a)(2). Manufacturers of other loose-fill material also would have to continue to conduct R-value tests based on samples that fully reflect the effect of settling on the product's R-value (*see* § 460.5(a)(3)). The Commission sought comments on questions related to the efficacy of ASTM C 1374, and the costs and benefits of the Commission's proposal.

Comments

The comments demonstrated general support for the Commission's proposed amendments with regard to initial installed thickness information, although several commenters raised specific concerns with regard to blowing machine settings and other issues.[27] ICAA (pp. 11–23) strongly supported the amendment stating that the changes will benefit all parties because they will help alleviate the problems installers face in providing the correct amount of insulation.[28] These include differences in "as designed" models and "as built" homes in large developments, resulting in the actual job site space differing from the "contracted for" space; increasingly complex new home plans that make measurements difficult; and problems in obtaining adequate measurements in some retrofit applications.[29]

ICAA (pp. 21–23) also indicated that incorporation of ASTM C 1374 into the Rule is unlikely to increase significantly, if it at all, the costs consumers will pay for loose-fill insulation. ICAA (p. 22) emphasized that the ASTM C 1374 amendment will not cause installers to use more loose-fill material or cause an increase in installation time on any given job because installers will now have an explicit thickness target for each attic, and therefore the overall variance (both overage and underage) may be reduced. ICAA also believes the proposal will not hinder the installers' ability to provide consumers coverage area information required by the Rule because contractors will continue to measure coverage area to estimate the volume and cost associated with each job.

R&D (pp. 3–4), while agreeing generally that the initial installed thickness information would be beneficial, stated that the Rule should continue to require installers to provide the minimum pounds per square foot to insure at least a minimum settled thickness. R&D also raised some specific concerns about ASTM C 1374, cautioning that "there is no assurance that results from C 1374 will be consistent with the existing procedure for determining the settled density and R-value of loose-fill cellulose insulation." R&D's comments raise the possibility that the initial installed thickness results from ASTM C 1374 may not necessarily be consistent with, for instance, the settled density results for cellulose yielded from ASTM C 739. In other words, the instructions for initial installed thickness for a certain R-value could potentially fail to prescribe the insulation amount suggested by the label's area and bag count (*i.e.*, weight) information. Despite this uncertainty, R&D supported the inclusion of initial installed thickness information in the Rule as a

[27] ICAA (p. 15); NAIMA (p. 4); PIMA (p. 8), and CIMA (pp. 1–2). In a late-filed comment (July 8, 2004), U.S. Green Fiber (p. 3), the largest cellulose insulation manufacturer, indicated that the addition of ASTM C 1374 would be "positive" and recommended its incorporation into the Rule. Green Fiber also described a procedure it intends to follow in complying with ASTM C 1374. Given the late timing of Green Fiber's comment, the Commission has not addressed the procedure outlined in its letter.

[28] ICAA stated that there are no other test procedures that should be incorporated into the Rule in lieu of (or in addition to) ASTM C 1374 at this time. ICAA wrote that ASTM members are working on an update to the procedure that will involve only very slight, non-substantive modifications. (ICAA, p. 19).

[29] ICAA also suggested that, because the actual net weight in bags sometimes differs from the minimum net weight printed on the packaging, the amendment would allow customers to receive the contracted R-value regardless of bag weight deviations.

"recommendation" by manufacturers and urged the Commission to require manufacturers to provide initial installed thickness information that is consistent with the results obtained from settled density tests.[30]

Several commenters raised concerns with the blowing machine setting requirements of the Rule. For instance, CIMA stated that because contractors use more than a hundred different blowing machines and a machine's performance changes with age and usage, it would be difficult for manufacturers to provide required blowing machine settings for all of them.[31] It suggested that the Commission allow manufacturers to select one blowing machine deemed to be "representative" and publish settings for just that machine. Otherwise, CIMA asserted, manufacturers, particularly smaller ones, would incur significant financial burdens if they have to provide blower settings for many machines.[32] ICAA interpreted the Commission's proposal as requiring the disclosure of blowing machine settings that conform to the reporting requirements of ASTM C 1374, section 11.1.4 which requires the manufacturer to provide information only about the machine settings used to conduct the test. ICAA suggested that the Commission delete reference to blowing machine settings in § 460.17 (installer requirements) because it is inconsistent with ASTM C 1374. ICAA also suggested modifying the proposed language in 460.17, applicable to initial installed thickness, to read: "For loose-fill, you must follow the manufacturer's label instructions for initial installed thickness."

Discussion

The Commission has decided to amend the Rule as proposed, with modifications to respond to the comments. The final rule indicates that manufacturers must provide blowing machine settings for the machine used in conducting the test (consistent with ASTM C 1374). This should address comments about the financial burden of testing with multiple blowing machines. Manufacturers, of course, may provide additional information (*e.g.*, settings for additional types of machines) to aid installers.

ASTM C 1374 provides a way to derive initial installed thickness measurements from the weight information (*i.e.*, bag count) on a manufacturer's package label (*see* sections 5.5 and 8.2) of the test method.[33] The test method itself does not require the generation of specific information about product density, settled thickness, weight, or R-value. It assumes that manufacturers have already developed this information before they conduct the initial installed thickness procedure. The data generated by ASTM C 1374 simply adds to existing information on the label by providing installers with guidance on the insulation amounts they should install.

The Commission has considered R&D's concern about possible inconsistencies between results yielded from a procedure for *initial* thickness and another for *settled* density. Because the record does not demonstrate that such inconsistencies will necessarily occur, this concern appears to reflect a potential issue rather than a proven flaw.[34] Other commenters, representing loose-fill manufactures and installers, supported the test method's use for labeling purposes. As proposed in the NPR, the Commission is retaining other information requirements (bags per square feet, etc.).[35] This information will help contractors to install appropriate amounts even if inconsistencies arise between the initial and settled thickness information. This other information (*e.g.*, bag count) also provides installers, consumers,[36] and inspectors an additional means to verify that the appropriate amount of material has been installed. It may also discourage unscrupulous installers from intentionally altering the blowing machine settings to "fluff" material (*i.e.*, increase thickness at the expense of density and total R-value). Although initial installed thickness will provide important guidance to installers, they still will have to pay attention to area measurements and bag counts to ensure they install the correct thickness *and* amount.

To avoid possible confusion, the Commission has not included in § 460.17 the proposed requirement that installers follow manufacturers' instructions for initial installed thickness information. In light of the comments, the Commission is concerned that such specific language may lead some installers to follow only the initial installed thickness information and ignore other important data on the bag label. Under the final rule, § 460.17 continues to direct installers to "use the data the manufacturer gives you" to "figure out the R-value of the insulation." This language is sufficient to direct installers to follow the manufacturers' instructions including information about coverage area, weight, and initial installed thickness.[37]

D. Other Testing Requirements

1. Test Temperature Differential

Background

In the NPR, the Commission indicated that it did not propose to amend the Rule with regard to the required mean test temperature (75°) for R-value tests. (68 FR at 41887). The current Rule, however, does not require a specific temperature differential (*i.e.*, the temperature difference between the hot and cold surface during testing) in conducting the § 460.5(a) tests. In the NPR, the Commission proposed to require that tests be conducted with a temperature differential of 50 °F plus or minus 10 °F because the thermal properties of a specimen may change both with mean temperature and with the temperature difference across the test specimen.

Comments

The comments generally supported requiring the performance of tests using

[30] R&D supplemented its initial letter in a late filed comment (March 23, 2004) stating that ASTM C 1374 should "be identified as a guide for determining installed thickness" and not the sole criterion for installers to follow.

[31] See also R&D (pp. 3–4) and ICAA (pp. 17–18, and 20).

[32] R&D explained the costs arise from the significant capital investment in installation equipment required, and that a prescriptive requirement for blowing machine settings could double the cost of creating a coverage chart.

[33] For instance, section 5.5 of the Test Method states: "The material blown for a given R-value as part of the installed thickness test equals the installed mass/unit area times the test chamber area. This mass can be calculated from information provided on the package label at the R-value prescribed." Section 8.2 states in part: "From product label information, calculate the mass of insulation required to fill the test chamber for the R-value selected * * * ."

[34] The test method itself directs manufacturers to derive the initial installed thickness information using given R-values for the *mass* of material indicated on the package label (not the thickness). (See ASTM C 1374–03, section 5.5.) If experience demonstrates that there are significant inconsistencies between the results of the two tests, the Commission may consider revisiting this requirement.

[35] The NPR indicated that manufacturers will continue to provide information currently required on loose-fill labels such as minimum settled thickness, maximum new coverage area, number of bags per 1,000 square feet, and minimum weight per square foot at various R-values. (68 FR at 41893).

[36] Initial installed thickness information should make it easier for consumers to verify they have received adequate insulation because they can now use a ruler to measure the installed thickness. Consumers also will continue to receive information regarding minimum settled thickness.

[37] As indicated in the NPR (68 FR at 41893, n. 97), the Commission has decided to change the term "minimum thickness" in § 460.12(b)(2) to "minimum settled thickness." This will improve the clarity of the existing language in the Rule.

a temperature differential of 50 °F plus or minus 10 °F.[38] PIMA (p. 5) supported the proposal but noted that the Rule allows reflective insulation testing at a temperature differential of 30 °F. Given the need for consistency in R-value test conditions, PIMA questioned the Commission's decision to exempt aluminum foil insulations from this standardized condition. Honeywell (pp. 1–2) also supported the proposal but recommended that the Rule require testing at a mean temperature of 40 °F, in addition to the mean temperature of 75 °F, to insure that consumers will use an adequate insulation amount in cold temperature regions.[39]

Discussion

The Commission has decided to amend § 460.5(a), as proposed, to require that tests be conducted with a temperature differential of 50 °F plus or minus 10 °F. This amendment will help ensure the comparability of R-value claims for competing home insulations. The Commission is not, however, revising the Rule's mean test temperature requirement, which is not intended to be representative of any particular geographical region, season, or actual performance conditions. Indeed, when the Commission initially promulgated the requirement, it concluded that requiring sellers to test and disclose R-values at a mean temperature representative of any specific geographical region, or season of the year, would yield R-value results that would be inappropriate for other regions or seasons. (44 FR at 50219 and 50227). Further, it concluded that requiring sellers to test and disclose R-values separately for different regions or seasons would yield multiple disclosures that could confuse consumers and perhaps discourage them from using R-values in making purchasing decisions. Although useful information may be derived by testing material at a lower mean temperature, the Commission believes that testing at additional mean temperatures could unduly complicate the testing and reporting of R-values. Manufacturers, of course, may take low temperature performance into account in advertising their products. (*See* 68 FR at 41878–41879).

The Commission also has decided not to alter the temperature differential requirements in the Rule for reflective insulations (*see* § 460.5(b) and (c) of the amended Rule) as PIMA suggested. The Rule's temperature differential requirements for reflective insulations are consistent with well-established procedures mentioned in the Rule itself. For single sheet reflective products, § 460.5(b) references tables in the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Fundamentals Handbook that do not contain R-values for temperature differentials greater than 30 °F.[40] For multi-sheet reflective insulations, § 460.5(c) requires the use of ASTM 1224 which itself mandates a 30 °F differential (*see* 9.7.3). It would not be appropriate to issue amendments inconsistent with these industry consensus standards without additional information about any technical problems caused by such changes or the practical benefit, if any, such amendments will provide for consumers.

2. Tolerance

Background

In the ANPR (64 FR at 48037–48038), the Commission proposed to clarify that the 10% tolerance provision in § 460.8 applies to manufacturer claims and not to claims made by other sellers or installers who rely on R-value data provided by the manufacturer. Under the tolerance provision, the actual R-value of any insulation sold to consumers cannot be more than 10 percent below the R-value shown on a label, fact sheet, ad, or other promotional material for the product. The Commission solicited comments on whether it should amend the tolerance provision, and the benefits and burdens such an amendment would confer on consumers and insulation sellers. In addition, the Commission sought comments on whether the Rule should be changed with regard to sampling procedures.

After analyzing the comments received in response to the ANPR, the Commission proposed to amend § 460.8 of the Rule to clarify that the tolerance provision applies to manufacturers and the manufacturing process (not to installation). (68 FR at 41887). The Commission also proposed to amend § 460.8 to require that the mean R-value of sampled specimens of a production lot meet or exceed the R-value shown in a label, fact sheet, ad or other promotional material for that insulation. For the purposes of the proposed amendment, the Commission defined the term "production lot" as a definite quantity of the product manufactured under uniform conditions of production. In addition, the Rule would continue to specify that no individual specimen of that insulation may have an R-value more than 10% below the R-value shown in a label, fact sheet, ad, or other promotional material for that insulation.[41]

Comments

The Commission received five comments on the tolerance issue. No commenters opposed the Commission's proposal to clarify that the tolerance provision applies to manufacturers and not installers. Two commenters supported the proposal to require that the mean R-value of sampled specimens of a production lot meet or exceed the labeled R-value.[42] Rockwool, in contrast, believes the proposal allows too many sampled specimens to fall below the stated R-value.

NAIMA (pp. 5–6) generally supported the proposal to clarify that manufacturers should meet 100 percent of labeled R-value and that the mean R-values should meet or exceed the labeled R-value, but stated that the proposed rule language could lead to confusion. NAIMA warned that manufacturers, in attempting to meet the new requirement, would adjust their manufacturing process to yield mean R-values above the labeled R-value because normal production processes yield normal variations that may cause a failure to meet the literal requirements of the proposed language.[43] According to NAIMA, the Commission's proposal would necessitate product design changes that would render most insulation more expensive for consumers.

PIMA (pp. 10–11) urged the Commission to retain the current language in the Rule which "is well

[38] NAIMA (p. 3) (Commission proposal is consistent with ASTM Standard Practice C 1058, "Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation" and industry practice). See also, XPSA (pp. 3–4) and Pactiv (p. 1).

[39] Honeywell described past research suggesting that mean temperature has an effect on the thermal conductivity of rigid polyurethane foams. Honeywell noted that the European Union specifies a mean temperature of 50 °F to represent more adequately insulation requirements of their geographic region, which is similar to that of the northern regions of the U.S.

[40] See 2001 ASHRAE Fundamentals Handbook, Ch. 25, Table 3.

[41] The Commission did not propose a specific sampling procedure, stating that there was no clear indication that manufacturers' implementation of the tolerance provision results in the selection of test specimens that are not representative of ongoing production. (68 FR at 41888).

[42] XPSA (p. 4) and Pactiv (p. 2). XPSA indicated that this change will give flexibility to manufacturers and would not require a new, costly testing schedule.

[43] In addition, PIMA (pp. 10–11) explained that the precision and bias of commonly used R-value test methods, such as ASTM C 518, are in the ±3–5% range. It also stated that the Commission has not adequately defined the term "production lot" and should designate sampling procedures.

understood." NAIMA suggested, however, that the proposed rule specify that manufacturers must use valid statistical tests in their manufacturing process. In NAIMA's opinion, this would remove the potential for manufacturers to make inappropriate assumptions about lot size, sample size, or sampling frequency.

Rockwool International (pp. 1–2) explained that manufacturers interpret the existing Rule to allow the production to be run with a mean R-value equal to labeled R-value. As a result 50% of what is delivered to the market is equal or better than labeled, while the rest is below labeled R-value. Rockwool explained that the change "will raise the fraction of what is at labeled R-value or better to approximately 75% of what is put on the market and approximately 25% will be below labeled R-value." Rockwool indicated that, ultimately, the tolerance rules reflect a policy decision but, in its view, it is reasonable to require that at least 90% of the production to be equal to or better than labeled R-value.

Discussion

The Commission is amending § 460.8 to clarify that the tolerance limit applies to manufacturers and the manufacturing process (not to installation). The Rule will continue to allow professional installers and new home sellers to rely on the manufacturer's installation instructions, unless they have reason to believe that the instructions are inaccurate or not based on the proper tests. The amendment clarifies that the tolerance is not intended to allow installers or new home sellers to deviate from the manufacturer's installation instructions.[44]

The Commission has decided not to include specific language in the Rule related to the mean R-value of sampled specimens in a production lot. As the comments indicate, the proposed language has created significant confusion. The proposed change was meant to clarify existing requirements and foster consistency in the tolerance provision's application, not to change the underlying tolerance requirement or cause changes to existing industry practices. The Commission's proposal sought to explain that the mean R-value of products must meet or exceed the labeled R-value. According to NAIMA, this is the way most manufacturers currently interpret the Rule. The Commission did not intend to require changes in existing production processes due to complications caused by normal variation. Although NAIMA has suggested language to clarify the Commission's intent, such language could also lead to confusion. In addition, any requirement related to the mean of samples in production lots would be difficult to implement and enforce without mandated sampling procedures. Given that the Commission is not amending the Rule in this regard, we note that the tolerance provision is designed to take the place of detailed quality control standards in the Rule. It does not give industry members a license to inflate their R-values above the amount determined through R-value testing. Rather, the testing sections impose two separate bases for potential liability. First, industry members will be liable if their stated R-values do not reflect the results of tests performed in accordance with the Rule. Second, if the Commission tests the manufacturer's product, the tested R-value must be within 10 percent of the R-value represented to consumers. If the product is not within this 10 percent tolerance, the manufacturer may be liable even if the stated R-value accurately reflects the manufacturer's test results. In that event, failure to pass the tolerance test indicates that the manufacturer's quality control procedures are insufficient to reasonably assure consumers that they are receiving the represented R-value. (*See* 45 FR at 68923).

3. Determining the Thermal Performance of Reflective Insulations

Background

There are two basic forms of reflective insulation products in the residential market: (1) Traditional single sheet and multi-sheet reflective insulations; and (2) single-sheet radiant barrier reflective insulations. Traditional reflective insulation products normally are installed in closed cavities, such as walls. The Rule requires that manufacturers of traditional reflective insulation products use specific test procedures to determine the R-values of their products, and that manufacturers and other sellers disclose R-values to consumers for specific applications. (*See* 64 FR at 48038–48039). Section 460.5(c) of the current Rule requires the use of ASTM E 408 for single sheet systems. For reflective systems with more than one sheet, § 460.5(b) requires use of ASTM C 236 and ASTM C 976.

In the NPR, the Commission proposed to reorganize §§ 460.5(b), (c), and (d) and make substantive changes to existing requirements. (68 FR at 41888–90). Proposed § 460.5(b) would require that single sheet systems of aluminum foil (*i.e.*, reflective material) be tested with ASTM C 1371, "Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers" or E 408 (as currently required). ASTM C 1371 tests the emissivity of the foil. To get the R-value for a specific emissivity level, air space, and direction of heat flow, the amendment would continue to refer industry members to the tables in the most recent edition of the ASHRAE Handbook, if the product is intended for applications that meet the conditions specified in the tables. Industry members would have to use the R-value for 50 °F, with a temperature differential of 30 °F.

In new § 460.5(c), the Commission proposed requiring that aluminum foil systems with more than one sheet, and single sheet systems of aluminum foil (*i.e.*, reflective insulation) that are intended for applications that do not meet the conditions specified in the tables in the most recent edition of the ASHRAE Handbook, be tested with (i) ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus," (ii) in a test panel constructed according to ASTM C 1224–03, "Standard Specification for Reflective Insulation for Building Applications," and (iii) under the test conditions specified in ASTM C 1224–03. To get the R-value from the results of those tests, the amendment would require the use of the formula specified in ASTM C 1224–03. The tests must be done at a mean temperature of 75 °F, with a temperature differential of 30 °F.

Finally, the Commission proposed to amend § 460.5(d)(1) to insert a reference to ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box," in place of ASTM C 236–89 (Reapproved 1993), "Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box," and ASTM C 976–90, "Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box."

Comments

Five commenters generally supported the proposed amendments.[45] R&D (p. 4),

[44] For instance, the 10% tolerance provision does not apply to the thickness at which loose-fill insulation is installed. Under the current Rule, loose-fill insulation must be installed at a settled thickness equal to or greater than the minimum settled thickness specified by the manufacturer.

[45] SPFA (p. 1), PIMA (pp. 9–10), NAIMA (pp. 4–5), and Pactiv (p. 2) supported the Commission's proposals without elaboration. AFS noted that ASTM E–408 is not in use anymore and recommended that the Commission eliminate references to the test. AFS indicated that ASTM C

Continued

however, expressed concern that the proposed requirements for single sheet systems of aluminum foil are overly restrictive. Because the ASHRAE Handbook of Fundamentals references only four thicknesses for each heat flow direction, R&D urged the Commission to acknowledge that the footnotes in the Handbook allow for "interpolation and moderate extrapolation" from the data for those specified thicknesses.

Discussion

The Commission has determined to amend the Rule as proposed because the amendments account for recent improvements in the applicable test procedures. In response to R&D's concerns, the Commission notes that, in issuing these amendments, it does not intend to restrict the use of the tables only to those values specifically printed in the tables themselves. Rather, the Commission recognizes that explanatory information in the footnotes to the ASHRAE handbook allow for "interpolation and moderate extrapolation" and would expect industry members to use this guidance in complying with the Rule.[46]

E. Other Disclosure Issues

1. Disclosures on Labels and Fact Sheets

a. Disclosures for Batt, Blanket, and Boardstock Insulations

Background

Subsections 460.12(b)(1) and (4) of the Rule require manufacturers to label all packages of "mineral fiber batts and blankets" and all boardstock insulations with a chart showing the R-value, length, width, thickness, and square feet of insulation in the package, and § 460.13(c)(1) requires that they include the chart on manufacturer-provided fact sheets. As indicated in the ANPR, NAIMA recommended amending § 460.12(b)(1) to apply to all batt and blanket insulation products by deleting the reference to "mineral fiber." (64 FR at 48041).

In the NPR, the Commission agreed that all types of batt and blanket insulations should be labeled with the same basic R-value and coverage area information, and that manufacturers' fact sheets for these insulation products should include these disclosures. Therefore, the Commission proposed deleting the phrase "mineral fiber" from § 460.12(b)(1). (68 FR at 41890–41891).[47]

Comments

Both PIMA (p. 11) and NAIMA (p. 7) supported the Commission's proposal to delete "mineral fiber" from § 460.12(b)(1) and to clarify that the coverage chart disclosure requirement applies to all types of batts and blanket insulation.

Discussion

For the reasons explained in the NPR and because no negative comments were received, the Commission has decided to amend § 460.12(b)(1) to require that all types of batt and blanket insulations to be labeled with the same basic R-value and coverage area information. This amendment also requires that manufacturers' fact sheets for these insulation products include these disclosures.

b. Required Disclosures for Loose-fill Insulations

i. R-value Disclosures

Background

Section 460.12(b) of the Rule requires that labels on loose-fill insulation packages disclose the minimum net weight of the insulation in the package and include a coverage chart disclosing minimum thickness (after settling), maximum net coverage area, minimum weight per square foot, and, for loose-fill cellulose insulation only, number of bags per 1,000 square feet for each of several specified total R-values for installation in open attics. The Rule specifies different total R-values for which the disclosures must be made for loose-fill cellulose insulations and other types of loose-fill insulations. To install an adequate amount of insulation, professional installers must calculate the number of square feet to be insulated and install the number of bags indicated on the manufacturer's coverage chart that are necessary for the desired R-value (commonly referred to as the "bag count"). In the NPR, the Commission proposed to amend §§ 460.12(b)(2) and (3) to require the same coverage charts for all types of loose-fill insulation (not just cellulose) at R-values of 11, 13, 19, 22, 24, 32, and 40.

Comments

In general, commenters supported the Commission's proposal to require the same R-value information on labels and fact sheets for all types of loose-fill insulation. ICAA (pp. 9–10) said disclosures based on specified R-values would make it easier for contractors and "do-it-yourself" consumers to compare various products and would enhance competition in the market. ICAA and R&D (p. 3) believe any costs associated with this amendment will be small and will have little or no financial impact on manufacturers. ICAA and NAIMA (p. 5) suggested that the disclosure requirement for loose-fill insulations include R-values of 30, 38, and 49 because these values reflect DOE's most common R-value insulation recommendations.[48]

Because the proposed values differ from those traditionally used by cellulose manufacturers and specified in ASTM C 739 ("Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation"), CIMA (p. 1) said that some cellulose insulation manufacturers would have to develop new coverage charts. To minimize the costs associated with developing these new charts, CIMA urged the Commission to give manufacturers a reasonable amount of time to comply with this change.

Discussion

After reviewing the comments, the Commission has determined to consolidate § 460.12(b)(2) and (3) into § 460.12(b)(2) and to require R-value disclosures at 13, 19, 22, 30, 38, and 49. The Commission agrees with NAIMA and ICAA's suggestions to include other values DOE most commonly recommends for different regions of the country.[49] Some of the proposed values, such as 24, 32, and 40, have not been included in the final rule because they do not appear in the DOE recommendations. Manufacturers, however, may include voluntarily these and other R-values on their labels.

The commenters provided differing opinions about the costs of such changes. Although the Commission has altered the final rule to be more consistent with commonly used R-values, the Commission recognizes that

1371 is the appropriate, updated test to use for measuring surface emittance.

[46] The Commission has decided to retain ASTM E 408 in the Rule. Although it may not be widely used and has largely been displaced by C 1371 (for measurements of emittance using portable emissometers), the commenters have not identified any negative impact from retaining this procedure in the Rule.

[47] Section 460.12(b) refers to "mineral fiber" batts and blankets because, when the Rule was promulgated, the batt and blanket insulation products being sold in the residential market were mineral fiber insulation products, primarily fiberglass. Since then, the market has expanded to include other types of batt and blanket insulations.

[48] See also R&D (p. 3) (specifying a minimum number of R-values that must be included in a coverage chart is appropriate, but voluntary disclosure of other R-values on the coverage chart should be allowed).

[49] See "U.S. Department of Energy Recommended Total R-Values for New Construction Houses in Six Insulation Zones," *http://www.eere.energy.gov/consumerinfo/energy_savers/pdfs/rvalue_map.pdf*. See also "Insulation Fact Sheet," DOE/CE–0180, Oct. 2002.

the amendment may require manufacturers to change their labels and complete any necessary calculations for these new values. Accordingly, the Commission is making the effective date of the amendments announced in this document 180 days after publication in the **Federal Register**.

ii. Initial Installed Thickness

As discussed in section V.C.2.c. of this document, the Commission has amended the Rule to require manufacturers to provide information on bag labels and fact sheets related to the "initial installed thickness" of loose-fill insulation. This requirement necessitates changes to § 460.12 (Labels) to require this new information on product labels.

c. Disclosures for Urea-Based Foam Insulations

In the NPR, the Commission proposed to delete the Rule's disclosure requirements related to urea-based foam insulations (§§ 460.13(d) and 460.18(e)) (*e.g.*, "Foam insulation shrinks after it is installed. This shrinkage may significantly reduce the R-value you get"). Earlier comments recommended that the Commission revise the required statement to refer to "urea-based foam insulation" because the reference to "foam insulation" implies that all foam-type insulation products (including other types of cellular plastics insulations) shrink after installation, resulting in lower R-values than claimed. Because there is no indication that urea-based foam insulation is being sold, the Commission proposed to eliminate the provision completely.

NAIMA (p. 7) and PIMA (pp. 12–13) supported eliminating the Rule's requirements for urea-based foam insulation because the product is no longer available. Both, however, recommended that the Commission ensure that procedures are in place to reinstate this product category under the Rule should the product reappear. Given that commenters identified no reasonable expectation that such products will reappear on the market, the Commission has decided to amend the Rule as proposed. If necessary, ordinary rulemaking procedures can be used to address the issue if the product reappears.

2. Disclosures in Advertising and Other Promotional Materials

In the NPR (68 FR at 41894), the Commission proposed to eliminate current disclosure requirements for radio ads in §§ 460.18 and 460.19.[50] Three comments supported the Commission's proposal and none opposed.

The Commission has decided to amend the Rule as proposed. There is no indication that the absence of requirements for television ads, which are exempt from the affirmative disclosure requirements pursuant to §§ 460.18(f) and 460.19(g), has had an adverse impact on consumers over the years. Similarly, the Commission expects that the elimination of radio disclosure requirements will have little impact on consumers. In addition, the lengthy disclosures required by §§ 460.18 and 460.19 are arguably more burdensome for radio than television because the disclosures must necessarily displace significant portions of the ad's message or increase the duration of the ad and hence the advertiser's cost. Required information on fact sheets, labels, and print ads will continue to provide consumers with critical performance information when they shop for insulation or use installers.

3. Disclosures by Installers or New Home Sellers

As discussed in detail in section V.C.2.c. above, the Commission is amending § 460.17 to require loose-fill installers to provide information to customers about initial installed thickness in addition to information currently required by the Rule (*i.e.*, coverage area, R-value, minimum settled thickness, and bag count).[51] In response to comments, the Commission has decided not to include proposed language in § 460.17 about blowing machine settings and the specific requirement related to initial installed thickness instructions (*see* section V.C.2.c.). Existing rule language should provide sufficient direction to installers (§ 460.17 already requires installers to use manufacturer data to determine the installed insulation R-value). In its comments, CIMA (p. 2) urged the Commission to require installers to post "attic cards" for use by homeowners and building inspectors. Attic cards contain information about the installed insulation and are usually posted in the attic near the access opening for later reference by code inspectors and home owners. In the NPR, the Commission addressed this issue and suggested that requirements related to initial installed thickness information on the bag label would be a more direct approach to addressing the issue. (68 FR at 41895). Because the Commission is now requiring disclosures on customer receipts of initial installed thickness, the Commission has determined that the additional burden imposed by an attic card requirement is not warranted.

4. Disclosures by Retailers

Background

In the years since the Commission promulgated the Rule, the nature of retail sales to do-it-yourself consumers has changed. Now insulation packages are usually available to consumers before purchase. Section 460.14 of the Rule requires retailers who sell insulation to do-it-yourself consumers to make the manufacturers' fact sheets available to consumers before purchase in any manner the retailer chooses, as long as consumers are likely to notice the fact sheets. The ANPR explained that the purpose of this requirement is to ensure that consumers have the information about home insulation they need to make cost-based purchasing decisions. (64 FR at 48048). When the Commission promulgated the Rule, bulky insulation packages were not normally available on the retail sales floor, so the consumer would not see the disclosures on labels before purchase. Today, retailers often sell home insulation directly from warehouse-type sales floors where consumers select the packages themselves. The NPR solicited comments on whether to amend the Rule to exempt retailers from making separate fact sheets available at the point of purchase if all the required fact sheet disclosures are made on the insulation package and if the insulation packages are available on the sales floor for the consumer to inspect before purchase. (68 FR at 41896).

Comments

NAIMA (p. 7) supported the Commission's proposed amendment to exempt retailers from providing fact sheets when the very same information may be found on the bag label. It suggested, however, that the Rule clearly require manufacturers to supply retailers with the relevant fact sheets when labels lack the data required to

[50] XPSA (p. 4), NAIMA (pp. 7–8), and PIMA (p. 13). PIMA suggested that the FTC also consider issuing materials to educate consumers about the Rule and the information they need when purchasing home insulation. Over the years the Commission has developed a variety of consumer education items for insulation and other energy-related consumer products. Many of these materials can be found at *www.ftc.gov/energy*. The Commission plans to continue its efforts in this area as appropriate.

[51] The final rule language clarifies that installers must provide information on initial *and* settled thickness. As the Commission stated in the proposed notice, it did not intend to eliminate any existing disclosure requirements (which include settled thickness information) (*see* 68 FR at 41893).

appear on fact sheets. PIMA (p. 12) also supported the proposed change as long as the retailer is responsible for determining whether the package labels contain the necessary information.

Discussion

The Commission has determined to amend the Rule as proposed. This amendment does not change the manufacturers' responsibility to prepare and disseminate fact sheets (*see* § 460.13). Rather, it simply gives individual retailers an option not to make fact sheets available to consumers if the retailer determines the package labels contain the information that would otherwise be in the fact sheets and the packages are displayed in a way that customers can obtain the required information prior to purchase. If a retailer does not want to take the time to compare the labels with the fact sheets, it can always make the fact sheets available to customers as provided by the Rule.

F. Amendments To Update References to ASTM Standards

In addition to the amendments discussed herein, the Commission proposed to amend certain Rule provisions to update referenced ASTM Standards that ASTM has reviewed and updated since the Rule was amended in 1996. Several commenters expressed support for this proposal (*see* PIMA, p. 10, ASTM, and NAIMA, p. 3 and 5). ASTM provided information on the latest version of all the standards mentioned in the Rule. Therefore, the Commission is updating the references to all the ASTM procedures referenced in the Rule. These procedures include: ASTM C 177–04, "Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus;" ASTM C 518–04, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus;" ASTM C 578–03, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation;" ASTM C 591–01, "Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation;" ASTM C 739–03, "Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation;" ASTM C 1029–02, "Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation;" ASTM C 1045–01, "Standard Practice for Calculating Thermal Transmission Properties from Steady-State Conditions;" ASTM C 1114–00, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus;" ASTM C 1149–02, "Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation;" ASTM C 1224–03, "Standard Specification for Reflective Insulation for Building Applications;" ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus" (in place of ASTM C 236–89 and ASTM C 976–90); ASTM C 1371–04a, "Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers;" ASTM C 1374–03, "Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation;" and ASTM E 408–71 (Reapproved 2002), "Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques."

The Commission has also added a new paragraph (e) in § 460.5 to consolidate information regarding incorporation by reference approvals from by the Office of the Federal Register.[52]

G. Comments on New Products

A few comments raised issues about the Rule's coverage of some new products in the market such as a low-density foam for home insulation called "polyicynene" and a weather resistant cellulose product with an aluminum facing called "Thermo-ply." PIMA urged the Commission to reference polyicynene and Thermo-ply in the Rule to remove any doubt that these products are subject to FTC regulation.

The Commission is aware that new insulation product types frequently appear. The requirements of the R-value Rule apply to any material (unless specifically exempted) "mainly used to slow down heat flow." (*See* § 460.2). To the extent that the products identified by the commenters meet this definition, manufacturers and other industry members selling such products must meet all applicable requirements of the Rule.[53] The fact that the Rule does not specifically mention a particular type of insulation does not exempt such products from the Rule's coverage. Therefore, no amendments are needed to address these new products at this time.

H. Effective Date of Amendments

As discussed above in section V.E.1.b., some commenters have indicated that any compliance costs associated with these amendments would be reduced if the Rule provides industry members with sufficient time to make necessary changes to their testing, labeling, or other practices. The Commission agrees with these commenters and has decided to make the effective date of these amendments 180 days after publication, rather than the standard 30 days usually provided.

VI. Regulatory Analysis and Regulatory Flexibility Act Requirements

Under section 22 of the FTC Act, 15 U.S.C. 57b, the Commission must issue a regulatory analysis for a proceeding to amend a rule only when it (1) estimates that the amendment will have an annual effect on the national economy of $100,000,000 or more; (2) estimates that the amendment will cause a substantial change in the cost or price of certain categories of goods or services; or (3) otherwise determines that the amendment will have a significant effect upon covered entities or upon consumers.

Several commenters addressed the economic impact of the proposed Rule. In general, the commenters indicated that the amendments would have a beneficial effect but did not indicate that the amendments would have an annual impact of more than $100,000,000, cause substantial change in the cost of goods, or otherwise have a significant effect upon covered entities or consumers. ICAA (pp. 24–32), which focused on changes to loose-fill labeling requirements, stated that the amendments are likely to reduce energy bills for consumers[54] but not increase their costs.[55]

ICAA (p. 27) acknowledged that there are "some," but only nominal, costs associated with performing tests on loose-fill insulation products under ASTM C 1374 and maintaining related

[52] As indicated in the NPR, the Commission is also amending § 460.23 to correct a typographical error.

[53] For instance, for foamed-in-place insulations (such as polyicynene), sellers must show the R-value of the product at 3½ inches (*see* § 460.13(c)(1)).

[54] Using studies and reports about the deficiency of insulation amounts installed in the past, ICAA's 1992 and 2002 analysis estimated that, if the proposed loose-fill labeling requirement had been in place beginning in 1992, residential consumers would have realized a total economic benefit from energy savings between approximately $49 million and $500 million over that eleven-year period.

[55] ICAA indicated that the amendments for loose-fill insulation will allow home owners to verify installations easily by providing them with a less expensive method than alternatives such as the existing "cookie-cutter" test. In its view, this will also decrease the costs for builders and installers by making it easier for professional loose-fill installers to provide the contracted R-value.

records. It suggested that the initial installed thickness test (ASTM C 1374) "is quite simple to apply and does not require complex or expensive apparatus." Because manufacturers modify product bag labels periodically, ICAA believes any costs associated with the amendments will be negligible and may well represent no incremental cost over current labeling requirements. ICAA also suggested that the initial cost of the amendments to manufacturers can be further minimized by allowing a phase-in period of up to 90-days for implementation of the amended rules.[56]

Finally, PIMA (pp. 21–22) commented generally that use of home insulation delivers a positive impact on the environment because it reduces the use of fossil fuels to heat and cool buildings. In its view, the R-value Rule provides a means to ensure the proper amount of insulation is installed and educates consumers on their insulation purchases. NAIMA and ICAA similarly provided general information about the benefits that insulation products have for pollution reduction, energy savings, and public health. The Commission has analyzed these comments and determined that the proposed amendments to the Rule will not have significant effects on the national economy, on the cost of home insulation products, or on covered parties or consumers.[57] In any event, to the extent, if any, these final rule amendments will have such effects, the Commission has previously explained above the need for, and the objectives of, the final amendments; the regulatory alternatives that the Commission has considered; the projected benefits and adverse economic or other effects, if any, of the amendments; the reasons that the final amendments will attain their intended objectives in a manner consistent with applicable law; the reasons for the particular amendments that the agency has adopted; and the significant issues raised by public comments, including the Commission's assessment of and response to those comments on those issues. See 15 U.S.C. 57b–3(a)(2).

The Regulatory Flexibility Act ("RFA"), 5 U.S.C. 601–12, requires that the agency conduct an analysis of the anticipated economic impact of the proposed amendments on small businesses. The purpose of a regulatory flexibility analysis is to ensure that the agency considers impact on small entities and examines regulatory alternatives that could achieve the regulatory purpose while minimizing burdens on small entities. Section 605 of the RFA, 5 U.S.C. 605, provides that such an analysis is not required if the agency head certifies that the regulatory action will not have a significant economic impact on a substantial number of small entities.

With respect to the Rule's impact on small businesses, ICAA (p. 32) stated that very few loose-fill manufacturers are likely to be "small businesses" as defined by the U.S. Small Business Administration ("SBA").[58] Even so, ICAA believes that any possible adverse economic effects are likely to be small and did not identify any disproportionate impacts from the amendments on large and small builders or insulation contractors.[59]

Because the R-value Rule covers home insulation manufacturers and retailers, professional installers, new home sellers, and testing laboratories, the Commission believes that any amendments to the Rule may affect a substantial number of small businesses. Nevertheless, the proposed amendments would not appear to have a significant economic impact upon such entities. Specifically, the Commission is adopting only a few limited amendments that are designed to clarify the Rule, make disclosure requirements consistent for competing types of loose-fill insulation products as well as batt and blanket insulation products, require the most current procedures for preparing R-value test specimens and conducting R-value tests, provide consumers with information about the initial installed thickness of loose-fill insulation, and provide retailers with an optional method for satisfying the Rule's fact sheet disclosure requirement. The Commission concluded that the proposed amendments will not have a significant or disproportionate impact on the costs of small manufacturers, retailers, installers, new home sellers, and testers of home insulation products. Based on available information, therefore, the Commission certifies that the R-value Rule amendments published in this document will not have a significant economic impact on a substantial number of small businesses.

Nonetheless, to ensure that no such impact, if any, has been overlooked, the Commission has conducted the following final regulatory flexibility analysis, as summarized below.

A. Need for and Objectives of the Rule

As previously discussed, the Commission is issuing these amendments to streamline and increase the Rule's benefits for consumers and sellers, minimize its costs, and respond to the development and utilization of new technologies to make homes more energy efficient and less costly to heat and cool.

B. Significant Issues Raised by Public Comment, Summary of the Agency's Assessment of These Issues, and Changes, if any, Made in Response to Such Comments

The Commission has reviewed the comments received and made changes to the proposed rule as appropriate. Section V of this notice contains a detailed discussion of the comments and the Commission's responses.

C. Description and Estimate of Number of Small Entities Subject of the Final Rule or Explanation Why No Estimate Is Available

In general, under the size standards used by the SBA, the "small business" threshold (measured in number of employees or average annual receipts) in the manufacturing industry is 500 employees; wholesale trade, 100 employees; general and heavy construction, $28.5 million (avg. annual receipts); and special trade contractors, $12 million. See generally 13 CFR part 121. The Commission estimates that there are fewer than 170,000 small entities subject to the R-value Rule (*see* 67 FR 45734, 45736 (July 10, 2002)). These entities include insulation manufacturers and their testing laboratories, insulation installers, new home builders/sellers of site-built homes, manufactured housing dealers, and retail sellers.

D. Description of the Projected Reporting, Recordkeeping, and Other Compliance Requirements of the Rule, Including an Estimate of the Classes of Small Entities That Will Be Subject to the Rule and the Type of Professional Skills That Will Be Necessary To Comply

As discussed in the Paperwork Reduction Act analysis of this notice (section VII.), the amendments will make minor changes to the reporting,

[56] CIMA (p. 1) provided similar comments (*see* section V.E.1.b.i. of this document).

[57] As discussed at section V.H. of this document, the Commission plans to provide industry members 180 days to comply with the Rule?s new requirements.

[58] In general, under the size standards used by the SBA, the "small business" threshold (measured in number of employees or average annual receipts) in the manufacturing industry is 500 employees; wholesale trade, 100 employees; general and heavy construction, $28.5 million (avg. annual receipts); and special trade contractors, $12 million. See generally 13 CFR part 121; and *http://www.sba.gov/size/summary-whatis.html* (summary of SBA size standards).

[59] CIMA (p. 2) and R&D (pp. 3–4) commented that the proposed amendments related to blowing machine settings may have a significant impact on small businesses. The Commission, however, has altered the final amendments to address this concern.

recordkeeping, and other compliance requirements of the Rule. This may affect some small entities such as certain manufacturers and installers. In addition, some of the new testing requirements for manufacturers may require engineering skills (although it is likely that affected entities have access to such skills in their current operations). The incremental cost of the amendments is difficult to estimate. As suggested by the comments, however, the Commission expects that the added costs of the amendments will be very small.

E. Steps the Agency Has Taken To Minimize Any Significant Economic Impact on Small Entities, Consistent With the Stated Objectives of the Applicable Statutes, Including the Factual, Policy and Legal Reasons for Selecting the Alternative(s) Finally Adopted, and Why Each of the Significant Alternatives, if Any, Was Rejected

In response to comments, the Commission has extended the effective date of these amendments to 180 days after publication to minimize the Rule's impact on small entities. This extended date will provide manufacturers with more time to complete the new test required by the amendments. This should reduce the burden by allowing businesses to determine the best and most cost-effective means to comply. In developing these final amendments, the Commission has sought to minimize the burden on small businesses while achieving the intended objectives of the Rule. For example, the Commission has amended § 460.14 to exempt retailers from making separate fact sheets available at the point of purchase if all the required fact sheet disclosures are made on the insulation package and if the insulation packages are available on the sales floor for the consumer to inspect before purchase. In addition, the Commission has decided not to amend the tolerance provision (§ 460.8) as proposed to avoid confusion and unnecessary costs the changes could have imposed on companies subject to the Rule.

VII. Paperwork Reduction Act

The R-value Rule contains various information collection requirements for which the Commission has obtained clearance under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, Office of Management and Budget ("OMB") Control Number 3084–0109. The Commission believed that the proposed rule amendments would not substantially or materially modify the collection of information and related burden estimates but sought comments on any paperwork burden related to the proposed changes to ensure that no significant paperwork burden was being overlooked. (68 FR at 41897). In response, PIMA (pp. 21–22) indicated that there would be no additional paperwork burdens associated with the proposed changes. Similarly, ICAA (p. 26) did not identify any paperwork burden requirements beyond those already identified by the Commission in the proposed rule. ICAA (p. 27) also acknowledged that there may be "some costs" associated with the new loose-fill requirements but such costs would be nominal.

The Commission is adopting a limited number of final rule amendments that are designed to clarify the Rule, make disclosure requirements consistent for competing types of loose-fill insulation products and batt and blanket insulation products, require the most current procedures for preparing R-value test specimens and conducting R-value tests, require initial installed thickness information for loose-fill insulations, eliminate disclosure requirements for radio ads, provide retailers with a method that decreases their compliance burden, and additional minor clarifications and changes.

The Commission believes that any additional burden resulting from certain amendments will be offset (or possibly exceeded) by other amendments that eliminate disclosure requirements for radio ads and relieve retailers from providing fact sheets for customers under certain circumstances. The new labeling, testing, and recordkeeping requirements for loose-fill manufacturers affect a subset of the manufacturers in the industry, and according to most comments, would not impose a significant burden. Although those few manufacturers producing batts or blankets from materials other than mineral fiber may have to add information to their coverage charts, the Commission believes, based on staff's knowledge of the industry that at least some of these entities voluntarily are providing this information already. In addition, ICAA, an installer association, did not identify an increase in paperwork burden for installers.

The rule amendments eliminating disclosure requirements for radio ads and relieving retailers from providing fact sheets in certain circumstances will decrease burden and will affect many more industry members than the small subset of loose-fill manufacturers who may have an increased burden. In sum, the net effect of the rule amendments will not increase burden under the Paperwork Reduction Act.

List of Subjects in 16 CFR Part 460

Advertising, Incorporation by reference, Insulation, Labeling, Reporting and recordkeeping requirements, Trade practices.

VIII. Final Rule Language

■ For the reasons set out in this document, the Commission is adopting the following amendments to 16 CFR part 460.

PART 460—LABELING AND ADVERTISING OF HOME INSULATION

■ 1. The authority citation for part 460 continues to read as follows:

Authority: 38 Stat. 717, as amended (15 U.S.C. 41 *et seq.*).

■ 2. Revise § 460.1 to read as follows:

§ 460.1 What this regulation does.

This regulation deals with home insulation labels, fact sheets, ads, and other promotional materials in or affecting commerce, as "commerce" is defined in the Federal Trade Commission Act. If you are covered by this regulation, breaking any of its rules is an unfair and deceptive act or practice or an unfair method of competition under section 5 of that Act. You can be fined heavily (up to $11,000 plus an adjustment for inflation, under § 1.98 of this chapter) each time you break a rule.

■ 3. Revise § 460.5 to read as follows:

460.5 R-value tests.

R-value measures resistance to heat flow. R-values given in labels, fact sheets, ads, or other promotional materials must be based on tests done under the methods listed below. They were designed by the American Society of Testing and Materials (ASTM). The test methods are:

(a) All types of insulation except aluminum foil must be tested with ASTM C 177–04, "Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus;" ASTM C 518–04, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus;" ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus" or ASTM C 1114–00, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus." The tests must be done at a mean temperature of 75 [degrees] Fahrenheit and with a temperature differential of 50

[degrees] Fahrenheit plus or minus 10 degrees Fahrenheit. The tests must be done on the insulation material alone (excluding any airspace). R-values ("thermal resistance") based upon heat flux measurements according to ASTM C 177–04 or ASTM C 518–04 must be reported only in accordance with the requirements and restrictions of ASTM C 1045–01, "Standard Practice for Calculating Thermal Transmission Properties from Steady-State Conditions."

(1) For polyurethane, polyisocyanurate, and extruded polystyrene, the tests must be done on samples that fully reflect the effect of aging on the product's R-value. To age the sample, follow the procedure in paragraph 4.6.4 of GSA Specification HH–I–530A, or another reliable procedure.

(2) For loose-fill cellulose, the tests must be done at the settled density determined under paragraph 8 of ASTM C 739–03, "Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

(3) For loose-fill mineral wool, self-supported, spray-applied cellulose, and stabilized cellulose, the tests must be done on samples that fully reflect the effect of settling on the product's R-value.

(4) For self-supported spray-applied cellulose, the tests must be done at the density determined pursuant to ASTM C 1149–02, "Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation."

(5) For loose-fill insulations, the initial installed thickness for the product must be determined pursuant to ASTM C 1374–03, "Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation," for R-values of 13, 19, 22, 30, 38, 49 and any other R-values provided on the product's label pursuant to § 460.12.

(b) Single sheet systems of aluminum foil must be tested with ASTM E 408–71 (Reapproved 2002), "Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques," or ASTM C 1371–04a, "Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers." This tests the emissivity of the foil—its power to radiate heat. To get the R-value for a specific emissivity level, air space, and direction of heat flow, use the tables in the most recent edition of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers' (ASHRAE) Fundamentals Handbook, if the product is intended for applications that meet the conditions specified in the tables. You must use the R-value shown for 50[degrees] Fahrenheit, with a temperature differential of 30[degrees] Fahrenheit.

(c) Aluminum foil systems with more than one sheet, and single sheet systems of aluminum foil that are intended for applications that do not meet the conditions specified in the tables in the most recent edition of the ASHRAE Fundamentals Handbook, must be tested with ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus," in a test panel constructed according to ASTM C 1224–03, "Standard Specification for Reflective Insulation for Building Applications," and under the test conditions specified in ASTM C 1224–03. To get the R-value from the results of those tests, use the formula specified in ASTM C 1224–03.

(d) For insulation materials with foil facings, you must test the R-value of the material alone (excluding any air spaces) under the methods listed in paragraph (a) of this section. You can also determine the R-value of the material in conjunction with an air space. You can use one of two methods to do this:

(1) You can test the system, with its air space, under ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus," which is incorporated by reference in paragraph (a) of this section. If you do this, you must follow the rules in paragraph (a) of this section on temperature, aging and settled density.

(2) You can add up the tested R-value of the material and the R-value of the air space. To get the R-value for the air space, you must follow the rules in paragraph (b) of this section.

(e) The standards listed above are incorporated by reference into this section. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Federal Trade Commission, Consumer Response Center, Room 130, 600 Pennsylvania Avenue, NW., Washington, DC 20580, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*. Copies of materials and standards incorporated by reference may be obtained from the issuing organizations listed in this section.

(1) The American Society of Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshocken, PA 19428–2959.

(i) ASTM C 177–04, "Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus."

(ii) ASTM C 518–04, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus."

(iii) ASTM C 739–03, "Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation."

(iv) ASTM C 1045–01, "Standard Practice for Calculating Thermal Transmission Properties from Steady-State Conditions."

(v) ASTM C 1114–00, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus."

(vi) ASTM C 1149–02, "Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation."

(vii) ASTM C 1224–03, "Standard Specification for Reflective Insulation for Building Applications."

(viii) ASTM C 1363–97, "Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus."

(ix) ASTM C 1371–04a, "Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers."

(x) ASTM C 1374–03, "Standard Test Method for Determination of Installed Thickness of Pneumatically Applied Loose-Fill Building Insulation."

(xi) ASTM E 408–71 (Reapproved 2002), "Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques."

(2) U.S. General Services Administration (GSA), 1800 F Street, NW., Washington, DC 20405.

(i) GSA Specification HH–I–530A, Federal Specification, Insulation Board, Thermal (Urethane), November 22, 1971.

(ii) [Reserved]

■ 4. Revise § 460.8 to read as follows:

§ 460.8 R-value tolerances.

If you are a manufacturer of home insulation, no individual specimen of the insulation you sell can have an R-value more than 10% below the R-value shown in a label, fact sheet, ad, or other promotional material for that insulation. If you are not a manufacturer, you can rely on the R-value data given to you by the manufacturer, unless you know or should know that the data is false or not based on the proper tests.

■ 5. Revise § 460.12 to read as follows:

§ 460.12 Labels.

If you are a manufacturer, you must label all packages of your insulation. The labels must contain:

(a) The type of insulation.

(b) A chart showing these items:

(1) For batts and blankets of any type: the R-value, length, width, thickness, and square feet of insulation in the package.

(2) For all loose-fill insulation: the minimum settled thickness, initial installed thickness, maximum net coverage area, number of bags per 1,000 square feet, and minimum weight per square foot at R-values of 13, 19, 22, 30, 38, and 49. You must also give this information for any additional R-values you list on the chart. Labels for these products must state the minimum net weight of the insulation in the package. You must also provide information about the blowing machine and machine settings used to derive the initial installed thickness information.

(3) For boardstock: the R-value, length, width, and thickness of the boards in the package, and the square feet of insulation in the package.

(4) For aluminum foil: the number of foil sheets; the number and thickness of the air spaces; and the R-value provided by that system when the direction of heat flow is up, down, and horizontal. You can show the R-value for only one direction of heat flow if you clearly and conspicuously state that the foil can only be used in that application.

(5) For insulation materials with foil facings, you must follow the rule that applies to the material itself. For example, if you manufacture boardstock with a foil facing, follow paragraph (b)(3) of this section. You can also show the R-value of the insulation when it is installed in conjunction with an air space. This is its "system R-value." If you do this, you must clearly and conspicuously state the conditions under which the system R-value can be attained.

(6) For air duct insulation: the R-value, length, width, thickness, and square feet of insulation in the package.

(c) The following statement: "R means resistance to heat flow. The higher the R-value, the greater the insulating power."

(d) If installation instructions are included on the label or with the package, add this statement: "To get the marked R-value, it is essential that this insulation be installed properly. If you do it yourself, follow the instructions carefully."

(e) If no instructions are included, add this statement: "To get the marked R-value, it is essential that this insulation be installed properly. If you do it yourself, get instructions and follow them carefully. Instructions do not come with this package."

§ 460.13 [Amended]

■ 6. In § 460.13, remove paragraph (d) and redesignate paragraphs (e) and (f) as paragraphs (d) and (e) respectively.

■ 7. Revise § 460.14 to read as follows:

§ 460.14 How retailers must handle fact sheets.

If you sell insulation to do-it-yourself customers, you must have fact sheets for the insulation products you sell. You must make the fact sheets available to your customers. You can decide how to do this, as long as your insulation customers are likely to notice them. For example, you can put them in a display, and let customers take copies of them. You can keep them in a binder at a counter or service desk, and have a sign telling customers where the fact sheets are. You need not make the fact sheets available to customers if you display insulation packages on the sales floor where your insulation customers are likely to notice them and each individual insulation package offered for sale contains all package label and fact sheet disclosures required by §§ 460.12 and 460.13.

■ 8. Revise § 460.17 to read as follows:

§ 460.17 What installers must tell their customers.

If you are an installer, you must give your customers a contract or receipt for the insulation you install. For all insulation except loose-fill and aluminum foil, the receipt must show the coverage area, thickness, and R-value of the insulation you installed. The receipt must be dated and signed by the installer. To figure out the R-value of the insulation, use the data that the manufacturer gives you. If you put insulation in more than one part of the house, put the data for each part on the receipt. You can do this on one receipt, as long as you do not add up the coverage areas or R-values for different parts of the house. Do not multiply the R-value for one inch by the number of inches you installed. For loose-fill, the receipt must show the coverage area, initial installed thickness, minimum settled thickness, R-value, and the number of bags used. For aluminum foil, the receipt must show the number and thickness of the air spaces, the direction of heat flow, and the R-value.

■ 9. In § 460.18, paragraph (e) is removed, and paragraph (f) is redesignated as paragraph (e) and revised to read as follows:

§ 460.18 Insulation ads.

* * * * *

(e) The affirmative disclosure requirements in § 460.18 do not apply to ads on television or radio.

■ 10. In § 460.19, paragraph (g) is revised to read as follows:

§ 460.19 Savings claims.

* * * * *

(g) The affirmative disclosure requirements in § 460.19 do not apply to ads on television or radio.

■ 11. In § 460.23, paragraph (a) is revised to read as follows:

§ 460.23 Other laws, rules, and orders.

(a) If an outstanding FTC Cease and Desist Order applies to you but differs from the rules given here, you can petition to amend the order.

* * * * *

By direction of the Commission.

Donald S. Clark,

Secretary.

[FR Doc. 05–10683 Filed 5–27–05; 8:45 am]

BILLING CODE 6750–01–P

Exhibit 4

EVALUATION REPORT Number: 291

Originally Issued: 05/03/2013 Revised: 05/29/2015 Valid Through: 05/31/2016

EVALUATION SUBJECT:

AA-2 VAPOR SHIELD, M-SHIELD, SILVER SHIELD RADIANT BARRIER, FSK SHIELD, RBI SHIELD AND VR PLUS SHIELD

REPORT HOLDER:

Fi-Foil Company, Inc.
P.O. Box 800
612 Bridgers Ave. West
Auburndale, FL 33823
www.fifoil.com
gbassham@fifoil.com

CSI Division: 07 00 00 – THERMAL AND MOISTURE PROTECTION
CSI Section: 07 21 00 – Thermal Insulation

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2012, 2009, and 2006 International Building Code® (IBC)
- 2012, 2009, and 2006 International Residential Code® (IRC)
- 2012, 2009, and 2006 International Energy Conservation Code® (IECC)
- 2014, 2010 and 2007 Florida Building Code, Building (FBC Building)
- 2014, 2010 and 2007 Florida Building Code, Residential (FBC Residential)
- 2014, 2010 and 2007 Florida Building Code, Energy Conservation (FBC Energy Conservation)

1.2 Evaluated in accordance with:

- ICC-ES AC 02 – Acceptance Criteria for Reflective Insulation, approved June 2011
- ICC-ES AC 220 – Acceptance Criteria for Sheet Radiant Barriers, approved September 2010. *

**Applies only to Silver Shield Radiant Barrier*

1.3 Properties assessed:

- Thermal Resistance
- Surface Burning Characteristics *
- Permeability

**Version of ASTM E84-11 mounted in accordance with ASTM E2599.*

2.0 PRODUCT USE

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are used as reflective insulation intended for use on furred-out masonry walls, framed walls and roofs, and comply with the following:

Section 720 of the 2012 IBC, 719 of the 2009 and 2006 IBC, Section N1101 of the 2012, 2009 and 2006 IRC, and Sections C303 and R303 of the 2012, 2009 or 2006 IECC.

3.0 PRODUCT DESCRIPTION

3.1 AA-2 Vapor Shield: AA-2 Vapor Shield is a multi-layer reflective insulation intended for use on furred-out masonry and framed walls. As noted in Section 3.1.1 of this report, AA-2 Vapor Shield shall be installed in substantial contact with the unexposed surface of the wall finish. The insulation is available in both non-perforated and perforated versions and in rolls either 16 inches (406 mm) or 24 inches (610 mm) wide containing 500 square feet (46.5 m^2) each. The inner layer is aluminum foil with a minimum 0.00035 inch (0.00889 mm) thickness and an outer layer is natural kraft paper of 35 pounds (15.9 kg) with internal expanders. The internal expanders separate the paper from the foil creating a ⅜ inch (9.5 mm) reflective air space between the layers. The thickness of the second air space is dependent on the thickness of the framing or furring strips.

3.1.1 Installation under the 2012, 2009 and 2006 IBC: AA-2 insulation is permitted to be installed in Type III, IV, and V exterior walls, within ¾, ⅞ and 1-½ inch (19, 22.2 and 38.1 mm) cavities, when placed in such a manner that it is behind and in substantial contact with the unexposed surface of the walls. Figure 1 of this report provides additional details. When installed in this manner, AA-2 Vapor Shield is exempt from surface burning characteristics as set forth in Section 720.2.1 of the 2012 IBC, and Section 719.2.1 of the 2009 and 2006 IBC .

3.1.2 AA-2 Vapor Shield (Standard Non-perforated Version) has a water vapor permeance of 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4 ° F (23°C).

3.1.3 AA-2 Vapor Shield (Hi-Perm Perforated Version) has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4 ° F (23°C).

3.1.4 AA-2 Vapor Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.2 M-Shield: M-Shield is reflective insulation for use on furred-out masonry and framed walls in buildings of Types I, II, III, IV, and V construction. M-Shield incorporates a layer of aluminum foil and synthetic polymers that contain no cellulose. Upon installation the layers separate with internal expanders creating a reflective air space that forms when installed on wood or metal furring strips spaced 16 inches (406 mm) or 24 inches (610 mm) on center. The second reflective air space is dependent upon the thickness of the framing or furring strips.

3.2.1 M-Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.2.2 M- Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.2.3 M-Shield has a water vapor permeance of 5.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4 ° F (23°C).

3.3 Silver Shield Radiant Barrier Silver Shield Radiant Barrier is a double layer reflective insulation and radiant barrier for use in roof systems or attics in buildings of Types I, II, III, IV, and V construction. It is available as perforated in 16 inches (406 mm) or 24 inches (610 mm) wide rolls each containing 500 square feet (46.5 m^2). A 30 inch (762 mm) wide roll containing 250 square feet (23.2 m^2) is also available. Silver Shield Radiant Barrier is formed by an inside layer of PVC film metalized PVC. The outside layer is reinforced aluminum foil kraft paper bonded with a fire retardant adhesive. Upon installation the layers expand to form a reflective air space to provide thermal performance and protect the internal or upper low emittance surface, which reduces the potential effect of dust accumulation.

3.3.1 Silver Shield Radiant Barrier has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.3.2 Silver Shield Radiant Barrier has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) when tested in accordance with Procedure B of ASTM E96 wet cup method at 73.4 ° F (23 °C). The material is vapor transmitting in accordance with ASTM C1313.

3.3.3 Silver Shield Radiant Barrier has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.4 FSK Shield: FSK Shield is a single sheet radiant barrier and insulation facing intended for use in an attic, roof, or wall in buildings of Types I, II, III, IV, and V construction. It is made of 0.0003 inch (0.0076 mm) aluminum foil bonded to 30 pounds (13.6 kg) natural kraft paper with a flame retardant. FSK Facing is available in 54 inch (1,372 mm) wide rolls of 1,000 square feet (92.9 m^2).

3.4.1 FSK Shield (on kraft side and foil side exposed) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E 84-11.

3.4.2 ASTM E84 test values stated in Section 3.4.2.1 through 3.4.2.3 are applicable only to 2006 Editions of the IBC, IRC, and IECC.

3.4.2.1 FSK Shield Facing & Fiberglass Unfaced Batt (R-11) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.2.2 FSK Shield Facing & Fiberglass Unfaced Batt (R-19) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.2.3 FSK Shield Facing & Fiberglass Unfaced Batt (R-30) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.3 FSK Shield has an emittance of less than 0.10 when measured in accordance with ASTM E408.

3.4.4 FSK Shield has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4° F (23°C).

3.5 RBI Shield: RBI Shield (Reflective Bubble Insulation) is intended for use in roofs, floors, and walls in buildings of Types I, II, III, IV, and V construction. RBI is available in both single and double bubble versions in rolls of 125 feet (30.1 m) long and 16 inches (406 mm), 24 inches (610 mm), 48 inches (1,219 mm), 54 inches (1,372 mm), 66 inches (1,676 mm), 72 inches (1,829 mm) and 96 inch (2438 mm) widths. It consists of two layers of air filled bubbles and various options for facings: Metalized film both sides or metalized film on one side and white or black polyethylene on the other. The total thickness of the insulation is $^3/_{16}$ inch (4.76 mm) for the Single Bubble and $^5/_{16}$ inch (7.94 mm) for the Double Bubble.

3.5.1 RBI Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.5.2 RBI Shield has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 70.5°F (21.4 °C) and 50.5 % relative humidity.

3.5.3 RBI Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.6 VR Plus Shield: VR Plus Shield is a triple layer reflective insulation for use on furred-out masonry and frame walls. It is available in both non-perforated and perforated versions and in rolls either 16 inches (406 mm) or 24 inches (610 mm) wide containing 500 square feet (46.5 m^2) each. The outer layer consists of 35 pound (15.9 kg) white kraft paper coated with polyethylene, a layer of 30 pounds (13.6 kg) natural kraft paper laminated to a minimum 0.00025 inch (0.00635

mm) aluminum foil, and a layer of minimum 0.00035 inch (0.00889 mm) aluminum foil. Upon installation, the layers open using internal expanders that form internal airspace ranging between ¼ inch (6.4mm) and ½ inch (12.7 mm).The thickness of the third airspace is dependent on the thickness of the furring strips or the wall studs.

3.6.1 VR Plus Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84.

3.6.2 VR Plus Shield non perforated version has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) .in accordance with Procedure A of ASTM E96 dry cup method at 73.4° F (23° C).

3.6.3 VR Plus Shield perforated version has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) in accordance with Procedure B of ASTM E96 wet cup method at 73.4 ° F (23°C).

4.0 DESIGN AND INSTALLATION

4.1.1. AA-2 Vapor Shield at ¾ inch (19.1 mm) thick with nominal 1 inch (25.4 mm) x 2 inch (50.8 mm) furring strips 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 4.2 hr ft^2 °F/Btu and the perforated type yielded an R-value of 4.1 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.1.2. AA-2 Vapor Shield at $^7/_8$ inch (22.2 mm) x 1.5 inch (38.1 mm) furring strips spaced 16 inches (405 mm) on center for the non-perforated type yielded an R-value of 4.7 hr ft^2 °F/Btu and the perforated type yielded an R-value of 4.6 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.1.3 AA-2 Vapor Shield at 1.5 inch (38.1 mm) x 1.5 inch (38.1mm) furring strips spaced 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 5.2 hr ft^2 °F/Btu and the perforated type yielded an R-value of 5.1 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.2 M-Shield Thermal Resistance

4.2.1. M-Shield at ¾ inch (19.1 mm) thick with a nominal 1 inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced 16 inches (406 mm) on center yielded an R-value of 4.1 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.2.2. M-Shield at $^7/_8$ inch (22.2 mm) x 1.5 inch (38.1 mm) furring strips spaced 16 inches (406 mm) on center yielded an R-value of 4.6 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.2.3. M-Shield at 1.5 inch (38.1 mm) x 1.5 inch (38.1 mm) furring strips spaced 16 inches (406 mm) on center yielded an R-value of 5.1 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.3 RBI Shield Thermal Resistance

4.3.1 RBI Shield at 1 inch (25.4 mm) x 1 - $^7/_{16}$ inch (36.5 mm) studs spaced 16 inches (406 mm) on center forming a 1 inch (25.4 mm) air space above the RBI and the bottom open to below. This consists of 1 inch (25.4 mm) of air within the cavity, insulation, and bottom surface air resistance. The RBI Shield shall be oriented with the metalized film facing the 1 inch (25.4 mm) air space and the white plastic facing down. The calculated R-value yielded 6.36 hr ft^2 °F/Btu. The RBI Shield having two foil sides in which heat flows down yielded an R-value of 9.78 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and C1224.

4.3.2 RBI Shield at 8 inch (203 mm) x 1 – ½ inch (38.1 mm) studs forming an 8 inch (203 mm) horizontal air space above the RBI and the bottom open to below. This consists of 8 inch (203 mm) of air within the cavity, insulation, and bottom surface air resistance. The RBI Shield™ shall be oriented with the metalized film facing the 8 inch (203 mm) air space and the white plastic facing down. The calculated R-value yielded 7.63 hr ft^2 °F/Btu. The RBI Shield having two foil sides in which heat flows down yielded an R-value of 11.16 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and derived according to ASTM C1224.

The small cavity aspect ratio of 30.5 inch (775 mm)/ 8 inch (203 mm) requires that additional radiant transfer items be considered that are neglected in the strict ASTM C1224 procedure. Specifically there is also radiation heat exchange between the hot plywood cover surfaces and the long intermediate temperature stud surfaces, as well as the hot plywood cover surfaces and the short, intermediate temperature end frame sections. When these are considered the air space above, RBI, and the air space below yielded an R-value of 13.7 hr ft^2 °F/Btu for the white undercoating and 17.4 hr ft^2 °F/Btu for the reflective undercoating.

4.3.3 Calculated R-values for RBI

Table 4.3.3
Calculated R-Value for RBI[1,2]
(units of R= hr ft² °F/Btu)
Foil Emissivity = 0.03

Air space thickness above RBI Insulation	White & Foil[3]	Black & Foil[3]	Foil & Foil
1" Air space above with R=4.92	7	7	10
2.5" Air space above R=8.01	10	10	13
3.5" Air space above R=9.84	11	11	15
6" to 8" Air space above R is approximately 11.5[4]	13[4] Approximate	13[4] Approximate	17[4] Approximate

1. R-values shown include resistance of upper air space, RBI, and lower or room air resistance.
2. In these calculations, the RBI material itself has an R-value of 0.70.
3. Where white/foil RBI material is used, the foil side faces up into the cavity.
4. Calculated values are approximate for this depth of air space.

The calculated R-values in Table 4.3.3 of this report are for the ceiling-roof RBI application at different air space thicknesses and for emissivity of 0.03 for heat flow down. The air space depth shown is the distance from upper surface of insulation to inside of ceiling-roof, and the R-value shown in column is achieved by the air space alone. The insulation is suspended above an open room. The open air space below the insulation has an R-value of 0.92 for the RBI White/Foil and 4.55 for the RBI Foil/Foil.

4.4 Installation shall be in accordance with this report; the manufacturer's published installation instructions and the applicable code; the manufacturer's published installation instructions shall be available on the job site. In the event of a conflict between this report and the installation instructions, the more restrictive assumes governance.

4.5 VR Plus Shield Thermal Resistance

4.5.1 VR Plus Shield at 1 inch (24 mm) thick formed by furring strips 16 inches (406 mm) on center for the perforated type yielded an R-value of 5.0 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.5.2 VR Plus Shield at 1.5 inches (38 mm) with two furring strips of 1 inch (24 mm) and ½ inch (13 mm) thick placed 16 inches (406 mm) on center for the non- at a mean temperature of 75°F (24°C) perforated type yielded an R-value of 7.1 hr ft² °F/Btu and the perforated type yielded an R-value of 7.0 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

5.0 LIMITATIONS

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, with the following conditions:

5.1 Installation shall comply with this report; the manufacturer's published installation instructions and the applicable code. In the event of a conflict between this report and the installation instructions, the more restrictive assumes governance.

5.2 AA-2 Vapor Shield shall be installed in concealed spaces in buildings of Type III, IV or V construction, in the flame spread and smoke developed limitations do not apply to the AA-2 Vapor Shield since it is installed behind and in substantial contact with the unexposed surface of the wall finish as per Sections 720.2.1 of the 2012 IBC, and 719.2.1 of the 2009 IBC and 2006 IBC.

5.3 Silver Shield Radiant Barrier shall not be installed on the attic floor.

5.4 For recognition under the Florida Building Code: The Fi-Foil AA-2 Vapor Shield, M Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield, and VR Plus Shield products described in this report comply with the Florida Building Code as described in Section 1.1. Use and installation shall be in accordance with this report, the manufacturer's published installation instructions, and Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, as applicable.

5.4.1 Compliance with the high-velocity hurricane zone provisions of the FBC, Building, and FBC, Residential, has not been evaluated and is outside the scope of this evaluation report.

5.4.2 For products falling under Florida Rule 61G20-3.001, verification is required that the report holder's quality assurance program is audited by a quality assurance entity, approved by the Florida Building Commission (or the building official when the report holder does not possess an approval by the Commission), to provide oversight and determine that the products are being manufactured as described in this evaluation report to establish continual product performance.

5.5 AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are manufactured in Auburndale, FL, under a quality control program with inspections by IAPMO.

6.0 SUBSTANTIATING DATA

Data and test reports submitted for this report are from laboratories recognized as being in compliance with ISO/IEC 17025 and the following:

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Reflective Insulation (AC 02), approved June 2011.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Sheet Radiant Barriers (AC 220), approved September 2010.

6.3 Reports of emittance, humidity resistance, adhesive performance, and fungi resistance testing in accordance with, and meeting the thermal resistance parameters in Section 9.7 of, ASTM C1224.

7.0 IDENTIFICATION

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are marked with one of the IAPMO Uniform ES Marks of Conformity and the Evaluation Report Number (ER-291).

IAPMO ES ® or UES ™

IAPMO ER #291

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

FIGURE 1: AA-2 VAPOR SHIELD DETAIL

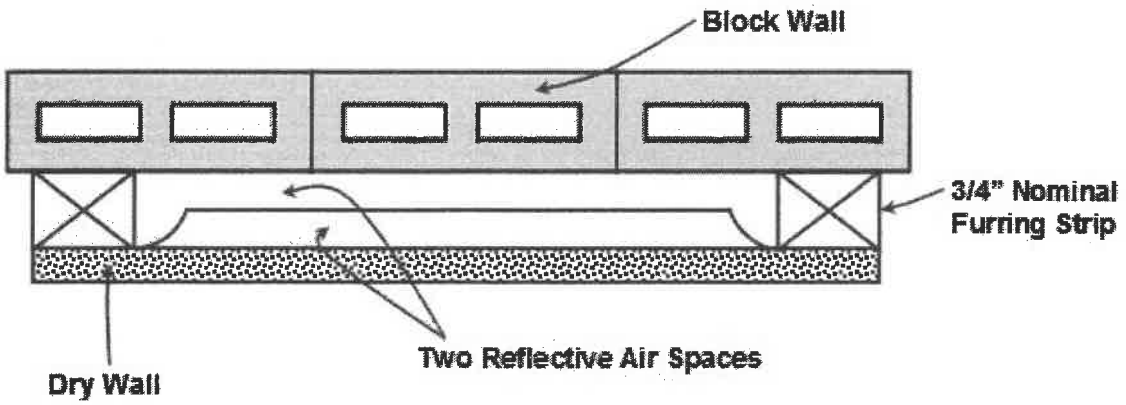


Exhibit 5

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ICC

AAA

NEWS RELEASE

For Immediate Release
September 20, 2016
www.iccsafe.org

Contact: Trey Hughes
1-888-ICC-SAFE (422-7233), ext. 5237
thughes@iccsafe.org

U.S. Federal District Court Clears Path for ICC Copyright Complaint against IAPMO

A Federal Court on Monday cleared the path for ICC Evaluation Service, LLC (ICC-ES) to proceed with its copyright infringement complaint against the International Association of Plumbing and Mechanical Officials, Inc. (IAPMO) when the court denied IAPMO's motion to have the case dismissed.

On January 13, 2016, ICC-ES, a subsidiary of the International Code Council (ICC), filed a lawsuit against IAPMO and IAPMO Evaluation Service, LLC, in the U.S. District Court for the District of Columbia, alleging the willful and unauthorized copying of at least seventeen ICC-ES copyrighted works, including fourteen ICC-ES evaluation reports and four acceptance criteria that thousands of designers, manufacturers, and building safety and fire prevention professionals rely on to ensure the highest standards of construction safety across the United States.

IAPMO responded by asking the Court to dismiss the case.

In a 25-page opinion, U.S. District Judge Emmet G. Sullivan struck down IAPMO's arguments to dismiss ICC-ES' Federal copyright claims as "unavailing," noting that side-by-side comparisons of ICC-ES' copyrighted materials with IAPMO's allegedly infringing works that were presented to the Court as evidence along with ICC-ES' complaint, "could permit a reasonable observer to conclude that appropriation occurred."

IAPMO now must submit an answer to the Court responding to ICC-ES' copyright infringement claim by October 3, 2016.

###

About the International Code Council

The International Code Council is a member-focused association. It is dedicated to developing model codes and standards used in the design, build and compliance process to construct safe, sustainable, affordable and resilient structures. Most U.S. communities and many global markets choose the International Codes.

Exhibit 6

ICC EVALUATION SERVICE

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ACCEPTANCE CRITERIA FOR REFLECTIVE INSULATION

AC02

Approved June 2011

Compliance date March 1, 2012

Previously approved July 2010, June 2006, November 2005, June 2005, September 2004, February 2004

PREFACE

Evaluation reports issued by ICC Evaluation Service, LLC (ICC-ES), are based upon performance features of the International family of codes. (Some reports may also reference older code families such as the BOCA National Codes, the Standard Codes, and the Uniform Codes.) Section 104.11 of the *International Building Code®* reads as follows:

> The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

This acceptance criteria has been issued to provide interested parties with guidelines for demonstrating compliance with performance features of the codes referenced in the criteria. The criteria was developed through a transparent process involving public hearings of the ICC-ES Evaluation Committee, and/or on-line postings where public comment was solicited.

New acceptance criteria will only have an "approved" date, which is the date the document was approved by the Evaluation Committee. When existing acceptance criteria are revised, the Evaluation Committee will decide whether the revised document should carry only an "approved" date, or an "approved" date combined with a "compliance" date. The compliance date is the date by which relevant evaluation reports must comply with the requirements of the criteria. See the ICC-ES web site for more information on compliance dates.

If this criteria is a revised edition, a solid vertical line (|) in the margin within the criteria indicates a technical change from the previous edition. A deletion indicator (→) is provided in the margin where wording has been deleted if the deletion involved a technical change.

ICC-ES may consider alternate criteria for report approval, provided the report applicant submits data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. ICC-ES retains the right to refuse to issue or renew any evaluation report, if the applicable product, material, or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause injury or unreasonable damage.

NOTE: The Preface for ICC-ES acceptance criteria was revised in July 2011 to reflect changes in policy.

Acceptance criteria are developed for use solely by ICC-ES for purposes of issuing ICC-ES evaluation reports.

ACCEPTANCE CRITERIA FOR REFLECTIVE INSULATION (AC02)

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for reflective insulations to be recognized in an ICC Evaluation Service, LLC (ICC-ES), evaluation report under the 2009 and 2006 *International Building Code®* (IBC), the 2009 and 2006 *International Residential Code®* (IRC), the 2009 and 2006 *International Mechanical Code®* (IMC), and the 2009 and 2006 *International Energy Conservation Code®* (IECC). The bases of recognition include IBC Sections 104.11, 719, and (2009 IBC) 2613, IMC Sections 105.2, 602.2.1 and 604, IRC Sections R104.11, R302.10 and R316, and IECC *R*-value requirements.

The reason for development of this criteria is to provide guidelines for evaluating materials, *R*-values, emissivity and surface burning characteristics of reflective insulations (consisting of reflective foil insulations, reflective metalized surface insulations and reflective plastic core insulations).

1.2 Scope: This acceptance criteria is intended to establish *R*-values and surface burning characteristics for reflective insulations, as they are defined in this acceptance criteria, installed in general thermal envelope applications or on air ducts. Reflective insulation products are installed in the cavities of stud, roof rafter and floor joist spaces with the insulation either in direct contact with the sheathing or spaced away from the sheathing. This criteria does not cover sheet radiant barriers, which are addressed in the ICC-ES Acceptance Criteria for Sheet Radiant Barriers (AC220).

1.3 Codes and Referenced Standards:

1.3.1 2009 and 2006 *International Building Code®* (IBC), International Code Council.

1.3.2 2009 and 2006 *International Residential Code®* (IRC), International Code Council.

1.3.3 2009 and 2006 *International Mechanical Code®* (IMC), International Code Council.

1.3.4 2009 and 2006 *International Energy Conservation Code®* (IECC), International Code Council.

1.3.5 ASTM C 168-10, Standard Terminology Relating to Thermal Insulating Materials, ASTM International.

1.3.6 ASTM C 335-03a, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation, ASTM International.

1.3.7 ASTM C 411-05 (2009 IBC), -97 (2006 IBC) Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation, ASTM International.

1.3.8 ASTM C 518-04, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus, ASTM International.

1.3.9 ASTM C 1224-01, Standard Specification for Reflective Insulation for Building Applications, ASTM International.

1.3.10 ASTM C 1363-97, Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus, ASTM International.

1.3.11 ASTM C 1371-98, Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers, ASTM International.

1.3.12 ASTM C1668-10, Standard Specification for Externally Applied Reflective Insulation Systems on Rigid Duct in Heating, Ventilation, and Air Conditions (HVAC) Systems, ASTM International.

1.3.13 ASTM E-84-09c (2009 IBC), -04, (2006 IBC) Standard Test Method for Surface Burning Characteristics of Building Materials, ASTM International.

1.3.14 ASTM E 96-05 (2009 IBC), -00e01 (2006 IBC) Standard Test Method for Water Vapor Transmission of Materials, ASTM International.

1.3.15 ASTM E 2599-09a, (2009 IBC) Standard Practice for Specimen Preparation and Mounting of Reflective Insulation Materials and Radiant Barrier Materials for Building Applications to Assess Surface Burning Characteristics, ASTM International.

1.3.16 ASTM E 408-71, Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques, ASTM International.

1.3.17 ASTM E 970-00, Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source, ASTM International.

1.3.18 NFPA 286-06, Standard Method of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, National Fire Protection Association.

1.3.19 UL 723-03 with revisions through May 2005, Standard Test for Surface Burning Characteristics of Building Materials, Underwriters Laboratories, Inc.

1.4 Definitions: For definitions of terms not covered herein, see ASTM C 168.

1.4.1 Reflective insulations: Reflective insulation materials consist of one or more low-emittance surfaces, such as metallic foil or metallic deposits, unmounted or mounted on substrates. Reflective insulations derive their thermal performance from surfaces with an emittance of 0.1 or less, facing enclosed air spaces, yielding a reduction in radiant heat transfer. For purposes of this criteria, reflective Insulations are classified into three types with requirements as noted herein: (1) reflective foil insulation; (2) reflective metalized surface insulation; and (3) reflective plastic core insulation. See category definitions following:

1.4.1.1 Reflective Foil Insulation: Thermal insulation consisting of one or more low-emittance surfaces, typically of metallic foil bounding one or more enclosed air spaces.

1.4.1.2 Reflective Metalized Surface Insulation: This insulation is the same as reflective foil insulation except that the reflective surface is formed by a process of adding metal to a substrate.

1.4.1.3 Reflective Plastic Core Insulations: Reflective plastic core insulation is an insulation material packaged in rolls, that is less than 0.5 inch thick, with at least one exterior low-emittance surface (0.1 or less) and

a core material containing voids or cells. Plastic cores include foam plastic cores and "bubblewrap" insulations. This definition excludes foam plastic insulation boards with reflective surfaces ½ inch or more in thickness, and products incorporating field-applied spray foam plastic insulations.

1.4.2 Core Materials: Core materials are materials laminated to or between one or more layers of low-emittance surface materials to produce a finished product. Plastic core materials that may be used in reflective plastic core insulations include cellular plastics, plastic foams, polymer bubblepack; or polymer foams. Other core materials that may be used in reflective insulations can include fibrous materials like fiberglass, cellulose, cotton; paper, aluminum foil and other single-sheet materials.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description: Complete information concerning material specifications, thickness, size and the manufacturing process.

2.1.2 Installation Instructions: Installation details and limitations, field cutting, fastening methods, joint treatments, and face treatments.

2.1.3 Packaging and Identification: A description of the method of packaging and field identification of the insulation material. Identification provisions shall include the evaluation report number, the name of the report holder, the product name, the surface burning characteristics, the thermal resistance (*R*-value) of the duct insulation, the wording "See ESR-XXXX for the thermal resistance (R-value) of the assembly or assemblies," and information sufficient to determine that the end use will comply with the applicable code requirements.

2.1.4 Field Preparation: A description of the methods of field-cutting and application.

2.2 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

2.3 Test Reports: Test reports shall comply with AC85. Reports of tests in accordance with ASTM C 1363 shall also include dimensional cross-sectional drawings.

2.4 Product Sampling: Sampling of products for testing must be in accordance with Section 3.1 of AC85.

3.0 TEST METHODS AND PERFORMANCE REQUIREMENTS

3.1 General:

3.1.1 Reflective insulations addressed by this criteria which are intended for thermal envelope applications shall comply with Sections 3.2 through 3.7. Insulations for use on air ducts shall comply with Section.3.8

3.1.2 IECC. When evaluated against the thermal resistance *R*-value requirements of the IECC:

3.1.2.1 Thermal Envelope Applications: Evidence of compliance with the applicable *R*-value requirements in the IECC shall be submitted.

3.1.2.2 Air duct applications: Insulations intended for application on air ducts shall comply with IECC Sections 403.2 and 503.2.7, as applicable.

3.2 ASTM C1224. The following tests shall be conducted in accordance with, and meet the conditions of acceptance of, ASTM C 1224: emittance, humidity resistance, adhesive performance (bleeding, delamination and pliability) and fungi resistance. Exception: Emittance may be tested in accordance with ASTM C 1371, as specified in ASTM C 1224, or in accordance with ASTM E 408, as specified in Section 3.3.

3.3 Low emittance Surfaces:

3.3.1 Foil and metalized surfaces shall have an emittance, after lamination, no greater than 0.10 when measured in accordance with ASTM E 408 or ASTM C 1371.

3.4 Thermal Resistance:

3.4.1 General: Thermal performance of the assembly or assemblies shall be determined using ASTM C1363 testing procedures and the parameters noted in Section 9.7 of ASTM C 1224 Thermal resistance (R-value) of duct insulation shall be determined in accordance with Section 3.8.4.

3.4.2 The assembly or assemblies shall be tested with heat flow in the direction for which recognition is sought.

3.4.3 Thermal performance (R-values) of the assembly or assemblies shall be reported for heat flow direction for the intended applications.

3.4.4 Insulation installation shall be representative of typical assemblies for which recognition is sought.

3.5 Surface-burning Characteristics:

3.5.1 Flame-spread and Smoke Developed Testing: Surface-burning characteristics shall be determined in accordance with, ASTM E 84 or UL 723, and shall not exceed a flame-spread index of 25 and a smoke-developed index of 450.

EXCEPTIONS:

1. Reflective plastic core insulations evaluated under the 2009 IBC may be tested in accordance with NFPA 286 when installed at the maximum thickness and density intended for use in the assembly for which recognition is sought. When tested in accordance with NFPA 286, the conditions of acceptance shall be in accordance with 2009 IBC Section 803.1.2.1.

2. For reflective foil insulations and reflective metalized surface insulations (not applicable to reflective plastic core insulations):

   a. Under the IBC in buildings of Type I and II construction: insulations placed between two layers of noncombustible materials without an intervening airspace shall be allowed to have a flame-spread index of 100.

   b. Under the IBC in buildings of Type I and II construction: insulation installed between a finished floor and solid decking without intervening airspace shall be allowed to have a flame-spread index of not more than 200.

   c. Under the IBC in buildings of Type III, IV or V construction, or under the IRC, flame-spread and

smoke-developed limitations do not apply to facings, coverings, and layers of reflective foil or reflective metalized surfaces that are installed behind and in substantial contact with the unexposed surface of the ceiling, wall or floor finish.

3. Reflective plastic core insulations evaluated under the IRC only shall not exceed a flame-spread index of 75 when evaluated under ASTM E 84 or UL 723.

3.5.2 Mounting of Test Assemblies for Surface Burning Testing: Reflective foil insulations and reflective metalized surface insulations are mounted in accordance with ASTM E 84. Reflective plastic core specimen preparation and mounting of test materials shall be in accordance with either Section 3.5.2.1 or 3.5.2.2:

3.5.2.1 Under the 2006 IBC test specimens are mounted in accordance with ASTM E 84.

3.5.2.2 Under the 2009 IBC, test specimens are mounted in accordance with ASTM E 2599, or the insulation may be mounted in the tunnel on 2-inch-high (51 mm) metal frames so as to create an air space between the unexposed face and the lid of the test apparatus.

3.6 Water Vapor Transmission: Reflective insulations shall be tested for permeance in accordance with the desiccant method (Procedure A) of ASTM E 96.

3.6.1 Reflective insulations intended to provide resistance to water vapor transport shall have a maximum water vapor permeance of 1.0 perm (grains/ft^2·h·inch Hg) .

3.6.2 Reflective insulations intended to allow passage of water vapor shall have a minimum water vapor permeance of 5 perms (grains/ft^2·h·inch Hg).

3.7 Installation on Attic Floors: If the product is to be installed exposed on an attic floor, results of tests in accordance with ASTM E 970 shall be submitted showing a critical radiant flux of not less than 0.12 watt per square centimeter.

3.8 Reflective Insulation for Use as Air Duct Insulation:

3.8.1 General. Reflective Insulations recognized for use as air duct insulation shall comply with ASTM C1668 or sections 3.8.2 through 3.8.5.

3.8.2 Surface-burning characteristics shall be determined in accordance with ASTM E 84, or UL723 and shall not exceed a flame-spread index of 25 and a smoke-developed index of 50 When tested in accordance with ASTM E 84, test specimens are to be mounted in accordance with ASTM E 2231 as specified in Section 6.8 of ASTM E 84.

3.8.3 When tested in accordance with ASTM C 411 at the higher of the exposed temperature or 250°F (121°C), the insulation shall not flame, glow, smolder or smoke. The report shall state the temperature indicated by testing as the maximum the insulation shall be exposed to in the field.

3.8.4 *R*-values shall be determined using ASTM C 518 on flat sections at a mean temperature of 75°F (23.9°C). The report shall specify the insulation *R*-value without air film resistance.

Exception: In the case of reflective insulation systems which include enclosed air spaces, testing at a mean temperature of 75°F (23.9°C) in accordance with ASTM C 335 is permitted in lieu of the ASTM C 518 testing required by Section 3.8.4.

3.8.5 When recognition is sought for use on cooling ducts without an additional vapor retarder, the permeance shall be 0.02 perm [2.87 ng/(Pa•s•m^2)] or less when testing is in accordance with Section 3.6 above.

4.0 QUALITY CONTROL

4.1 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

4.2 Third-party follow-up inspections are not required under this acceptance criteria.

EXCEPTION TO SECTION 4.0: Reflective foil insulations containing foam plastic shall also satisfy AC12.

5.0 EVALUATION REPORT RECOGNITION

General: The evaluation report shall specify the intended uses, product materials, installation procedures and configurations, thermal resistance (*R*-value) of the duct insulation, thermal resistance (*R*-values) of the assembly or assemblies including direction of heat flow, cross-sectional figures of typical assembly installations, surface burning characteristics, water vapor transmission ratings (if intended to provide resistance to water vapor transport), and critical radiant flux ratings (if intended for installation on attic floors).

5.1 The evaluation report shall specify the construction types for which the reflective insulation has been recognized.

5.2 The evaluation report shall state, when applicable, that reflective insulation for use on air ducts must be installed in accordance with the applicable requirements of IMC Chapter 6.

5.3 The evaluation report shall state that ducts operating at temperatures exceeding 120°F (49°C) must be provided with sufficient thermal insulation to limit the exposed surface temperature to 120°F (49°C),

5.4 Reflective plastic core insulations containing foam plastic shall be separated from the interior of the building by a minimum 15-minute thermal barrier unless successfully tested in accordance with Section 3.5.1 Exception 1.■

Exhibit 7

Gmail by Google

EXHIBIT 1

1

Report 291

dermot@iiproducts.com <dermot@iiproducts.com>
To: brian.gerber@uniform-es.org

Mon, Apr 9, 2018 at 9:35 AM

Brian

Please find attached letter relating to our telephone conversation friday.

Dermot Ennis
International Insulation Products LLC
4938 South Atlanta Rd Suite, 700
Atlanta , GA 30339
Ph: 678-646-1251
dermot@iiproducts.com

Evaluation Report Letter.pdf
39K

Brian Gerber

Brian

This letter is to follow up on our telephone conversation relating to your evaluation report 291 (Originally Issued: 05/03/2013, Revised 04/02/2018, Valid Through: 05/31/2019) as it relates to the following three products: AA2, M-Shield and VR Plus. Manufactured by Fi Foil of Aubendale Florida

Fifoil was informed recently that their product was not in compliance with Florida building code due to the fact that they did not appear to have tested their product 24 on center in your report 291 from two days ago. It only listed in the section 4.0 Design and Installation that if the furring strips where spaced 16 on center to determine r-value. Overnight the report was changed to show not only 16 on center but also include 24 on center. The changing of the furring strips changes the r-value. There was no way appropriate testing (not calculations) could have been performed to validate this claim in two days. We have consulted two accredited testing labs and we have conducted the testing on our product to prove this correct.

Another change was made to the whole scope of the evaluation report by adding the words "insulation only" in the same section relating to each product even though this is in direct conflict with the data referenced in your report. ASTM C16 committee members we shared this report with confirmed this. We have had FiFoil products independently tested and documented at certified labs and these lab results back up our findings.

Falsifying documentation and reports is a violation. When it leads to harm in the market place, it is subject to fines, penalties and reparations. We have retained counsel and are prepared to use all means available to rectify this matter. I was asked to contact you to give you the opportunity to correct any oversight you may have made in referenced to this report.

Thank you for taking the time to review this complaint. I look forward to hearing from your complaint administrator and can forward any information to them to support this complaint per your operating standards.

Sincerely,

Dermot Ennis

Exhibit 8

Gmail by Google

EXHIBIT 8

8

Fwd: Your April 9, 2018 letter on ER-291

Dermot Ennis <dermot@iiproducts.com>
To: Dermot Ennis <dermot@iiproducts.com> Mon, Jul 8, 2019 at 8:44 AM

Dermot Ennis
4938 South Atlanta Rd
Suite 700
30332
678-646-1251

---------- Forwarded message ---------
From: **Dermot Ennis** <dermot@iiproducts.com>
Date: Thu, Jun 20, 2019 at 7:56 PM
Subject: Fwd: Your April 9, 2018 letter on ER-291
To: Laura Boehmer <boehmer@sostrategy.com>

Over one year after I issued the complaint they finally responded. They as guilty as Fi Foil
Dermot Ennis
4938 South Atlanta Rd
Suite 700
30339
678-646-1251

---------- Forwarded message ---------
From: **Rafael Donado** <rafael.donado@uniform-es.org>
Date: Thu, Jun 20, 2019 at 7:28 PM
Subject: Your April 9, 2018 letter on ER-291
To: dermot@iiproducts.com <dermot@iiproducts.com>

Hello Mr. Ennis,

Back on April 9, 2018, you issued a letter with a few questions on ER-291 by Fi-Foil. Your inquiry was filed as a complaint, as it raised a few questions on the content of ER-291.

In reply to the questions, ER-291 was revised to address your concerns. The IAPMO UES Complaint Committee accepted this action as resolution of the issues raised. Therefore, the complaint is closed.

Thank you for your interest in IAPMO UES. Let us know if we can be of further assistance.

Best Regards,

Rafael Donado

Product Evaluation Engineer I

IAPMO Uniform Evaluation Service

The IAPMO GROUP-World Headquarters West

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image002.jpg
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Exhibit 9

EVALUATION REPORT Number: 291

Originally Issued: 05/03/2013 Revised: 04/05/2018 Valid Through: 05/31/2019

EVALUATION SUBJECT:
AA-2 VAPOR SHIELD, M-SHIELD, SILVER SHIELD RADIANT BARRIER, FSK SHIELD, RBI SHIELD AND VR PLUS SHIELD

REPORT HOLDER:
Fi-Foil Company, Inc.
P.O. Box 800
612 Bridgers Ave. West
Auburndale, FL 33823
www.fifoil.com
gbassham@fifoil.com

CSI Division: 07 00 00 – THERMAL AND MOISTURE PROTECTION
CSI Section: 07 21 00 – Thermal Insulation

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2015, 2012, 2009, and 2006 International Building Code® (IBC)
- 2015, 2012, 2009, and 2006 International Residential Code® (IRC)
- 2015, 2012, 2009, and 2006 International Energy Conservation Code® (IECC)
- 2017 and 2014Florida Building Code, Building (FBC, Building) – see Supplement
- 2017 and 2014Florida Building Code, Residential (FBC, Residential) – see Supplement
- 2017 and 2014 Florida Building Code, Energy Conservation (FBC, Energy Conservation) – see Supplement

1.2 Evaluated in accordance with:

- ICC-ES AC 02 – Acceptance Criteria for Reflective Insulation, approved June 2011, editorially revised March 2017
- ICC-ES AC 220 – Acceptance Criteria for Sheet Radiant Barriers, approved September 2010, editorially revised September 2013. *

**Applies only to Silver Shield Radiant Barrier*

1.3 Properties assessed:

- Thermal Resistance
- Surface Burning Characteristics *
- Permeability

**Version of ASTM E84-11 mounted in accordance with ASTM E2599.*

2.0 PRODUCT USE

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are used as reflective insulation intended for use on furred-out masonry walls, framed walls and roofs, and comply with the following codes:

Section 720 of the 2015 and 2012 IBC, Section 719 of the 2009 and 2006 IBC, Section N1101 of the 2015, 2012, 2009 and 2006 IRC, and Sections C303 and R303 of the 2015, 2012, 2009 or 2006 IECC.

3.0 PRODUCT DESCRIPTION

3.1 AA-2 Vapor Shield: AA-2 Vapor Shield is a multi-layer reflective insulation intended for use on furred-out masonry and framed walls. As noted in Section 3.1.1 of this report, AA-2 Vapor Shield shall be installed in substantial contact with the unexposed surface of the wall finish. The insulation is available in both non-perforated and perforated versions and in rolls either 16 inches (406 mm) or 24 inches (610 mm) wide containing 500 square feet (46.5 m^2) each. The inner layer is aluminum foil with a minimum 0.00035-inch (0.00889 mm) thickness and an outer layer is natural kraft paper of 35 pounds (15.9 kg) with internal expanders. The internal expanders separate the paper from the foil creating a ⅜ inch (9.5 mm) reflective air space between the layers. The thickness of the second air space is dependent on the thickness of the framing or furring strips.

3.1.1 Installation under the 2015, 2012, 2009 and 2006 IBC: AA-2 insulation is permitted to be installed in Type III, IV, and V exterior walls, within ¾, ⅞ and 1½ inch (19, 22.2 and 38.1 mm) cavities, when placed in such a manner that it is behind and in substantial contact with the unexposed surface of the walls. Figure 1 of this report provides additional details. When installed in this manner, AA-2 Vapor Shield is exempt from surface burning characteristics as set forth in Section 720.2.1 of the 2015 and 2012 IBC, and Section 719.2.1 of the 2009 and 2006 IBC.

3.1.2 AA-2 Vapor Shield (Standard Non-Perforated Version) has a water vapor permeance of 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4 ° F (23°C).

3.1.3 AA-2 Vapor Shield (Hi-Perm Perforated Version) has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4 ° F (23°C).

3.1.4 AA-2 Vapor Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.2 M-Shield: M-Shield is reflective insulation for use on furred-out masonry and framed walls in buildings of Types I, II, III, IV, and V construction. M-Shield incorporates a layer of aluminum foil and synthetic polymers that contain no cellulose. Upon installation, the layers separate with internal expanders creating a reflective air space that forms when installed on wood or metal furring strips spaced 16 inches (406 mm) or 24 inches (610 mm) on center. The second reflective air space is dependent upon the thickness of the framing or furring strips.

3.2.1 M-Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.2.2 M-Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.2.3 M-Shield has a water vapor permeance of 5.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4°F (23°C).

3.3 Silver Shield Radiant Barrier Silver Shield Radiant Barrier is a double layer reflective insulation and radiant barrier for use in roof systems or attics in buildings of Types I, II, III, IV, and V construction. It is available as perforated in 16 inches (406 mm) or 24 inches (610 mm) wide rolls each containing 500 square feet (46.5 m^2). A 30 inch (762 mm) wide roll containing 250 square feet (23.2 m^2) is also available. Silver Shield Radiant Barrier is formed by an inside layer of PVC film metalized PVC. The outside layer is reinforced aluminum foil kraft paper bonded with a fire-retardant adhesive. Upon installation, the layers expand to form a reflective air space to provide thermal performance and protect the internal or upper low emittance surface, which reduces the potential effect of dust accumulation.

3.3.1 Silver Shield Radiant Barrier has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.3.2 Silver Shield Radiant Barrier has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) when tested in accordance with Procedure B of ASTM E96 wet cup method at 73.4°F (23°C). The material is vapor transmitting in accordance with ASTM C1313.

3.3.3 Silver Shield Radiant Barrier has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.4 FSK Shield: FSK Shield is a single sheet radiant barrier and insulation facing intended for use in an attic, roof, or wall in buildings of Types I, II, III, IV, and V construction. It is made of 0.0003-inch (0.0076 mm) aluminum foil bonded to 30 pounds (13.6 kg) natural kraft paper with a flame retardant. FSK Facing is available in 54 inch (1,372 mm) wide rolls of 1,000 square feet (92.9 m^2).

3.4.1 FSK Shield (on kraft side and foil side exposed) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E 84-11.

3.4.2 ASTM E84 test values stated in Section 3.4.2.1 through 3.4.2.3 are applicable only to 2006 Editions of the IBC, IRC, and IECC.

3.4.2.1 FSK Shield Facing & Fiberglass Unfaced Batt (R-11) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.2.2 FSK Shield Facing & Fiberglass Unfaced Batt (R-19) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.2.3 FSK Shield Facing & Fiberglass Unfaced Batt (R-30) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.3 FSK Shield has an emittance of less than 0.10 when measured in accordance with ASTM E408.

3.4.4 FSK Shield has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4°F (23°C).

3.5 RBI Shield: RBI Shield (Reflective Bubble Insulation) is intended for use in roofs, floors, and walls in buildings of Types I, II, III, IV, and V construction. RBI is available in both single and double bubble versions in rolls of 125 feet (30.1 m) long and 16 inches (406 mm), 24 inches (610 mm), 48 inches (1,219 mm), 54 inches (1,372 mm), 66 inches (1,676 mm), 72 inches (1,829 mm) and 96 inch (2438 mm) widths. It consists of two layers of air filled bubbles and various options for facings: Metalized film both sides or metalized film on one side and white or black polyethylene on the other. The total thickness of the insulation is $^3/_{16}$ inch (4.76 mm) for the Single Bubble and $^5/_{16}$ inch (7.94 mm) for the Double Bubble.

3.5.1 RBI Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.5.2 RBI Shield has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 70.5°F (21.4°C) and 50.5 percent relative humidity.

3.5.3 RBI Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.6 VR Plus Shield: VR Plus Shield is a triple layer reflective insulation for use on furred-out masonry and frame walls. It is available in both non-perforated and perforated versions and in rolls either 16 inches (406 mm) or 24 inches (610 mm) wide containing 500 square feet (46.5 m^2) each. The outer layer consists of 35-pound (15.9 kg) white kraft paper coated with polyethylene, a layer of 30 pounds (13.6 kg) natural kraft paper laminated to a minimum 0.00025-inch (0.00635 mm) aluminum foil, and a layer of minimum 0.00035-inch (0.00889 mm) aluminum foil. Upon installation, the layers open using internal expanders that form internal airspace ranging between ¼ inch (6.4 mm) and ½ inch (12.7 mm). The thickness of the third airspace is dependent on the thickness of the furring strips or the wall studs.

3.6.1 VR Plus Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84.

3.6.2 VR Plus Shield non-perforated version has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) in accordance with Procedure A of ASTM E96 dry cup method at 73.4°F (23°C).

3.6.3 VR Plus Shield perforated version has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) in accordance with Procedure B of ASTM E96 wet cup method at 73.4°F (23°C).

4.0 DESIGN AND INSTALLATION

4.1.1. AA-2 Vapor Shield at ¾ inch (19.1 mm) thick with nominal 1 inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced 16 inches (406 mm) and 24 inches (610 mm) on center for the non-perforated and perforated types yielded R-values for the insulation alone of 4.2 hr ft^2 °F/Btu and 4.1 hr ft^2 °F/Btu, respectively, at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.1.2. AA-2 Vapor Shield at ⅞ inch (22.2 mm) x 1.5 inch (38.1 mm) furring strips spaced 16 inches (405 mm) and 24 inches (610 mm) on center for the non-perforated and perforated types yielded R-values for the insulation alone of 4.7 hr ft^2 °F/Btu and 4.6 hr ft^2 °F/Btu, respectively, at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.1.3 AA-2 Vapor Shield at 1.5 inch (38.1 mm) x 1.5 inch (38.1mm) furring strips spaced 16 inches (406 mm) and 24 inches (610 mm) on center for the non-perforated and perforated types yielded R-values for the insulation alone of 5.2 hr ft^2 °F/Btu and 5.1 hr ft^2 °F/Btu, respectively, at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.2 M-Shield Thermal Resistance

4.2.1. M-Shield at ¾ inch (19.1 mm) thick with a nominal 1 inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced at 16 inches (406 mm) and 24 inches (610 mm) on center yielded an R-value for the insulation alone of 4.1 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.2.2. M-Shield at ⅞ inch (22.2 mm) x 1.5 inch (38.1 mm) furring strips spaced at 16 inches (406 mm) and 24 inches (610 mm) on center yielded an R-value for the insulation alone of 4.6 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.2.3. M-Shield at 1.5-inch (38.1 mm) x 1.5 inch (38.1 mm) furring strips spaced at 16 inches (406 mm) and 24 inches (610 mm) on center yielded an R-value for the insulation alone of 5.1 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.3 RBI Shield Thermal Resistance

4.3.1 RBI Shield at 1-inch (25.4 mm) x 1 $^7/_{16}$-inch (36.5 mm) studs spaced 16 inches (406 mm) on center forming a 1-inch (25.4 mm) air space above the RBI and the bottom open to below. This consists of 1 inch (25.4 mm) of air within the cavity, insulation, and bottom surface air resistance. The RBI Shield shall be oriented with the metalized film facing the 1 inch (25.4 mm) air space and the white plastic facing down. The calculated R-value yielded 6.36 hr ft^2 °F/Btu. The RBI Shield having two foil sides in which heat flows down yielded an R-value of 9.78 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and C1224.

4.3.2 RBI Shield at 8-inch (203 mm) x 1 ½ inch (38.1 mm) studs forming an 8 inch (203 mm) horizontal air space above the RBI and the bottom open to below. This consists of 8-inch (203 mm) of air within the cavity, insulation, and bottom surface air resistance. The RBI Shield™ shall be oriented with the metalized film facing the 8-inch (203 mm) air space and the white plastic facing down. The calculated R-value yielded 7.63 hr ft^2 °F/Btu. The RBI Shield having two foil sides in which heat flows down yielded an R-value of 11.16 hr ft^2 °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and derived according to ASTM C1224. The small cavity aspect ratio of 30.5 inch (775 mm)/ 8 inch (203 mm) requires that additional radiant transfer items be considered that are neglected in the strict ASTM C1224 procedure. Specifically, there is also radiation heat exchange between the hot plywood cover surfaces and the long intermediate temperature stud surfaces, as well as the hot plywood cover surfaces and the short, intermediate temperature end frame sections. When these are considered the air space above, RBI, and the air space below yielded an R-value of 13.7 hr ft^2 °F/Btu for the white undercoating and 17.4 hr ft^2 °F/Btu for the reflective undercoating.

Table – 4.3.3 Calculated R-values for RBI

Table 4.3.3 Calculated R-Value for RBI[1,2] (units of R= hr ft² °F/Btu) Foil Emissivity = 0.03			
Air space thickness above RBI Insulation	White & Foil[3]	Black & Foil[3]	Foil & Foil
1" Air space above with R=4.92	7	7	10
2.5" Air space above R=8.01	10	10	13
3.5" Air space above R=9.84	11	11	15
6" to 8" Air space above R is approximately 11.5[4]	13[4] Approximate	13[4] Approximate	17[4] Approximate

1. R-values shown include resistance of upper air space, RBI, and lower or room air resistance.
2. In these calculations, the RBI material itself has an R-value of 0.70.
3. Where white/foil RBI material is used, the foil side faces up into the cavity.
4. Calculated values are approximate for this depth of air space.

The calculated R-values in Table 4.3.3 of this report are for the ceiling-roof RBI application at different air space thicknesses and for emissivity of 0.03 for heat flow down. The air space depth shown is the distance from upper surface of insulation to inside of ceiling-roof, and the R-value shown in column is achieved by the air space alone. The insulation is suspended above an open room. The open-air space below the insulation has an R-value of 0.92 for the RBI White/Foil and 4.55 for the RBI Foil/Foil.

4.4 Installation shall be in accordance with this report; the manufacturer's published installation instructions and the applicable code; the manufacturer's published installation instructions shall be available on the job site. In the event of a conflict between this report and the installation instructions, the more restrictive assumes governance.

4.5 VR Plus Shield Thermal Resistance

4.5.1 VR Plus Shield at 1 inch (24 mm) thick formed by furring strips spaced at 16 inches (406 mm) and 24 inches (610 mm) on center for the perforated type yielded an R-value for the insulation alone of 5.2 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

4.5.2 VR Plus Shield at 1.5 inches (38 mm) with two furring strips of 1 inch (24 mm) and ½ inch (13 mm) thick and spaced at 16 inches (406 mm) and 24 inches (610 mm) on center for the non-perforated and perforated types yielded R-values for the insulation alone of 7.1 hr ft² °F/Btu and 7.0 hr ft² °F/Btu, respectively, at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363.

5.0 LIMITATIONS

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, with the following conditions:

5.1 Installation shall comply with this report; the manufacturer's published installation instructions and the applicable code. In the event of a conflict between this report and the installation instructions, the more restrictive assumes governance.

5.2 AA-2 Vapor Shield shall be installed in concealed spaces in buildings of Type III, IV or V construction, in the flame spread and smoke developed limitations do not apply to the AA-2 Vapor Shield since it is installed behind and in substantial contact with the unexposed surface of the wall finish as per Sections 720.2.1 of the 2015 and 2012 IBC, and 719.2.1 of the 2009 IBC and 2006 IBC.

5.3 Silver Shield Radiant Barrier shall not be installed on the attic floor.

5.4 AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are manufactured in Auburndale, FL, under a quality control program with inspections by IAPMO UES.

6.0 SUBSTANTIATING DATA

Data and test reports submitted for this report are from laboratories recognized as complying with ISO/IEC 17025 and the following:

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Reflective Insulation (AC 02), approved June 2011, editorially revised March 2017.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Sheet Radiant Barriers (AC 220), approved September 2010. editorially revised September 2013.

6.3 Reports of emittance, humidity resistance, adhesive performance, and fungi resistance testing in accordance with, and meeting the thermal resistance parameters in Section 9.7 of ASTM C1224.

7.0 IDENTIFICATION

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are marked with one of the following IAPMO Uniform ES Marks of Conformity and the Evaluation Report Number (ER-291).

IAPMO ES ® or UES TM

IAPMO UES ER-291

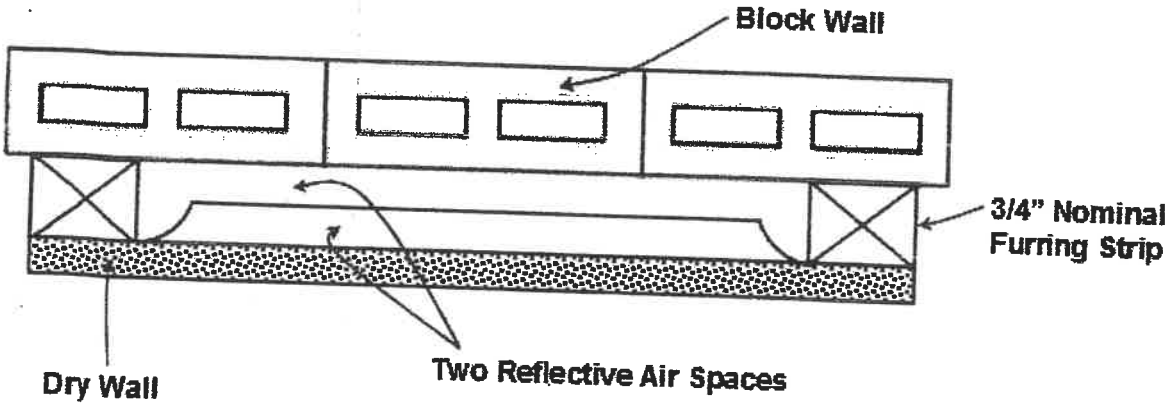
Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

FIGURE 1: AA-2 VAPOR SHIELD DETAIL



FLORIDA SUPPLEMENT

EVALUATION SUBJECT:
AA-2 VAPOR SHIELD, M-SHIELD, SILVER SHIELD RADIANT BARRIER, FSK SHIELD, RBI SHIELD AND VR PLUS SHIELD

REPORT HOLDER:
Fi-Foil Company, Inc.
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CSI Division: 07 00 00 – THERMAL AND MOISTURE PROTECTION
CSI Section: 07 21 00 – Thermal Insulation

1.0 SCOPE OF EVALUATION

- 2017and 2014 Florida Building Code® (FBC, Building)
- 2017and 2014Florida Residential Code® (FBC, Residential)
- 2017and 2014 Florida Energy Conservation Code® (FBC, Energy Conservation)

1.1 Evaluated in accordance with:

- ICC-ES AC 02 – Acceptance Criteria for Reflective Insulation, approved June 2011, editorially revised March 2017
- ICC-ES AC 220 – Acceptance Criteria for Sheet Radiant Barriers, approved September 2010, editorially revised September 2013*

**Applies only to Silver Shield Radiant Shield*

1.2 Properties assessed:

- Thermal Resistance
- Surface Burning Characteristics
- Permeability

2.0 APPLICABILITY

2.1 FBC, Building: All provisions of ER0291 referencing the 2015, 2012, 2009 and 2006 IBC shall apply to use under the 2017and 2014 FBC, respectively. In addition, compliance with Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, shall be observed as applicable.

2.2 FBC, Residential: All provisions of ER-291 referencing the 2015, 2012, 2009 and 2006 IRC shall apply to use under the 2017and 2014 FBC, Residential respectively, along with Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, as applicable.

2.3 FBC, Energy Conservation: All provisions of ER-291 referencing the 2015, 2012, 2009 and 2006 IECC shall apply to use under the 2017and 2014 FBC, Energy Conservation respectively, along with Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, as applicable.

3.0 ADDITIONAL REQUIREMENTS

Evaluation to the high-velocity hurricane zone provisions in Section 1409 of the FBC, Building and Chapter 44 of the FBC, Residential is outside the scope of this report.

Verification shall be provided that a quality assurance agency audits the manufacturers quality assurance program and audits the production quality of products, in accordance with Section (5)(d) of Florida Rule 61G20-3.008. The quality assurance agency shall be approved by the Commission (or the building official when the report holder does not possess an approval by the Commission).

4.0 SUBSTANTIATING DATA

Data and test reports submitted for this report are from laboratories recognized as complying with ISO/IEC 17025 and the following:

4.1 Data in accordance with the ICC-ES Acceptance Criteria for Reflective Insulation (AC 02), approved June 2011, editorially revised March 2017.

4.2 Data on Radiant Shield only in accordance with the ICC-ES Acceptance Criteria for Sheet Radiant Barriers (AC 220), approved September 2010, editorially revised September 2013.

Exhibit 10

EXHIBIT 10

EVALUATION REPORT Number: 291

10

Originally Issued: 05/03/2013 **Revised: 05/30/2019** **Valid Through: 05/31/2020**

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AA-2 VAPOR SHIELD, M-SHIELD, SILVER SHIELD RADIANT BARRIER, FSK SHIELD, RBI SHIELD AND VR PLUS SHIELD

CSI Section:
07 21 00 – Thermal Insulation

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2015, 2012, 2009, and 2006 International Building Code® (IBC)
- 2015, 2012, 2009, and 2006 International Residential Code® (IRC)
- 2015, 2012, 2009, and 2006 International Energy Conservation Code® (IECC)
- 2017 and 2014 Florida Building Code, Building (FBC, Building) – see Supplement
- 2017 and 2014 Florida Building Code, Residential (FBC, Residential) – see Supplement
- 2017 and 2014 Florida Building Code, Energy Conservation (FBC, Energy Conservation) – see Supplement

1.2 Evaluated in accordance with:

- ICC-ES AC 02 – Acceptance Criteria for Reflective Insulation
- ICC-ES AC 220 – Acceptance Criteria for Sheet Radiant Barriers*

**Applies only to Silver Shield Radiant Barrier*

1.3 Properties assessed:

- Thermal Resistance
- Surface Burning Characteristics *
- Permeability

**Version of ASTM E84-11 mounted in accordance with ASTM E2599.*

2.0 PRODUCT USE

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are used as reflective insulation intended for use on furred-out masonry walls, framed walls and roofs, and comply with the following codes:

Section 720 of the 2015 and 2012 IBC, Section 719 of the 2009 and 2006 IBC, Section N1101 of the 2015, 2012, 2009 and 2006 IRC, and Sections C303 and R303 of the 2015, 2012, 2009 or 2006 IECC.

3.0 PRODUCT DESCRIPTION

3.1 AA-2 Vapor Shield: AA-2 Vapor Shield is a multi-layer reflective insulation intended for use on furred-out masonry and framed walls. As noted in Section 3.1.1 of this report, AA-2 Vapor Shield shall be installed in substantial contact with the unexposed surface of the wall finish. The insulation is available in both non-perforated and perforated versions and in rolls either 16 inches (406 mm) or 24 inches (610 mm) wide containing 500 square feet (46.5 m^2) each. The inner layer is aluminum foil with a minimum 0.00035-inch (0.00889 mm) thickness and an outer layer is natural kraft paper of 35 pounds (15.9 kg) with internal expanders. The internal expanders separate the paper from the foil creating a ⅜ inch (9.5 mm) reflective air space between the layers. The thickness of the second air space is dependent on the thickness of the framing or furring strips.

3.1.1 Installation under the 2015, 2012, 2009 and 2006 IBC: AA-2 insulation is permitted to be installed in Type III, IV, and V exterior walls, within ¾, ⅞ and 1½ inch (19, 22.2 and 38.1 mm) cavities, when placed in such a manner that it is behind and in substantial contact with the unexposed surface of the walls. Figure 1 of this report provides additional details. When installed in this manner, AA-2 Vapor Shield is exempt from surface burning characteristics as set forth in Section 720.2.1 of the 2015 and 2012 IBC, and Section 719.2.1 of the 2009 and 2006 IBC.

3.1.2 AA-2 Vapor Shield (Standard Non-Perforated Version) has a water vapor permeance of 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4° F (23°C).

3.1.3 AA-2 Vapor Shield (Hi-Perm Perforated Version) has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4° F (23°C).

3.1.4 AA-2 Vapor Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.2 M-Shield: M-Shield is reflective insulation for use on furred-out masonry and framed walls in buildings of Types I, II, III, IV, and V construction. M-Shield incorporates a layer of aluminum foil and synthetic polymers that contain no

cellulose. Upon installation, the layers separate with internal expanders creating a reflective air space that forms when installed on wood or metal furring strips spaced 16 inches (406 mm) or 24 inches (610 mm) on center. The second reflective air space is dependent upon the thickness of the framing or furring strips.

3.2.1 M-Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.2.2 M-Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.2.3 M-Shield has a water vapor permeance of 5.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4°F (23°C).

3.3 Silver Shield Radiant Barrier: Silver Shield Radiant Barrier is a double layer reflective insulation and radiant barrier for use in roof systems or attics in buildings of Types I, II, III, IV, and V construction. It is available as perforated in 16 inches (406 mm) or 24 inches (610 mm) wide rolls each containing 500 square feet (46.5 m^2). A 30 inch (762 mm) wide roll containing 250 square feet (23.2 m^2) is also available. Silver Shield Radiant Barrier is formed by an inside layer of PVC film metalized PVC. The outside layer is reinforced aluminum foil kraft paper bonded with a fire-retardant adhesive. Upon installation, the layers expand to form a reflective air space to provide thermal performance and protect the internal or upper low emittance surface, which reduces the potential effect of dust accumulation.

3.3.1 Silver Shield Radiant Barrier has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.3.2 Silver Shield Radiant Barrier has a water vapor permeance of 5.0 perms (grains/ft^2·h·inch Hg) when tested in accordance with Procedure B of ASTM E96 wet cup method at 73.4°F (23°C). The material is vapor transmitting in accordance with ASTM C1313.

3.3.3 Silver Shield Radiant Barrier has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.4 FSK Shield: FSK Shield is a single sheet radiant barrier and insulation facing intended for use in an attic, roof, or wall in buildings of Types I, II, III, IV, and V construction. It is made of 0.0003-inch (0.0076 mm) aluminum foil bonded to 30 pounds (13.6 kg) natural kraft paper with a flame retardant. FSK Facing is available in 54 inch (1,372 mm) wide rolls of 1,000 square feet (92.9 m^2).

3.4.1 FSK Shield (on kraft side and foil side exposed) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E 84-11.

3.4.2 ASTM E84 test values stated in Section 3.4.2.1 through 3.4.2.3 are applicable only to 2006 Editions of the IBC, IRC, and IECC.

3.4.2.1 FSK Shield Facing & Fiberglass Unfaced Batt (R-11) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.2.2 FSK Shield Facing & Fiberglass Unfaced Batt (R-19) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.2.3 FSK Shield Facing & Fiberglass Unfaced Batt (R-30) has a flame-spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84-98.

3.4.3 FSK Shield has an emittance of less than 0.10 when measured in accordance with ASTM E408.

3.4.4 FSK Shield has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 73.4°F (23°C).

3.5 RBI Shield: RBI Shield (Reflective Bubble Insulation) is intended for use in roofs, floors, and walls in buildings of Types I, II, III, IV, and V construction. RBI is available in both single and double bubble versions in rolls of 125 feet (30.1 m) long and 16 inches (406 mm), 24 inches (610 mm), 48 inches (1,219 mm), 54 inches (1,372 mm), 66 inches (1,676 mm), 72 inches (1,829 mm) and 96 inch (2438 mm) widths. It consists of two layers of air filled bubbles and various options for facings: Metalized film both sides or metalized film on one side and white or black polyethylene on the other. The total thickness of the insulation is $^3/_{16}$ inch (4.76 mm) for the Single Bubble and $^5/_{16}$ inch (7.94 mm) for the Double Bubble.

3.5.1 RBI Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84-11.

3.5.2 RBI Shield has a water vapor permeance of less than 1.0 perm (grains/ft^2·h·inch Hg) when tested in accordance with Procedure A of ASTM E96 dry cup method at 70.5°F (21.4°C) and 50.5 percent relative humidity.

3.5.3 RBI Shield has a thermal emittance of less than 0.10 when measured in accordance with ASTM C1371.

3.6 VR Plus Shield: VR Plus Shield is a triple layer reflective insulation for use on furred-out masonry and frame walls. It is available in both non-perforated and perforated versions and in rolls either 16 inches (406 mm) or 24 inches (610 mm) wide containing 500 square feet (46.5 m^2) each. The outer layer consists of 35-pound (15.9 kg) white kraft paper coated

with polyethylene, a layer of 30 pounds (13.6 kg) natural kraft paper laminated to a minimum 0.00025-inch (0.00635 mm) aluminum foil, and a layer of minimum 0.00035-inch (0.00889 mm) aluminum foil. Upon installation, the layers open using internal expanders that form internal airspace ranging between ¼ inch (6.4 mm) and ½ inch (12.7 mm). The thickness of the third airspace is dependent on the thickness of the furring strips or the wall studs.

3.6.1 VR Plus Shield has a flame-spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84.

3.6.2 VR Plus Shield non-perforated version has a water vapor permeance of less than 1.0 perm (grains/ft²·h·inch Hg) in accordance with Procedure A of ASTM E96 dry cup method at 73.4°F (23°C).

3.6.3 VR Plus Shield perforated version has a water vapor permeance of 5.0 perms (grains/ft²·h·inch Hg) in accordance with Procedure B of ASTM E96 wet cup method at 73.4°F (23°C).

4.0 DESIGN AND INSTALLATION

4.1 The R-values shown in Section 4.0 of this report are for the added insulation which includes the adjacent reflective air spaces. The R-values of structural building materials such as framing members, concrete blocks or gypsum board are not included.

4.1.1 AA-2 Vapor Shield at ¾ inch (19.1 mm) thick with nominal 1 inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 4.2 hr ft² °F/Btu, at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.1.1.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 4.1 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.1.1.2 AA-2 Vapor Shield at ¾ inch (19.1 mm) thick with nominal 1-inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.1.1 and 4.1.1.1 of this report apply.

4.1.2. AA-2 Vapor Shield at ⅞ inch (22.2 mm) x 1.5 inch (38.1 mm) furring strips spaced 16 inches (405 mm) on center for the non-perforated types yielded an R-value of 4.7 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.1.2.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 4.6 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.1.2.2 AA-2 Vapor Shield at ⅞ inch (22.2 mm) thick with nominal 1.5-inch (38.1 mm) furring strips spaced 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.1.2 and 4.1.2.1 of this report apply.

4.1.3 AA-2 Vapor Shield at 1.5 inch (38.1 mm) x 1.5 inch (38.1mm) furring strips spaced 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 5.2 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and C1224.

4.1.3.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 5.1 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.1.3.2 AA-2 Vapor Shield at 1.5-inch (38.1 mm) thick x 1.5-inch (38.1 mm) furring strips spaced 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.1.3 and 4.1.3.1 of this report apply.

4.2 M-Shield Thermal Resistance

4.2.1 M-Shield at ¾ inch (19.1 mm) thick with a nominal 1 inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced at 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 4.2 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.2.1.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 4.1 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.2.1.1 M-Shield at ¾ inch (19.1 mm) thick with a nominal 1-inch (25.4 mm) x 2 inch (50.8 mm) furring strips spaced at 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.2.1 and 4.2.1.1 of this report apply.

4.2.2 M-Shield at ⅞ inch (22.2 mm) x 1.5 inch (38.1 mm) furring strips spaced at 16 inches (406 mm) on center for the non-perforated types yielded an R-value of 4.7 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.2.2.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 4.6 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.2.2.2 M-Shield at ⅞ inch (22.2 mm) thick with nominal 1.5-inch (38.1 mm) furring strips spaced 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.2.2 and 4.2.2.1 of this report apply.

4.2.3 M-Shield at 1.5-inch (38.1 mm) x 1.5 inch (38.1 mm) furring strips spaced at 16 inches (406 mm) on center for the

non-perforated type yielded an R-value of 5.2 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.2.3.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 5.1 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.2.3.2 M-Shield at 1.5-inch (38.1 mm) thick x 1.5- inch (38.1 mm) furring strips spaced 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.2.3 and 4.2.3.1 of this report apply.

4.3 RBI Shield Thermal Resistance

4.3.1 RBI Shield at 1-inch (25.4 mm) x 1 $^{7}/_{16}$-inch (36.5 mm) studs spaced 16 inches (406 mm) on center forming a 1-inch (25.4 mm) air space above the RBI and the bottom open to below. This consists of 1 inch (25.4 mm) of air within the cavity, insulation, and bottom surface air resistance. The RBI Shield shall be oriented with the metalized film facing the 1 inch (25.4 mm) air space and the white plastic facing down. The calculated R-value yielded 6.36 hr ft² °F/Btu. The RBI Shield having two foil sides in which heat flows down yielded an R-value of 9.78 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and C1224.

4.3.2 RBI Shield at 8-inch (203 mm) x 1 ½ inch (38.1 mm) studs forming an 8 inch (203 mm) horizontal air space above the RBI and the bottom open to below. This consists of 8-inch (203 mm) of air within the cavity, insulation, and bottom surface air resistance. The RBI Shield™ shall be oriented with the metalized film facing the 8-inch (203 mm) air space and the white plastic facing down. The calculated R-value yielded 7.63 hr ft² °F/Btu. The RBI Shield having two foil sides in which heat flows down yielded an R-value of 11.16 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and derived according to ASTM C1224. The small cavity aspect ratio of 30.5 inch (775 mm)/ 8 inch (203 mm) requires that additional radiant transfer items be considered that are neglected in the strict ASTM C1224 procedure. Specifically, there is also radiation heat exchange between the hot plywood cover surfaces and the long intermediate temperature stud surfaces, as well as the hot plywood cover surfaces and the short, intermediate temperature end frame sections. When these are considered the air space above, RBI, and the air space below yielded an R-value of 13.7 hr ft² °F/Btu for the white undercoating and 17.4 hr ft² °F/Btu for the reflective undercoating.

The calculated R-values in Table 4.3.3 of this report are for the ceiling-roof RBI application at different air space thicknesses and for emissivity of 0.03 for heat flow down. The air space depth shown is the distance from upper surface of insulation to inside of ceiling-roof, and the R-value shown in column is achieved by the air space alone. The insulation is suspended above an open room. The open-air space below the insulation has an R-value of 0.92 for the RBI White/Foil and 4.55 for the RBI Foil/Foil.

Table – 4.3.3 Calculated R-values for RBI

Table 4.3.3 Calculated R-Value for RBI[1,2] (units of R= hr ft² °F/Btu) Foil Emissivity = 0.03			
Air space thickness above RBI Insulation	White & Foil[3]	Black & Foil[3]	Foil & Foil
1" Air space above with R=4.92	7	7	10
2.5" Air space above R=8.01	10	10	13
3.5" Air space above R=9.84	11	11	15
6" to 8" Air space above R is approximately 11.5[4]	13[4] Approximate	13[4] Approximate	17[4] Approximate

1. R-values shown include resistance of upper air space, RBI, and lower or room air resistance.
2. In these calculations, the RBI material itself has an R-value of 0.70.
3. Where white/foil RBI material is used, the foil side faces up into the cavity.
4. Calculated values are approximate for this depth of air space.

4.4 Installation shall be in accordance with this report; the manufacturer's published installation instructions and the applicable code; the manufacturer's published installation instructions shall be available on the job site. In the event of a conflict between this report and the installation instructions, the more restrictive assumes governance.

4.5 VR Plus Shield Thermal Resistance

4.5.1 VR Plus Shield at 1 inch (24 mm) thick formed by furring strips spaced at 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 5.2 hr ft² °F/Btu at a mean temperature of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.5.1.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 5.1 hr ft² °F/Btu, at a mean temperature of 75°F (24°C).

4.5.1.2 VR Plus Shield at 1 inch (24 mm) thick formed by furring strips spaced at 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.5.1 and 4.5.1.1 of this report apply.

4.5.2 VR Plus Shield at 1.5 inches (38 mm) with two furring strips of 1 inch (24 mm) and ½ inch (13 mm) thick and spaced at 16 inches (406 mm) on center for the non-perforated type yielded an R-value of 7.1 hr ft² °F/Btu at a mean temperature

of 75°F (24°C) when tested in accordance with ASTM C1363 and ASTM C1224.

4.5.2.1 The perforated type is based on testing results for 16 inch on-center adjusted for emittance yields an R-value of 7.0 hr ft^2 °F/Btu, at a mean temperature of 75°F (24°C).

4.5.2.2 VR Plus Shield at 1.5 inches (38 mm) with two furring strips of 1 inch (24 mm) and ½ inch (13 mm) thick and spaced at 24 inches (610 mm) on center was calculated for the non-perforated and perforated types. The same R-values as shown in Sections 4.5.2 and 4.5.2.1 of this report apply.

5.0 LIMITATIONS

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, with the following limitations:

5.1 Installation shall comply with this report; the manufacturer's published installation instructions and the applicable code. In the event of a conflict between this report and the installation instructions, the more restrictive assumes governance.

5.2 AA-2 Vapor Shield shall be installed in concealed spaces in buildings of Type III, IV or V construction, in the flame spread and smoke developed limitations do not apply to the AA-2 Vapor Shield since it is installed behind and in substantial contact with the unexposed surface of the wall finish as per Sections 720.2.1 of the 2015 and 2012 IBC, and 719.2.1 of the 2009 IBC and 2006 IBC.

5.3 Silver Shield Radiant Barrier shall not be installed on the attic floor.

5.4 AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are manufactured in Auburndale, FL, under a quality control program with inspections by IAPMO UES.

6.0 SUBSTANTIATING DATA

Data and test reports submitted for this report are from laboratories recognized as complying with ISO/IEC 17025 and the following:

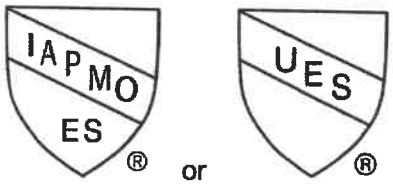
6.1 Data in accordance with the ICC-ES Acceptance Criteria for Reflective Insulation (AC 02), approved June 2011, editorially revised March 2017.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Sheet Radiant Barriers (AC 220), approved September 2010. editorially revised September 2013.

6.3 Reports of emittance, humidity resistance, adhesive performance, and fungi resistance testing in accordance with, and meeting the thermal resistance parameters in Section 9.7 of ASTM C1224.

7.0 IDENTIFICATION

AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield are marked with one of the following IAPMO Uniform ES Marks of Conformity and the Evaluation Report Number (ER-291).



IAPMO UES ER-291

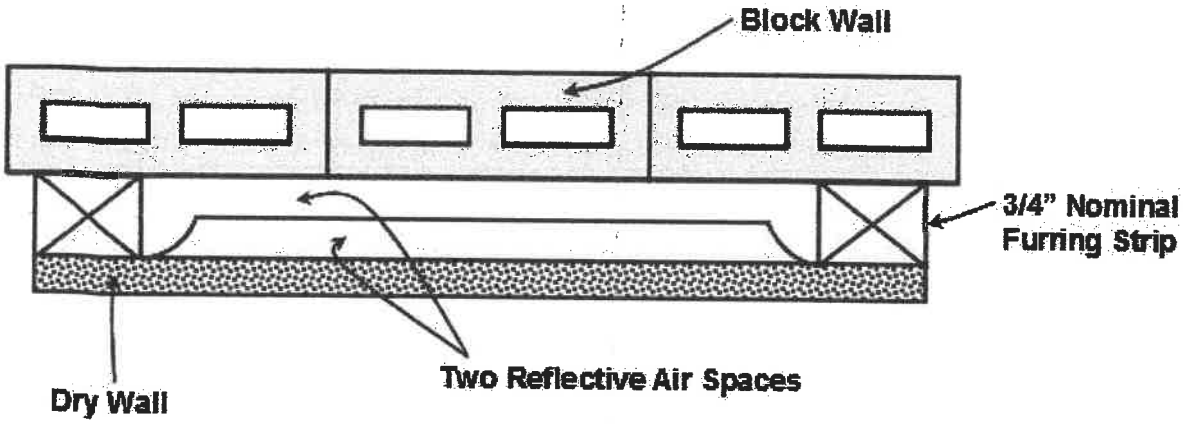
Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

FIGURE 1: AA-2 VAPOR SHIELD DETAIL



FLORIDA SUPPLEMENT

FI-FOIL COMPANY, INC.
P.O. Box 800
612 Bridgers Ave. West
Auburndale, FL 33823
www.fifoil.com
gbassham@fifoil.com

AA-2 VAPOR SHIELD, M-SHIELD, SILVER SHIELD RADIANT BARRIER, FSK SHIELD, RBI SHIELD AND VR PLUS SHIELD

CSI Section:

07 21 00 – Thermal Insulation

1.0 SCOPE OF EVALUATION

- 2017 and 2014 Florida Building Code® (FBC, Building)
- 2017 and 2014Florida Residential Code® (FBC, Residential)
- 2017 and 2014 Florida Energy Conservation Code® (FBC, Energy Conservation)

1.1 Evaluated in accordance with:

- ICC-ES AC 02 – Acceptance Criteria for Reflective Insulation
- ICC-ES AC 220 – Acceptance Criteria for Sheet Radiant Barriers*

**Applies only to Silver Shield Radiant Shield*

1.2 Properties assessed:

- Thermal Resistance
- Surface Burning Characteristics
- Permeability

2.0 APPLICABILITY

2.1 FBC, Building: All provisions of ER0291 referencing the 2015, 2012, 2009 and 2006 IBC shall apply to use under the 2017and 2014 FBC, respectively. In addition, compliance with Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, shall be observed as applicable.

2.2 FBC, Residential: All provisions of ER-291 referencing the 2015, 2012, 2009 and 2006 IRC shall apply to use under the 2017and 2014 FBC, Residential respectively, along with Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, as applicable.

2.3 FBC, Energy Conservation: All provisions of ER-291 referencing the 2015, 2012, 2009 and 2006 IECC shall apply to use under the 2017 and 2014 FBC, Energy Conservation respectively, along with Section 720 of the FBC, Building, or Section R302 of the FBC, Residential, and C303 or R303 of the FBC, Energy Conservation, as applicable.

3.0 ADDITIONAL REQUIREMENTS

Evaluation to the high-velocity hurricane zone provisions in Section 1409 of the FBC, Building and Chapter 44 of the FBC, Residential is outside the scope of this report.

Verification shall be provided that a quality assurance agency audits the manufacturers quality assurance program and audits the production quality of products, in accordance with Section (5)(d) of Florida Rule 61G20-3.008. The quality assurance agency shall be approved by the Commission (or the building official when the report holder does not possess an approval by the Commission).

4.0 SUBSTANTIATING DATA

Data and test reports submitted for this report are from laboratories recognized as complying with ISO/IEC 17025 and the following:

4.1 Data in accordance with the ICC-ES Acceptance Criteria for Reflective Insulation (AC 02), approved June 2011, editorially revised March 2017.

4.2 Data on Radiant Shield only in accordance with the ICC-ES Acceptance Criteria for Sheet Radiant Barriers (AC 220), approved September 2010, editorially revised September 2013.

Exhibit 11

Gmail by Google

11

Re: Our call today

Dermot Ennis <dermot@iiproducts.com>
To: Richard.Beck@uniform-es.org
Bcc: Laura Boehmer <boehmer@thesoutherngroup.com>

Tue, Apr 7, 2020 at 3:31 PM

Rickard
Thank you for taking the time to talk to me today relating to FiFoil's EV report 291. As you informed me you suspended the report in question 4 months ago and pulled the report yesterday.
As of today it still appears as a valid report on you website, but you said you are taking measures to have it removed. I also mentioned that FiFoil as of today still has it listed on their website and are still distributing it as a valid report. You asked me for any suggestion that would help. I suggest you send a letter to all building code officials in the state of Florida and the office of DBPR to inform them that the evaluation report in question is no longer valid and I suggest you write a letter to FiFoil to have them stop distributing the report and to ensure they remove the report from their website. I believe this will stop any confusion as if relates to the report in question. As I said you are not responsible for policing what products are approved, but you are responsible for your reports and how they are used in the market and if they are invalid you are responsible for informing the proper agency of the change in status.
Thank you again and I appreicate you efforts to remedy the situation. If I can be of any further assistance feel free to contact me

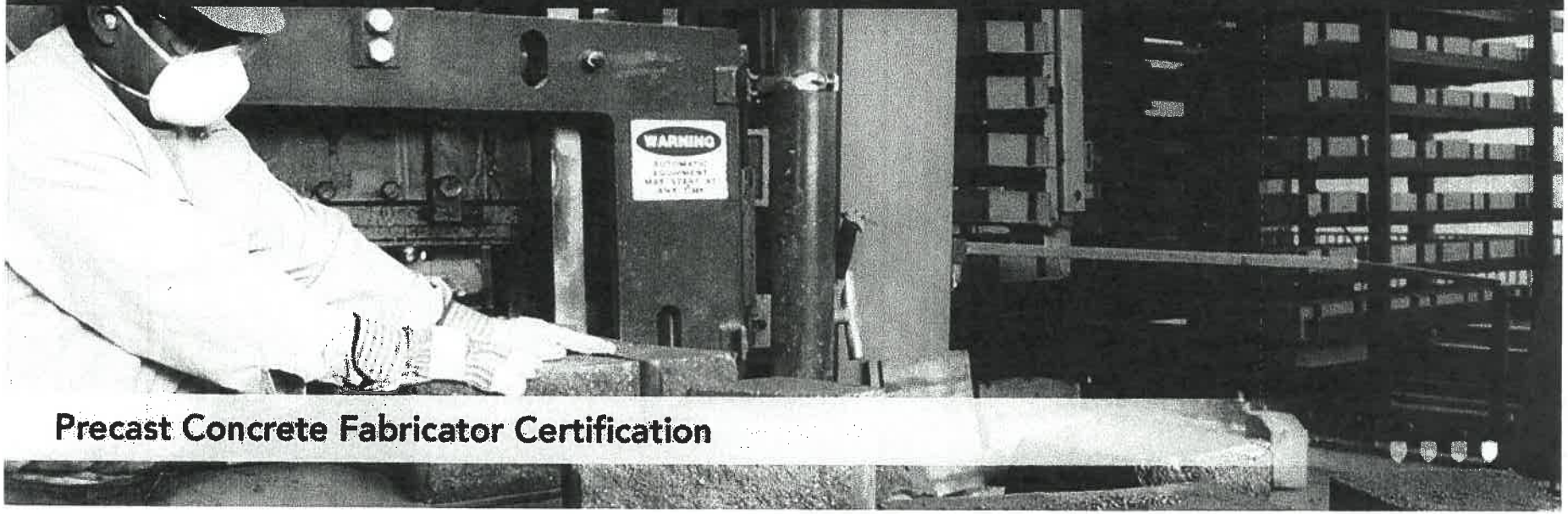
Dermot Ennis

678-646-1251

Exhibit 12

EXHIBIT 12

12



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REPORT NO.	REPORT HOLDER	DESCRIPTION	DRAWINGS	ISSUE DATE
[illegible] (Cancelled 2020-4-9)	[illegible] Company, Inc.	AA-2 Vapor Shield™, M- Shield™, Silver Shield Radiant Barrier™, FSK Shield™, and RBI Shield™		03 May 2013

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Exhibit 13

EXHIBIT 13

13

INTERNATIONAL
Insulation Products, LLC

603 Central Florida Parkway
Suite 108
Orlando, FL 32809
Phone: 407-286-4822
Website: www.iipproducts.com

Re: Cancelled Evaluation Report

Dear Florida Building Official

As part of International Insulation Products ongoing commitment to the state of Florida and to ensure Florida Building Code standards are maintained by our Company and those we compete with, from time to time, we review information not only in the building code but also information provided by competitors.

As a manufacturer, we understand and appreciate the outstanding job our building inspectors do each and every day to protect our communities. That said, we also understand how overwhelming it can be to stay up to date with daily changes that happen in our industry. Upon reading IAMPO UES Evaluation Report 0291 from Fi Foil for the following products, AA-2 Vapor Shield, M-Shield, Silver Shield Radiant Barrier, FSK Shield, RBI Shield and VR Plus Shield we noticed some inconsistency in the report as they relate to R Value testing and compliance to the Florida Building Code.

Namely, under the section for Thermal Resistance for AA-2 and M-Shield and VR Plus Shield the report stated the thermal testing was conducted on non-perforated types when tested in accordance with ASTM C1363 and ASTM C1224. This raised issues because we do not use non-perforated types in Florida due to moisture concerns. Additionally, the R values were exactly the same as R values achieved when these products where tested in 2001, using withdrawn ASTM C236 tests.

We also noticed the perforated types which are used in Florida, based their results on the non-perforated and adjusted for emittance yields. Although it sounds good, this statement does not conform to the Florida Building Code which clearly states how products are to be tested. We brought these inconsistencies to the attention of the Florida Department of Business and Professional Regulation. The Department contacted IAMPO which did a review and canceled their Evaluation Report 0291 on April 9th, 2020 (Cancelation notice attached).

To ensure International Insulation Products is in compliance with the Florida Building Code, IIP has provided both the Department of Business and Professional Regulation and the Florida Attorney General's Office testing for our product Sol-R-Wall which is used in Florida.

Under FBC Chapter 1 Administration Section 104.11.2

Tests. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the building official shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the building official shall approve the testing procedures. Tests shall be performed by an approved agency. Reports of such tests shall be retained by the building official for the period required for retention of public records.

The AA-2, M-Shield and VR Plus Shield products manufactured and sold by Fi Foil are being installed in homes in Florida as we speak. Building Codes are necessary to set minimum standards to ensure public safety and energy conservation are met. This company has no valid testing or evaluation report which is required by Florida Statutes and falls under your jurisdiction to enforce. Until appropriate testing documentation has been submitted to and approved by your office, should Fi Foil products be suspended from being installed in buildings in your area?

Should you have any questions or concerns, please don't hesitate to contact us.

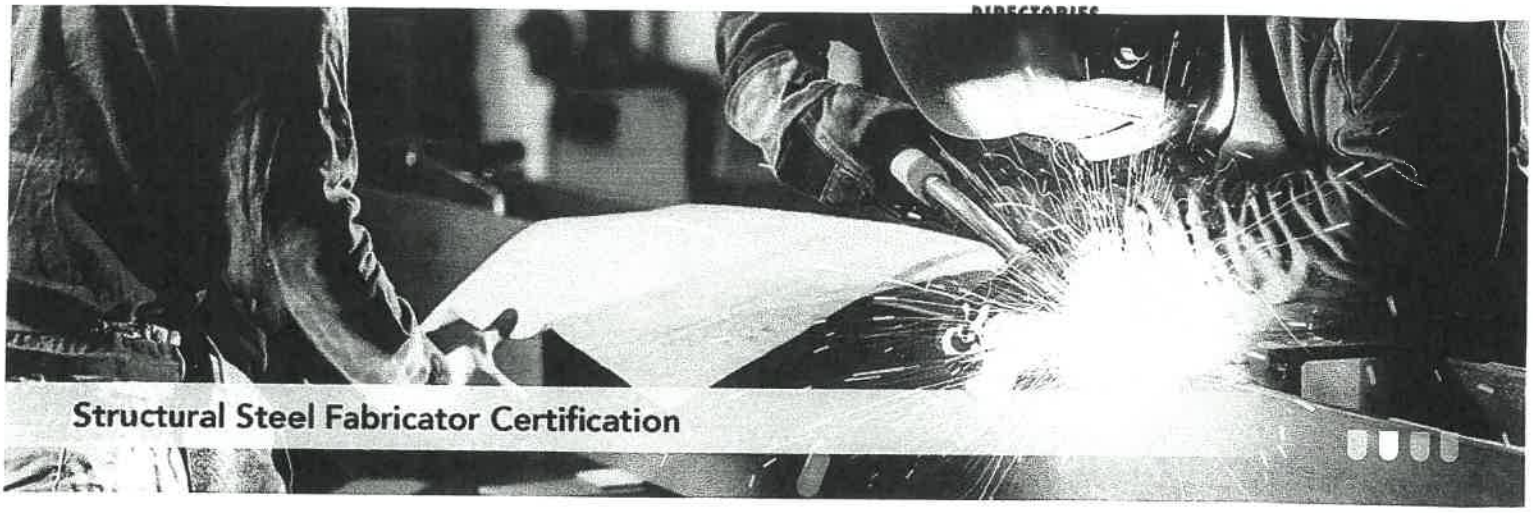
Sincerely,

Dermot Ennis

President

International Insulation Products

Exhibit 14



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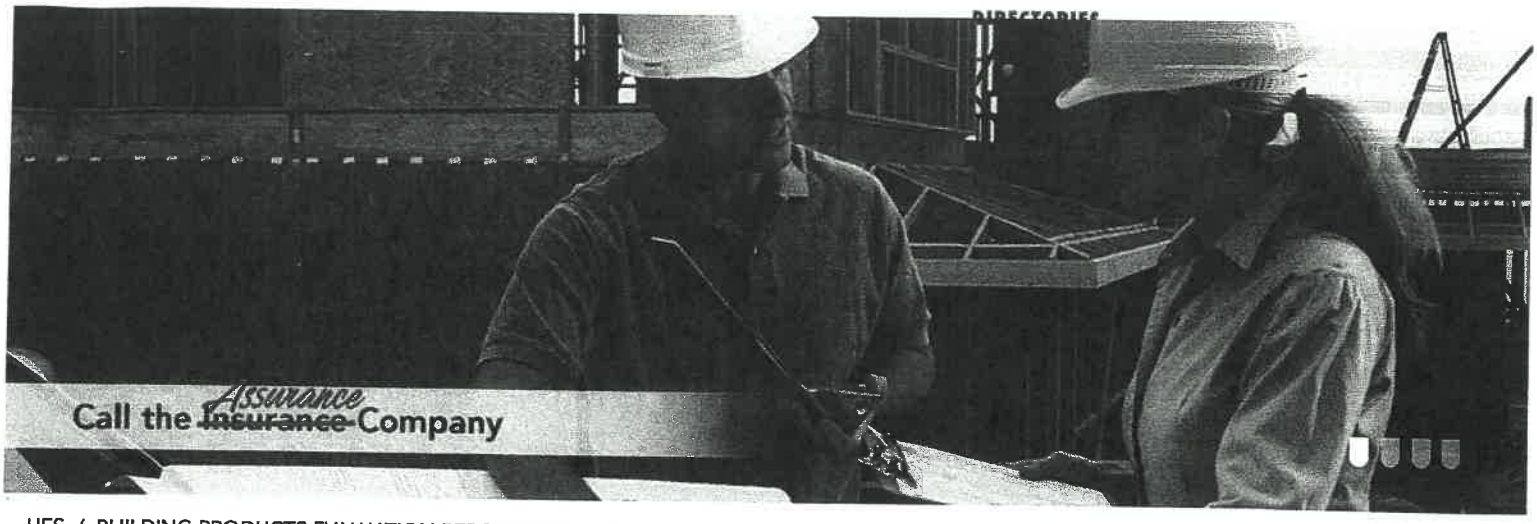

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Evaluation Criteria for Public Comment

Policy and Procedures

Minimum QA Requirements

Complaint Procedure

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Exhibit 16

LEGACY REPORT

Report Number 2133A

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

The Subcommittee on Evaluation has reviewed the data submitted for compliance with the *Standard Building Code*©, the Florida Building Code, and the International One and Two Family Dwelling Code and submits to the building official or other authority having jurisdiction the following report. The Subcommittee on Evaluation, ICC-ES and its staff are not responsible for any errors or omissions to any documents, calculations, drawings, specifications, tests or summaries prepared and submitted by the design professional or preparer of record that are listed in the Substantiating Data Section of this report. Portions of this report were previously included in SBCCI Evaluation Reports #7959, #8745, #8939, #8942, and PST & ESI Evaluation Reports #9246, #9399, #94101, #95101, #9809, #9809A, and #2133.

REPORT NO.: 2133A

EXPIRES: See the current EVALUATION REPORT LISTING

CATEGORY: INSULATION

SUBMITTED BY:

FI-FOIL COMPANY, INC.
P. O. BOX 800
612 BRIDGERS AVE. W.
AUBURNDALE, FLORIDA 33823
www.fifoil.com

1. PRODUCT TRADE NAMES

Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, RBI Shield, Radiant Shield NT, Silver Shield Radiant Barrier, and FSK Shield

2. SCOPE OF EVALUATION

2.1 ASTM C 1224 for: Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, and RBI Shield.
2.2 ASTM C 1313 for: Radiant Shield NT , and Silver Shield Radiant Barrier
2.3 ASTM E 84 for: FSK Shield.

3. USES

Materials evaluated to ASTM C 1224 satisfy section E104 for insulations, and are described in section 4.2. Materials evaluated to ASTM C 1313 are sheet radiant barriers, and are described in section 4.3. Materials evaluated to ASTM E84 are used as insulation facings or building paper, and are described in section 4.4.

4. DESCRIPTION

4.1 General

4.1.1 Reflective Insulations - Overview - Through the use of surfaces of high reflectivity and low emissivity, these products reduce the heat transferred by radiation. The thermal resistance values include the effects of air within the space, thus are relatively dependent on the thickness of the space. Several construction tolerances can effect the thermal resistance value including; (1) consistency of the furring strip's thickness, (2) bowing of the cover plate, and (3) the spacing of the insulation sheets. Such deviations can enhance or retard the R-value of any type insulation. Certain insulation values are shown in section 5.

4.1.2 Attic Floors - materials addressed in this report have not been evaluated according to ASTM E 970, thus shall not be installed exposed on top of the ceiling joists in attics (attic floors).

4.2 ASTM C 1224 Evaluations

4.2.1 Alfol Type 1A

1. **General** - Alfol Type 1A is a reflective insulation intended for use in vertical wall cavities formed by furring strips (usually 1" x 2" nominal) attached to the inside of masonry walls. Type 1A is formed by a minimum 0.00035" (1145 alloy) aluminum foil, a kraft forming sheet, and a 35 lb. kraft paper coated with 7 lbs of polyethylene. Internal expanders are oriented in such a way so as to form two non-conductive air spaces when installed. It is manufactured in 16" and 24" wide rolls containing 500 square feet each.

2. **Evaluation** according to ASTM C 1224 - **passed.** Specific testing is documented in section 6.

3. **Permeability** - Water Vapor Transmission according to procedure A of ASTM E 96 dry cup method at 73.4 °F yielded a value of less than 1 perm.

4. **Flame Spread & Smoke Developed Rating** - ASTM E 84 yielded a flame spread index of less than 75 and a smoke developed rating of less than 450.

5. **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.2.2 Vapor Shield Type AA-2

1. **General** - Vapor Shield AA-2 is available in both non-perforated and perforated versions. AA-2 is a double layer reflective insulation intended for use in vertical wall cavities

formed by furring strips (usually 1" x 2" nominal) attached to the inside of masonry walls. Type AA-2 is formed by a minimum of 0.00035" alloy 1145 foil and a 35 lb. kraft paper with internal expanders. Upon installation the layers open using internal expanders that form an approximate 3/8" thick air space between the layers. The material is then face stapled. The thickness of the second air space is dependent on the thickness of the furring strips. Type AA-2 is sold in rolls either 16" or 24" wide containing 500 square feet each.

2. **Evaluation** according to ASTM C 1224 - passed. Specific testing is documented in section 6.

3. **Permeability**

1. **Non-Perforated** - Water Vapor Transmission according to procedure A of ASTM E 96 dry cup method at 73.4° F and 50% RH yielded an average value of less than 1 perm.

2. **Perforated or High Perm Version** - Water Vapor Transmission according to procedure A of ASTM E-96 dry cup method at 73.4° F and 50% RH yielded an average perm rating in excess of 5, and is therefore not a water vapor retarder.

4. **Flame Spread & Smoke Developed Rating** - Flammability by ASTM E 84 yielded a flame spread index of less than 75 and a smoke developed rating of less than 450.

5. **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.2.3 VR Plus Shield

1. **General** - VR Plus Shield is available in both non-perforated and perforated versions. VR Plus Shield is a three layer reflective insulation intended for use in vertical wall cavities formed by furring strips attached to the inside of masonry walls. VR Plus Shield is formed by an outer layer of 35lb kraft paper coated with polyethylene, a layer of 30 lb natural kraft paper laminated to a minimum 0.00025" aluminum foil, and a layer of minimum 0.00035" aluminum foil. Upon installation the layers open using internal expanders that form air spaces ranging from 1/4" to ½" thick. The thickness of the third air space is dependent on the thickness of the furring strips. VR Plus Shield is sold in rolls either 16" or 24" wide containing 500 square feet each.

2. **Evaluation** according to ASTM C 1224 - passed. Specific testing is documented in section 6.

3. **Permeability**

1. **Non-Perforated** - Water Vapor Transmission according to procedure A of ASTM E 96 method A at 73° F and 50% RH yielded an average value of less than 1 perm.

2. **Perforated or High Perm Version** - Water Vapor Transmission according to procedure B of ASTM E-96 wet cup method at 73.4° F and 50% RH yielded an average perm rating in excess of 5, and is therefore not a water vapor retarder.

4. **Flame Spread & Smoke Developed Rating** - Flammability by ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 450.

5. **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.2.4 RBI Shield

1. **General** - RBI Shield (Reflective Bubble Insulation) is intended for use in walls, floors or roofs. These products come in 125' long rolls in 16", 24", 48", 66" and 72" widths. It consists of two layers of air filled bubbles and various options for facings: foil on both sides or foil on one side and white or black polyethylene on the other. The total thickness of the insulation is 5/16".

2. **Evaluation** according to ASTM C 1224 - passed. Specific testing is documented in section 6.

3. **Permeability** - Water Vapor Transmission according to the "Desiccant Method" of ASTM E 96 at 122° F and 50% RH yielded an average value of less than 1 perm.

4. **Flame Spread & Smoke Developed Rating** - ASTM E 84 testing on RBI yielded a flame spread index of less than 25 and a smoke developed rating of less than 450.

5. **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.3 ASTM C 1313 Evaluations

4.3.1 Radiant Shield NT

1. **General** - Radiant Shield NT is available in both non-perforated and perforated versions. Radiant Shield is a sheet comprised of two layers of aluminum foil laminated to a layer of woven polyester with two layers of polyethylene. Radiant Shield NT is intended for use in walls, floors or roofs. These products come in 25.5", 48", and 51" wide rolls containing 500 square feet each.

2. **Evaluation according to ASTM C 1313** - passed. Specific testing is documented in section 6.

3. **Permeability**

1. **Non Perforated** - Water Vapor Transmission according to procedure A of ASTM E 96 yielded an average value of less than 1 perm.

2. **Perforated or High Perm Version** - Water Vapor Transmission according to the Desiccant Method of ASTM E-96 at 72° F and 45% RH yielded an average perm rating of 4.9. 4.9 exceeds the maximum value of 1 perm necessary to be an "approved vapor retarder" in Chapter 5 of the IECC.

4. **Flame Spread & Smoke Developed Rating** - Flammability by ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 450.

4.3.2 Silver Shield Radiant Barrier

1. **General** - Silver Shield Radiant Barrier is available in both non-perforated and perforated versions. Silver Shield Radiant Barrier is a double layer radiant barrier intended for use in roofs. Silver Shield Radiant Barrier is formed by an inside layer of 1.4 mil metalized PVC. The outer layer is 0.000285" aluminum foil laminated with fire-retardant adhesive to 30 lb natural kraft paper reinforced with tri-directional fiberglass and polyester scrim. Upon installation the layers open using internal expanders that forms a minimum 3/4" thick air space between the layers. It is available in 16" or 24" wide rolls each containing 500 square feet. A 30" wide roll containing 250 square feet is also available.

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2. **Evaluation** according to ASTM C 1313 - passed. Specific testing is documented in section 6.

3. **Permeability**

1. **Non-perforated** - Water Vapor Transmission according to procedure A of ASTM E 96 dry cup method at 73.4° F and 50% RH yielded an average value of less than 1 perm.

2. **Perforated**- Water vapor transmission according to procedure B of ASTM E-96 wet cup method at 73.4° F and 50% RH yielded an average value in excess of 5.

4. **Flame Spread & Smoke Developed Rating** - ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 50.

4.4 ASTM E - 84

4.4.1 FSK Shield

1. **General** - FSK Shield is intended for use in ceilings, roofs, walls and floors as a flame retardant facing over unfaced insulation. FSK Shield is a single sheet product consisting of 0.0003 inch thick aluminum foil, fiberglass scrim, and 30 lb. kraft paper. FSK Radiant Barrier is sold in 54" wide rolls of 1000 ft² each.

2. **Flame Spread & Smoke Developed Ratings-**

1. FSK Shield Alone: UL 723 the FSK Shield exhibited a flame spread less than 25 and a smoke developed rating of less than 450.

2. FSK Shield (on foil side) and R-11 un-faced fiberglass batt, when tested according to ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 50.

3. FSK Shield (on foil side) and R-19 un-faced fiberglass batt, when tested according to ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 50.

4. FSK Shield (on foil side) and R-30 un-faced fiberglass batt, when tested according to ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 50.

5. INSTALLATION

5.1 General - Installation Instructions

The manufacturer's published installation instructions shall be strictly adhered to, and if requested by the building official, a copy of this report and the installation instructions shall be available at all times on the job site during installation. The instructions within this report govern if there are any conflicts between the manufacturer's instructions and this report. Applicable care must be exercised to properly expand the material. All tears must be repaired. Insulations covered in this report shall not be installed exposed on the attic floor.

5.2 Alfol Type 1A

R value @3/4" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a nominal 1" x 2" (actual 3/4" thick) furring strips 16" o.c., the Alfol Type 1A exhibited an R-value of 4.26 hr ft² °F/Btu, (insulation & cavity).

5.3 Type AA-2 Thermal Resistance

5.3.1 R value @ 3/4" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a nominal 1" x 2" (actual 3/4" thick) furring strips 16" o.c with a differential air to air temperature of 29.24° F and a mean temperature of 75.7° F, the Non Perforated type AA-2 exhibited an R-value of 4.2 hr ft² °F/Btu, (insulation & cavity). R - value for the Perforated AA-2 is calculated to be 4.1 hr ft² °F/Btu.

5.3.2 R value @ 7/8" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a 7/8" x 1.5" (actual) furring strips 16" o.c. with a differential air to air temperature of 31.2° F and a mean temperature of 74.7° F, the Non Perforated type AA-2 exhibited an R-value of 4.7 hr ft² °F/Btu, (insulation & cavity). R - value for the Perforated AA-2 is calculated to be 4.6 hr ft² °F/Btu.

5.3.3 R value @ 1.5" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a 1.5" x 1.5" (actual) furring strips 16" o.c. with a differential air to air temperature of 24.7°F and a mean temperature of 71° F, the Non Perforated type AA-2 exhibited an R-value of 5.2 hr ft² °F/Btu, (insulation & cavity). R - value for the Perforated AA-2 is calculated to be 5.1 hr ft² °F/Btu.

5.4 VR Plus Shield

5.4.1 R value @ 1" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with an actual 1" cavity formed by furring strips 16" o.c. with a differential air to air temperature of 28.3° F and a mean temperature of 71° F, the VR Plus Shield exhibited an R-value of 5.2 hr ft² °F/Btu, (insulation & cavity). R - value for the Perforated VR Plus Shield is calculated to be 5.1 hr ft² °F/Btu.

5.4.2 R value @ 1.5" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with two furring strips of 1" and ½" thick placed 16" o.c. with a differential air to air temperature of 30.6° F and a mean temperature of 73.8° F, the type VR Plus Shield exhibited an R-value of 7.1 hr ft² °F/Btu, (insulation & cavity). R - value for the Perforated VR Plus Shield is calculated to be 7 hr ft² °F/Btu.

5.5 RBI

5.5.1 R value @ 1" - When tested according to ASTM C 236 (Vertical heat flow down summer application) the set up consisted of 1" x 1 7/16" studs placed 16" oc forming a 1" air space above the RBI & and the bottom open to below. The RBI foil side faced the 1" air space and the white plastic faced down. With a differential air to air temperature of 30.7° F and a mean temperature of 74.5° F, the type RBI exhibited an R-value of 6.36 hr ft² °F/Btu, (1" air within the cavity & insulation & bottom surface air resistance). The Calculated R-value for RBI having two foil sides, heat flow down (summer conditions) is 9.78 hr ft² °F/Btu which includes 1" of air within the cavity & insulation & bottom surface air resistance).

5.5.2 R value @ 8" according to ASTM C 1224 - In this instance the 8" cavity was tested according to ASTM C 236 & derived according to ASTM C 1224 (Vertical heat flow down summer application). The set up consisted of an 8" horizontal air space above the RBI & and the bottom open to below. The RBI foil side faced the 8" air space and the white plastic faced down. With a differential air to air temperature of 30.5° F and a mean temperature of 72.7° F, the type RBI exhibited an R-value of 7.63

hr ft² °F/Btu, (consisting of the 8" air space within the cavity & insulation & bottom surface air resistance). The Calculated R-value for RBI having two foil sides, heat flow down (summer conditions) is 11.16 hr ft² °F/Btu which includes 8" of air within the cavity & insulation & bottom surface air resistance).

Note: According to the testing laboratory, the small cavity aspect ratio of 30.5"/8" requires that additional radiant transfer items be considered that are neglected in the strict ASTM C 1224 procedure. Specifically there is also radiation heat exchange between the hot plywood cover surfaces and the long intermediate temperature stud surfaces, as well as the hot plywood cover surfaces and the short, intermediate temperature end frame sections. When these are considered the air space above, RBI, and below exhibited a R value of 13.7 for the white undercoating and 17.4 for the reflective undercoating.

5.5.3 Calculated R- values for RBI

Table 5.5.3
Calculated R-Values for RBI[1,2]
(units of R = hr ft² °F/Btu)
Foil Emissivity = 0.03

Air space thickness above RBI insulation	White & Foil[3]	Black & Foil[3]	Foil & Foil
1" Air space above with R = 4.92	7	7	10
2.5" Air space above R = 8.01	10	10	13
3.5" Air space above R = 9.84	11	11	15
6" to 8" Air space above R is approximately 11.5[4]	13[4] Approximate	13[4] Approximate	17[4] Approximate

1. R- values shown include resistance of upper air space, RBI, and lower or room air resistance.
2. In these calculations the RBI material itself has an R-value of 0.70.
3. Where white/foil RBI material is used the foil side faces up into the cavity.
4. Calculated values are approximate for this depth of air space.

Table 5.5.3 shows calculated R-values for RBI below a metal roof with various thickness of air spaces in heat flow down (summer conditions). Thickness shown is distance from upper surface of insulation to inside of metal roof deck, and the R-value shown in column 1 is achieved by this air space alone. The insulation is suspended above an open room. The open air space below the insulation has an R-value of 0.92 for the white/foil RBI and 4.55 for the Foil/Foil RBI.

6. SUBSTANTIATING DATA

6.1 Manufacturer's descriptive literature and installation instructions.

6.2 **Alfol Type IA test reports**

6.2.1 ASTM C 1371 test for foil emittance report by R & D Services, signed by David W. Yarbrough, PhD, E, dated August 25, 1997.

6.2.2 ASTM E 96 Procedure A Dry Cup Water Vapor Permeability test by Geoscience Limited, signed by H.F. Poppendiek, dated December 4, 1995.

6.2.3 ASTM E 84 Flammability test by SGS U. S. Testing, signed by Steve Caldarola and Frank Pepe, dated March 10, 1997.

6.2.4 ASTM D 3310 Corrosivity test by Geoscience Ltd., signed by T. T. Saka and H. F. Poppendiek, dated November 1995.

6.2.5 ASTM C 1224 Section 9.2.1 Adhesive Performance (Bleeding and Delamination) test by Geoscience Ltd., signed by H. F. Poppendiek, dated May 19, 1997.

6.2.6 ASTM C 1224 Section 9.2.2 Adhesive Performance (pliability) test by Geoscience Ltd., signed by H. F. Poppendiek, dated May 19, 1997.

6.2.7 MIL - STD-8IQD Method 508.2 Fungus Resistance Test by Truesdail Laboratories, Inc., signed by Karl W. Schiller, MS, dated April 24, 1997.

6.2.8 ASTM C 177 test on mass insulation by Geoscience Ltd, Report #GLM 637, signed by H. F. Poppendiek, dated May 9, 1997.

6.2.9 ASTM C 236 test in a 3/4" air space evaluated according to ASTM C 1224 by Geoscience Ltd., Report#GLM 621, signed by H.F. Poppendiek, dated March 4, 1997.

6.2.10 Evaluation of various tests to ASTM C 1224 by Robert O. Covington, P.E., dated August 26, 1997.

6.3 **Vapor Shield Type AA-2**

6.3.1 Foil Emittance Test to ASTM C 1371 by R & D Services, Inc, dated August 25, 1997, signed by D. W. Yarbrough, Phd, P.E..

1. AA-2 [non-perforated] ASTM E 96 for Permeability by Geoscience Ltd., dated December 4, 1995, signed by H. F. Poppendeck.
2. AS-2 [perforated] ASTM E 96 for permeability by Geoscience Ltd., dated October 1, 2001, signed by H. F. Poppendiek.

6.3.2 AA-2 ASTM E 84 for Flammability by SGS U. S. Testing Company Inc, dated May 9, 1997, Report #121518, signed by S. Caldarola and F. Peep

6.3.3 AA-2 & B-3 ASTM D 3310 for Corrosiveness by Geoscience Ltd., dated November 1995, GLTN - 76, signed by T. T. Saka and H. F. Poppendiek.

6.3.4 AA-2 Pliability, bleeding and delaminating tests by Geoscience Ltd., dated May 19, 1997, signed by H. F. Poppendiek.

6.3.5 AA-2 & B-3 ASTM C 1338 Fungi Resistance by SGS U. S. Testing Company Inc., dated August 4, 1998, Report #111623, signed by D. K. Goins, PhD. and J. Laciirignola.

6.3.6 Frame Verification tests using foam by Geoscience Ltd., signed by H. F. Poppendiek.

1. 3/4" dated May 9, 1997, by ASTM C 177
2. 7/8" dated September 29, 1998, by ASTM C 236
3. 1.5" dated August 7, 1997, by ASTM C 236

6.3.7 AA-2 ASTM C 236 R-Value by Geoscience Ltd., signed by T. T. Saka and H. F. Poppendiek.

1. 3/4" dated April 2000 GLM-669
2. 7/8" dated September 1998 GLM-653
3. 1.5" dated September 1997 GLM-645

6.3.8 Letter from Geoscience, dated January 19, 2000, regarding GLM-645, signed by H. Poppendiek.
6.3.9 Evaluation of Perforated vs non-perforated AA-2 by Geoscience, LTD., dated October 30, 2001, signed and sealed by Dr. H. F. Poppendiek, P.E.
6.3.10 Letter from Geoscience Ltd., dated November 12, 2001, sealed by Dr. H. F. Poppendiek, P.E.

6.4 VR Plus Shield

6.4.1 VR Plus Shield ASTM C 1371 for Emittance by R & D Services, dated November 14, 2000, Specimen: 1023001004-1 signed by R. S. Graves.
1. VR Plus Shield [Non-perforated] ASTM E 96 for Permeability by SGS U. S. Testing Report #146967, dated 25 Oct 2000, signed by H. Litondo and C.R. Roberti.
2. VR Plus Shield [perforated] ASTM E 96 for Permeability by Geoscience Ltd., dated June 21, 2002, signed by H. F. Poppendiek.

6.4.2 VR Plus Shield ASTM E 84 Flammability test by SGS U. S. Testing Company Inc., Report #146967.001, dated October 13,2000, signed by D. Lepure.
6.4.3 VR Plus Shield ASTM D 3310 Corrosiveness by R & D Services, Specimen 1023001004-1, dated November 21, 2000, signed by R. Graves.
6.4.4 VR Plus Shield ASTM C 1313 Adhesive Performance (Bleeding And Delamination) Section 10.1 by R & D Services Specimen 1023000912-1, dated October 2, 2000, signed by R. Graves.
6.4.5 VR Plus Shield ASTM C 1338 Fungi Resistance tests by R & D Services, dated Dec 1, 2000, signed by D. W. Yarbrough, PhD, P.E.
6.4.6 VR Plus Shield ASTM C 236 for R-Value by Geoscience Ltd, signed by F. Poppendiek
1. 1" Cavity GLM 661-C, dated September 2000.
2. 1.5" Cavity GLM 646-B, dated November 2000.

6.4.7 Evaluation of Perforated vs non-perforated VR Plus by Geoscience, LTD, dated July 15, 2002, signed and sealed by Dr. H. F. Poppendiek, P.E.
6.4.8 Letter from Geoscience Ltd dated July 11, 2002, signed by H. F. Poppendiek

6.5 RBI Shield

6.5.1 RBI ASTM C 1371 for Emittance by Celotex, dated June 24, 1998, MTS Job #258528, signed by R. W. Woltemar and S. D. Gatland II.
6.5.2 RBI ASTM E 96 for Permeability by R & D Services, Report #RD 99240, dated December 28, 1999, signed by R. S. Graves and D. W. Yarbrough PhD, P.E..
6.5.3 RBI ASTM E 84 Flammability test
1. By Omega Point Laboratories dated August 28, 2001 report #15320-109423 signed by W. Fitch, P.E.
2. By Omega Point (foil both sides) report No 15320-98764 dated August 1, 1995 signed by William E. Fitch, P.E.

6.5.4 RBI Pliability, Corrosiveness & Delamination tests by SGS U. S. Testing Company Inc., Report #112119-3, dated September 23, 1998, signed by F. Savino and G. Falla.
6.5.5 RBI ASTM C 1338 Fungi Resistance by SGS U. S. Testing Company Inc., Report #112119- 002R1, dated September 15, 1998, signed by J. Lacirignola and D. K. Goins, PhD.
6.5.6 Lettter from John Starr of Covertech, dated November 3, 1999.
6.5.7 RBI ASTM C 236 @1" for R-Value by Geoscience Ltd, signed by F. Poppendiek, GLM 667, dated March 2000.
6.5.8 Calculated R-values for RBI by Dr. H. F. Poppendiek conveyed by letter, dated March 13, 2000.
6.5.9 RBI ASTM C 236 @8" for R-Value by Geoscience Ltd., signed by H. F. Poppendiek, GLM 670, dated May 2000.
6.5.10 Calculated R-Values for RBI by Geoscience Ltd, signed by H. F. Poppendiek, dated March 13, 2000

6.6 Radiant Shield NT - ASTM C 1313

6.6.1 Radiant Shield NT ASTM C 1371 for Emittance by R & D Services, dated August 9, 2000, Indent: 1177000804-1, signed by R. S. Graves.
6.6.2 Non-perforated Permeability ASTM E 96, Tear Strength ASTM D2661, Bleeding and Pliability ASTM C 1313 by SGS U. S. Testing, Report # 141978, dated July 20, 2000, signed by J. H. Van Houten, Sr. and F. Savino.
6.6.3 Radiant Shield NT ASTM E 84 Flammability test by Omega Point., Report #15757, dated September 19, 1997, signed by W. .E. Fitch P.E..
6.6.4 Perforated Permeability ASTM E96, by R & D Services, Inc, Report # RD03146 dated March 19, 2003, signed by D. W. Yarbrough, Phd, P.E..

6.7 Silver Shield Radiant Barrier (formally known as Silver Shield Type B-3)

6.7.1 ASTM C 1371 for Emittance by R & D Services, dated October 3, 2000, Specimen 1023000912-1, signed by R. S. Graves, December 14, 2000.
1. B-3 [non-perforated] ASTM E 96 for Permeability by Geoscience Ltd., dated December 4, 1995, signed by H. F. Poppendeck.
2. B-3 [perforated] ASTM E 96 for Permeability by Geoscience Ltd., dated May 31, 2002, and letter explaining results, dated June 7, 2002, both signed by H. F. Poppendeck.

6.7.2 Silver Shield Radiant Barrier ASTM E 84 for Flammability by SGS U. S. Testing Company Inc., dated August 10, 2000, Report #143593-R1, signed by M. Ostrovsky and J. Van Houten
6.7.3 Corrosivity Tests ASTM D 3310 by Geoscience Ltd., dated November 1995, GLTN - 76, signed by T. T. Saka and H. F. Poppendiek.
6.7.4 Bleeding & Delamination ASTM C 1313 by R & D Services, dated October 2, 2000, signed by R. S. Graves, December 14, 2000.
6.7.5 Toung Tear ASTM D 2661 by U. S. Testing, dated 27 October 1999, signed by C. Kehaya and C. R. Robertic CPP
6.7.6 Fungal Resistance Testing ASTM C 1338 by U. S. Testing, dated August 14, 1998, signed by D. Keither Goins, Ph.D.

6.8 FSK Shield

6.8.1 FSK UL 723 for Flammability by Underwriters Laboratory Inc., File R8734, Project 78NK12547, dated June 12, 1979, signed by K. Rhodes and J. F. Smith.
6.8.2 ASTM E 84 test on FSK Facing and R-11 unfaced fiberglass insulation by SGS U. S. Testing Report #120461-R1, dated March 27, 2001, signed by D. Lepore.
6.8.3 ASTM E 84 test on FSK Facing and R-19 unfaced fiberglass insulation by SGS U. S. Testing Report #153379-1, dated March 26, 2001, signed by D. Lepore.

6.8.4 ASTM E 84 test on FSK Facing and R-30 unfaced fiberglass insulation by SGS U. S. Testing Report #153379-2, dated March 26, 2001, signed by D. Lepore.

7. CODE REFERENCES

Florida Building Code - 2001 Edition

Section 103.7	Alternate Materials and Methods
Section 708	Thermal Insulating Materials

Standard Building Code - 1999 Edition

Section 103.7	Alternate Materials and Methods
Section 708	Thermal Insulating Materials
Section 803.2	Classification
Appendix E	Energy Conservation

Standard Building Code - 1997 Edition

Section 103.7	Alternate Materials and Methods
Section 708	Thermal Insulating Materials
Section 803.2	Classification
Appendix E	Energy Conservation

International One- and Two- Family Dwelling Code - 1998 Edition

Section R-108	Alternate Materials and Systems
Section 319	Insulation
Appendix C	Energy Conservation

8. COMMITTEE FINDINGS

The Subcommittee on Evaluation in review of the data submitted finds that, in their opinion, the Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, RBI Shield, Silver Shield Radiant Barrier, Radiant Shield NT, and FSK Shield as described in this report conform with or are suitable alternates to those specified in the *Standard Building Code*, the Florida Building Code, and the International One and Two Family Dwelling Code or Supplements thereto.

9. LIMITATIONS

9.1 Insulations noted in section 1 shall be installed in strict accordance with the manufacturer's installation instructions and this report.

9.2 When requested by the building official, this report shall be provided at the time of permit application.

9.3 None of these insulations may be installed exposed on the upper surface of the ceiling joists in the attic.

9.4 Only Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, and RBI were evaluated as reflective insulations to ASTM 1224.

10. IDENTIFICATION

Each package or roll of Fi-Foil insulation produced under this report shall be marked with the name and/or trademark of the manufacturer, the SBCCI Public Safety Testing and Evaluation Services, Inc. Seal, and the number of this report for field identification.

11. PERIOD OF ISSUANCE

SEE THE CURRENT EVALUATION REPORT LISTING FOR STATUS OF THIS EVALUATION REPORT.

For information on this report contact:
Richard L. Beck, P.E.
205/599-9800

Exhibit 17

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SBCCI PST & ESI

SBCCI PUBLIC SAFETY TESTING AND EVALUATION SERVICES INC.

900 Montclair Road, Suite A; Birmingham, Alabama 35213-1206
www.sbccies.org
a Participating Member of the NES, Inc.

Evaluation Reports are the opinion of the Committee on Evaluation, based on the findings, and do not constitute or imply an approval or acceptance by any local community. The Committee, in review of the data submitted, finds that in their opinion the product, material, system, or method of construction specifically identified in this report conforms with or is a suitable alternate to that specified in the Standard and International Codes, SUBJECT TO THE LIMITATIONS IN THIS REPORT.

The Committee on Evaluation has reviewed the data submitted for compliance with the *Standard Building Code*® and the International One and Two Family Dwelling Code and submits to the building official or other authority having jurisdiction the following report. The Committee on Evaluation, SBCCI PST & ESI and its staff are not responsible for any errors or omissions to any documents, calculations, drawings, specifications, tests or summaries prepared and submitted by the design professional or preparer of record that are listed in the Substantiating Data Section of this report. Portions of this report were previously included in SBCCI Evaluation Reports #7959, #8745, #8939,#8942, and PST & ESI Evaluation Reports #9246, #9399, #94101, #95101, #9809, and #9809A.

REPORT NO.: 2133

EXPIRES: See current SBCCI PST & ESI EVALUATION REPORT LISTING

CATEGORY: INSULATION

SUBMITTED BY:

FI-FOIL COMPANY, INC.
P. O. BOX 800
612 BRIDGERS AVE. W.
AUBURNDALE, FLORIDA 33823
www.fifoil.com

1. PRODUCT TRADE NAME

Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, RBI Shield, Radiant Shield NT, FSK Shield, and Silver Shield Radiant Barrier

2. SCOPE OF EVALUATION

2.1 ASTM 1224 for: Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, and RBI Shield.

2.2 ASTM E 84 for: Silver Shield Radiant Barrier, Radiant Shield NT and FSK Shield.

3. USES

Materials evaluated to ASTM 1224 satisfy section E104 for insulations. Materials evaluated to ASTM E84 as insulation facings or building paper.

4. DESCRIPTION

4.1 General

4.1.1 Reflective Insulations - Overview

Insulations addressed in section 4.2 - 4.5 of this report are all reflective type insulations. Through the use of surfaces of high reflectivity and low emissivity, these products reduce the heat transferred by radiation. The thermal resistance values include the effects of air within the space, thus are relatively dependent on the thickness of the space. Several construction tolerances can effect the thermal resistance value including; (1) consistency of the furring strip's thickness, (2) bowing of the cover plate, and (3) the spacing of the insulation sheets. Such deviations can enhance or retard the R-value of any type insulation.

4.1.2 Attic Floors - materials addressed by this report shall not be installed exposed on top of the ceiling joists in attics (attic floors).

4.2 Alfol Type 1A

4.2.1 General - Alfol Type 1A is a reflective insulation intended for use in vertical wall cavities formed by furring strips (usually 1" x 2" nominal) attached to the inside of masonry walls. Type 1A is formed by a minimum 0.00035" (1145 alloy) aluminum foil, a kraft forming sheet, and a 35 lb. kraft paper coated with 7 lbs of polyethylene. Internal expanders are oriented in such a way so as to form two non-conductive air spaces when installed. It is manufactured in 16" and 24" wide rolls containing 500 square feet each.

4.2.2 Evaluation according to ASTM C 1224 - passed. Specific testing is documented in section 6.

4.2.3 **Permeability** - Water Vapor Transmission according to procedure A of ASTM E 96 dry cup method at 73.4 •F yielded a value of less than 1 perm.

4.2.4 **Flame Spread & Smoke Developed Rating** - ASTM E 84 yielded a flame spread index of less than 75 and a smoke developed rating of less than 450.

4.2.5 **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.3 Vapor Shield Type AA-2

4.3.1 **General** - Vapor Shield AA-2 is a double layer reflective insulation intended for use in vertical wall cavities formed by furring strips (usually 1" x 2" nominal) attached to the inside of masonry walls. Type AA-2 is formed by a minimum of 0.00035" alloy 1145 foil and a 35 lb. kraft paper with internal expanders. Upon installation the layers open using internal expanders that form an approximate 3/8" thick air space between the layers. The material is then face stapled. The thickness of the second air space is dependent on the thickness of the furring strips. Type AA-2 is sold in rolls either 16" or 24" wide containing 500 square feet each.

4.3.2 **Evaluation** according to ASTM C 1224 - passed. Specific testing is documented in section 6.

4.3.3 **Permeability** - Water Vapor Transmission according to procedure A of ASTM E 96 dry cup method at 73.4° F and 50% RH yielded an average value of less than 1 perm.

4.3.4 **Flame Spread & Smoke Developed Rating** - Flammability by ASTM E 84 yielded a flame spread index of less than 75 and a smoke developed rating of less than 450.

4.3.5 **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.4 VR Plus Shield

4.4.1 **General** - VR Plus Shield is a triple-layer reflective insulation intended for use in vertical wall cavities formed by furring strips attached to the inside of masonry walls. VR Plus Shield is formed by an outer layer of 354lb kraft paper coated with polyethylene, a layer of 30 lb natural kraft paper laminated to a minimum 0.00025" aluminum foil, and a layer of minimum 0.00035" aluminum foil. Upon installation the layers open using internal expanders that form air spaces ranging from 1/4" to 1/2" thick. The thickness of the third air space is dependent on the thickness of the furring strips. VR Plus Shield is sold in rolls either 16" or 24" wide containing 500 square feet each.

4.4.2 **Evaluation** according to ASTM C 1224 - passed. Specific testing is documented in section 6.

4.4.3 **Permeability** - Water Vapor Transmission according to procedure A of ASTM E 96 method A at 73° F and 50% RH yielded an average value of less than 1 perm.

4.4.4 **Flame Spread & Smoke Developed Rating** - Flammability by ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 450.

4.4.5 **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.5 RBI Shield

4.5.1 **General** - RBI Shield (Reflective Bubble Insulation) is intended for use in walls, floors or roofs. These products come in 125' long rolls in 16", 24", 48" and 72" widths. The surface is a 4 mil film, with two layers of bubbles and two options for facings: foil on both side or foil on one side and white polyethylene on the other. The total thickness of the insulation is 5/16".

4.5.2 **Evaluation** according to ASTM C 1224 - passed. Specific testing is documented in section 6.

4.5.3 **Permeability** - Water Vapor Transmission according to the "Desiccant Method" of ASTM E 96 at 122° F and 50% RH yielded an average value of less than 1 perm.

4.5.4 **Flame Spread & Smoke Developed Rating** - ASTM E 84 yielded a flame spread index of less than 75 and a smoke developed rating of less than 450.

4.5.5 **R-values** for specific assemblies are shown below in Section 5. INSTALLATION.

4.6 ASTM E 84 & Misc Material Characteristics

4.6.1 **General**- The following materials were not evaluated as reflective insulations according to ASTM 1224

4.6.2 Radiant Shield NT

1. **General** - Radiant Shield NT. It is a sheet comprised of two layers of aluminum foil laminated to a layer of woven polyester with two layers of polyethylene. Radiant Shield NT is intended for use in walls, floors or roofs. These products come in 25.5", 48", and 51" wide rolls containing 500 square feet each.

2. **Permeability** - Water Vapor Transmission according to procedure A of ASTM E 96 yielded an average value of less than 1 perm.

3. **Flame Spread & Smoke Developed Rating** - Flammability by ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 450.

4.6.3 FSK Shield

1. **General** - FSK Shield is a single sheet product consisting of 0.0003 inch thick aluminum foil, fiberglass scrim, and 30 lb. kraft paper. FSK Radiant Barrier is sold in 26" and 54" wide rolls of 1000 ft^2 each.

2. **Flame Spread & Smoke Developed Rating** - UL 723 the FSK Shield exhibited a flame spread less than 25 and a smoke developed rating of less than 450.

4.6.4 Silver Shield Radiant Barrier

1. **General** - Silver Shield Radiant Barrier (formerly known as Silver Shield Type B-3) is a double layer radiant barrier intended for use in walls, floors or roofs. Silver Shield

Radiant Barrier is formed by an inside layer of 1.4 mil metalized PVC. The outer layer is 0.000285" aluminum foil laminated with fire-retardant adhesive to 30 lb natural kraft paper reinforced with tri-directional fiberglass and polyester scrim. Upon installation the layers open using internal expanders that form a 3/4" thick air space between the layers. It is available in 16" or 24" wide rolls each containing 500 square feet. A 30" wide roll containing 250 square feet is also available.

2. **Permeability** - Water Vapor Transmission according to procedure A of ASTM E 96 dry cup method at 73.4° F and 50% RH yielded an average value of less than 1 perm.

3. **Flame Spread & Smoke Developed Rating** - ASTM E 84 yielded a flame spread index of less than 25 and a smoke developed rating of less than 50.

5. INSTALLATION

5.1 General

5.1.1 Installation Instructions

The manufacturer's published installation instructions shall be strictly adhered to, and if requested by the building official, a copy of this report and the installation instructions shall be available at all times on the job site during installation. The instructions within this report govern if there are any conflicts between the manufacturer's instructions and this report. Applicable care must be exercised to properly expand the material. All tears must be repaired. Insulations covered in this report shall not be installed exposed on the attic floor.

5.1.2 Applications

Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, and RBI Shield have demonstrated compliance with the requirements in section E104 to be considered reflective insulation. Silver Shield Radiant Barrier, Radiant Shield NT and FSK have demonstrated flame spread ratings necessary to be used as insulation facing or building paper.

5.2 Alfol Type 1A

R value @3/4" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a nominal 1" x 2" (actual 3/4" thick) furring strips 16" o.c., the Alfol Type 1A exhibited an R-value of 4.28 hr ft² • F/Btu, (insulation & cavity).

5.3 Type AA-2 Thermal Resistance

5.3.1 R value @ 3/4" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a nominal 1" x 2" (actual 3/4" thick) furring strips 16" o.c. with a differential air to air temperature of 29.24• F and a mean temperature of 75.7• F, the type AA-2 exhibited an R-value of 4.2 hr ft² • F/Btu, (insulation & cavity).

5.3.2 R value @ 7/8" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a 7/8" x 1.5" (actual) furring strips 16" o.c. with a differential air to air temperature of 31.2• F and a mean temperature of 74.7• F, the type AA-2 exhibited an R-value of 4.7 hr ft² • F/Btu, (insulation & cavity).

5.3.3 R value @ 1.5" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with a 1.5" x 1.5" (actual) furring strips 16" o.c. with a differential air to air temperature of 24.7• F and a mean temperature of 71° F, the type AA-2 exhibited an R-value of 5.2 hr ft² • F/Btu, (insulation & cavity).

5.4 VR Plus Shield

5.4.1 R value @ 1" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with an actual 1" cavity formed by furring strips 16" o.c. with a differential air to air temperature of 28.3• F and a mean temperature of 71° F, the VR Plus Shield exhibited an R-value of 5.2 hr ft² • F/Btu, (insulation & cavity).

5.4.2 R value @ 1.5" - When tested according to ASTM C 236 (horizontal heat flow-wall application) with two furring strips of 1" and ½" thick placed 16" o.c. with a differential air to air temperature of 30.6• F and a mean temperature of 73.8• F, the type B-3 exhibited an R-value of 7.1 hr ft² • F/Btu, (insulation & cavity).

5.5 RBI

5.5.1 R value @ 1" - When tested according to ASTM C 236 (Vertical heat flow down summer application) the set up consisted of 1" x 1 7/16" studs placed 16" oc forming a 1" air space above the RBI & and the bottom open to below. The RBI foil side faced the 1" air space and the white plastic faced down. With a differential air to air temperature of 30.7• F and a mean temperature of 74.5• F, the type RBI exhibited an R-value of 6.36 hr ft² • F/Btu, (1" air within the cavity & insulation & bottom surface air resistance). The Calculated R-value for RBI having two foil sides, heat flow down (summer conditions) is 9.78 hr ft² • F/Btu which includes 1" of air within the cavity & insulation & bottom surface air resistance).

5.5.2 R value @ 8" - When tested according to ASTM C 236 (Vertical heat flow down summer application) the set up consisted of an 8" horizontal air space above the RBI & and the bottom open to below. The RBI foil side faced the 8" air space and the white plastic faced down. With a differential air to air temperature of 30.5• F and a mean temperature of 72.7• F, the type RBI exhibited an R-value of 7.63 hr ft² • F/Btu, (8" air within the cavity & insulation & bottom surface air resistance). The Calculated R-value for RBI having two foil sides, heat flow down (summer conditions) is 11.16 hr ft² • F/Btu which includes 8" of air within the cavity & insulation & bottom surface air resistance).

6. SUBSTANTIATING DATA

6.1 Manufacturer's descriptive literature and installation instructions.

6.A Alfol Type IA test reports

6.A.1 ASTM C 1371 test for foil emittance report by R & D Services signed by David W. Yarbrough, PhD, E, dated August 25, 1997.

6.A.2 ASTM E 96 Procedure A Dry Cup Water Vapor Permeability test by Geoscience Limited, signed by H.F. Poppendiek, dated December 4, 1995.

6.A.3 ASTM E 84 flammability test by SGS U. S. Testing, signed by Steve Caldarola and Frank Pepe, dated March 10, 1997.
6.A.4 ASTM D 3310 Corrosivity test by Geoscience Ltd., signed by T. T. Saka and H. F. Poppendiek, dated November 1995.
6.A.5 ASTM C 1224 Section 9.2.1 Adhesive Performance (Bleeding and Delamination) test by Geoscience Ltd., signed by H. F. Poppendiek, dated May 19, 1997.
6.A.6 ASTM C 1224 Section 9.2.2 Adhesive Performance (pliability) test by Geoscience Ltd., signed by H. F. Poppendiek, dated May 19, 1997.
6.A.7 MIL - STD-8IQD Method 508.2 Fungus Resistance Test by Truesdail Laboratories, Inc., signed by Karl W. Schiller, MS, dated April 24, 1997.
6.A.8 ASTM C 177 test on mass insulation by Geoscience Ltd, Report #GLM 637, signed by H. F. Poppendiek, dated May 9, 1997.
6.A.9 ASTM C 236 test in a 3/4" air space evaluated according to ASTM C 1224 by Geoscience Ltd., Report #GLM 621, signed by H.F. Poppendiek, dated March 4, 1997.
6.A.10 Evaluation of various tests to ASTM C 1224 by Robert O. Covington, PE, dated August 26, 1997.

6.B Vapor Shield Type AA-2
6.B.1 Foil Emittance Test to ASTM C 1371 by R & D Services, Inc, dated August 25, 1997 signed by D. W. Yarbrough, Phd, PE.
6.B.2 AA-2 ASTM E 96 for Permeability by Geoscience Ltd dated December 4, 1995, signed by H. F. Poppendeck.
6.B.3 AA-2 ASTM E 84 for Flammability by SGS U. S. Testing Company Inc, dated May 9, 1997, Report #121518 signed by S. Caldarola and F. Peep
6.B.4 AA-2 & B-3 ASTM D 3310 for Corrosiveness by Geoscience Ltd dated November 1995 GLTN - 76 signed by T. T. Saka and H. F. Poppendiek.
6.B.5 AA-2 Pliability, bleeding and delaminating tests by Geoscience Ltd dated May 19, 1997, signed by H. F. Poppendiek.
6.B.6 AA-2 & B-3 ASTM C 1338 Fungi Resistance by SGS U. S. Testing Company Inc., dated 08/04/98, Report #111623, signed by D. K. Goins, PhD. and J. Laciirignola.
6.B.7 Frame Verification tests using foam by Geoscience Ltd Signed by H. F. Poppendiek.
1. 3/4" dated May 9, 1997, by ASTM C 177
2. 7/8" dated September 29, 1998, by ASTM C 236
3. 1.5" dated August 7, 1997, by ASTM C 236

6.B.8 AA-2 ASTM C 236 R-Value by Geoscience Ltd signed by T. T. Saka and H. F. Poppendiek.
1. 3/4" dated April 2000 GLM -669
2. 7/8" dated September 1998 GLM-653
3. 1.5" dated September 1997 GLM-645

6.B.9 Letter from Geoscience dated January 19, 2000 regarding GLM-645 signed by H. Poppendiek.

6.C VR Plus Shield
6.C.1 VR Plus Shield ASTM C 1371 for Emittance by R & D Services, dated November 14, 2000, Specimen: 1023001004-1 signed by R. S. Graves.
6.C.2 VR Plus Shield ASTM E 96 for Permeability by SGS U. S. Testing Report #146967, dated 25 Oct 2000, signed by H. Litondo and C.R. Roberti.
6.C.3 VR Plus Shield ASTM E 84 Flammability test by SGS U. S. Testing Company Inc., Report #146967.001, dated October 13,2000, signed by D. Lepure.
6.C.4 VR Plus Shield ASTM D 3310 Corrosiviness by R & D Services, Specimen 1023001004-1, dated November 21, 2000, signed by R. Graves.
6.C.5 VR Plus Shield ASTM C 1313 Adhesive Performance (Bleeding And Delamination) Section 10.1 by R & D Services Specimen 1023000912-1, dated October 2, 2000, signed by R. Graves.
6.C.6 VR Plus Shield ASTM C 1338 Fungi Resistance tests by R & D Services, dated Dec 1, 2000, signed by D. W. Yarbrough, PhD, PE
6.C.7 VR Plus Shield ASTM C 236 for R-Value by Geoscience Ltd, signed by F. Poppendiek
1. 1" Cavity GLM 661-C dated September 2000.
2. 1.5" Cavity GLM 646-B dated November 2000.

6.D RBI Shield
6.D.1 RBI ASTM C 1371 for Emittance by Celotex, dated June 24, 1998, MTS Job #258528, signed by R. W. Woltemar and S. D. Galland II.
6.D.2 RBI ASTM E 96 for Permeability by R & D Services, Report #RD 99240 dated December 28, 1999, signed by R. S. Graves and D. W. Yarbrough PhD, PE.
6.D.3 RBI ASTM E 84 Flammability test by SGS U. S. Testing Company Inc., Report #112119-R1, dated August 26, 1998, signed by A. D. Fiorino and H. Pandya.
6.D.4 RBI Pliability, Corrosiviness & Delamination tests by SGS U. S. Testing Company Inc., Report #112119-3, dated September 23, 1998, signed by F. Savino and G. Falla.
6.D.5 RBI ASTM C 1338 Fungi Resistance by SGS U. S. Testing Company Inc., Report #112119-002R1, dated 09/15/98, signed by J. Laciignola and D. K. Goins, PhD.
6.D.6 Letter from John Starr of Covertech dated November 3, 1999.
6.D.7 RBI ASTM C 236 @1" for R-Value by Geoscience Ltd, signed by F. Poppendiek, GLM 667, dated March 2000.
6.D.8 Calculated R-values for RBI by Dr. H. F. Poppendiek conveyed by letter dated March 13, 2000.
6.D.9 RBI ASTM C 236 @8" for R-Value by Geoscience Ltd, signed by H. F. Poppendiek, GLM 670, dated May 2000.

6.E Radiant Shield NT
6.E.1 Radiant Shield NT ASTM C 1371 for Emittance by R & D Services, dated August 9, 2000, Indent: 1177000804-1, signed by R. S. Graves.
6.E.2 Radiant Shield NT ASTM E 96 for Permeability, Tear Strength, Bleeding and Pliability by SGS U. S. Testing, Report # 141978, dated July 20, 2000, signed by J. H. Van Houten, Sr. and F. Savino.
6.E.3 Radiant Shield NT ASTM E 84 Flammability test by Omega Point., Report #15757, dated September 19, 1997, signed by W.E. Fitch PE.

6.F **FSK Shield** FSK UL 723 for Flammability by Underwriters Laboratory Inc., File R8734, Project

78NK12547, dated June 12, 1979, signed by K. Rhodes and J. F. Smith.

6.G **Silver Shield Radiant Barrier (formally known as Silver Shield Type B-3)**

6.G.1 B-3 ASTM E 96 for Permeability by Geoscience Ltd., dated December 4, 1995, signed by H. F. Poppendeck..

6.G.2 Silver Shield Radiant Barrier ASTM E 84 for Flammability by SGS U. S. Testing Company Inc, dated August 10, 2000, Report #143593-R1, signed by M. Ostrovsky and J. Van Houten

7. CODE REFERENCES

Standard Building Code - 1999 Edition

Section 103.7	Alternate Materials and Methods
Section 708	Thermal Insulating Materials
Section 803.2	Classification
Appendix E	Energy Conservation

Standard Building Code - 1997 Edition

Section 103.7	Alternate Materials and Methods
Section 708	Thermal Insulating Materials
Section 803.2	Classification
Appendix E	Energy Conservation

International One- and Two- Family Dwelling Code - 1998 Edition

Section R-108	Alternate Materials and Systems
Section 319	Insulation
Appendix C	Energy Conservation

8. COMMITTEE FINDINGS

The Committee on Evaluation in review of the data submitted finds that, in their opinion, the Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, RBI Shield, Silver Shield Radiant Barrier, Radiant Shield NT, and FSK Shield as described in this report conform with or are suitable alternates to those specified in the *Standard Building Code* and the International One and Two Family Dwelling Code or Supplements thereto.

9. LIMITATIONS

9.1 Insulations noted in section 1 shall be installed in strict accordance with the manufacturer's installation instructions and this report.

9.2 When requested by the building official, this report shall be provided at the time of permit application.

9.3 None of these insulations may be installed exposed on the upper surface of the ceiling joists in the attic.

9.4 Only Alfol Type 1A, Vapor Shield AA-2, VR Plus Shield, and RBI were evaluated as reflective insulations to ASTM 1224.

9.5 Silver Shield Radiant Barrier, Radiant Shield NT, and FSK have demonstrated flame spread ratings necessary to be used as insulation facing or building paper.

10. IDENTIFICATION

Each package or roll of Fl-Foil Insulation produced under this report shall be marked with the name and/or trademark of the manufacturer, the SBCCI Public Safety Testing and Evaluation Services, Inc. Seal, and the number of this report for field identification.

11. PERIOD OF ISSUANCE

SEE CURRENT SBCCI PST & ESI EVALUATION REPORT LISTING FOR STATUS OF THIS EVALUATION REPORT.

For information on this report contact:
Richard L. Beck, P.E.
205/599-9800

Exhibit 18

GENERAL:

Exterior doors are often used to block the transmission of temperature from one side to the other. Energy lost through a door opening is the result of both:

- **Thermal transmission,** through the door assembly, is stated as either the U-Factor or the R-Factor. These factors are covered on this page.
- **Air infiltration,** around the perimeter of the door, is stated as air leakage in CFM. This rating is covered on Page 2 of this sheet.

THERMAL TESTS:

Doors are tested in accordance with ASTM C1363 and SDI 113. The door assembly (or door only) is subjected to heat with the amount of loss measured.

Honeycomb core doors provide insulation through the small air pockets created by the hexagonal cells. The insulation of the honeycomb core is far better than a solid core wood door, insulated glass and concrete block walls. Polystyrene and polyurethane core doors are recommended where extreme temperature variations are prevalent.

THERMAL FACTORS:

The following terms are used to describe thermal transmission through building products:

- **U-Factor** – Overall co-efficient of heat transmission passage through a built-up panel section. Technically, it is heat transmission in BTU per hour per square foot per degree Fahrenheit of temperature difference from air to air for a complete panel sectional (the lower the U-factor, the better the insulation).
- **R-Factor** – Thermal resistance is a measure of ability to retard heat flow. **R** is an expression of the total resistance to heat flow through a complete panel section or construction assembly. **R** represents a value of the thermal resistance, per hour per square foot of a typical panel section. **R** is the numerical reciprocal of the **U-factor** (the higher the **R**, the higher the insulating value).
- **K-Thermal** – Conductivity (**K**) is the amount of heat that passes through a homogenous material one inch thick and one square foot in area per hour. Values of **K** are expressed in BTU per hour (the lower the **K**, the higher the insulating value). The **K** unit is for a single component material one inch thick and one square foot in area. Therefore, it does not apply to a 1-3/4" thick door panel consisting of several materials. (Conductivity is not a method of measuring heat transmission through built up panels.)

THERMAL PERFORMANCE TEST RESULTS PER SDI 113-01

Door Series	Core	Tests Per ASTM C1363		Old Test Method Per ASTM C236			
		U-Factor	R-Value	U-Factor	R-Value	U-Factor Note Below	R-Value Note Below
B-Series	Steel Stiffeners	0.69	1.45	0.437	2.29	0.53	1.88
L-Series	Honeycomb	0.653	1.53	0.363	2.85	0.415	2.41
	Polystyrene	0.48	2.08	0.263	3.8	0.292	3.42
	Polyurethane	0.498	2.01	0.09	11.1	N.A.	N.A.
CE-Series	Polystyrene	0.526	1.9	0.23	4.3	N.A.	N.A.
H-Series	Honeycomb	0.545	1.83	N.A.	N.A.	N.A.	N.A.
	Polystyrene	0.539	1.85	N.A.	N.A.	N.A.	N.A.

Note: Corrected to ASHRAE winter design with 15 mph wind outside, still air inside.

HISTORICAL STATEMENT:

Historically, SDI 113 required thermal transmission testing in accordance with ASTM C236-89(1993) "Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box". In 2001ASTM C236-89(1993) was withdrawn as an ASTM standard. SDI 113-01 was subsequently revised to require testing in accordance with ASTM C1363-05 "Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus". This change in test methods results in significant changes in performance values which are not comparable between the current standard ASTM C1363 and the old standard ASTM C236. Architectural specifications must be carefully reviewed for compliance with the appropriate standard.

Exhibit 19

.9

4specs.com 4specs.com Home Page

U-value for steel door?

Author | Message

David Axt, AIA, CCS, CSI
Senior Member
Username: david_axt

Post Number: 1194
Registered: 03-2002

Posted on Thursday, May 19, 2011 - 04:16 pm:

What is the U-value for a steel door/frame with either polystyrene or polyurethane core? I can't seem to find this information on manufacturer's websites.

Ellis C. Whitby, PE, CSI, AIA, LEED® AP
Senior Member
Username: ecwhitby

Post Number: 103
Registered: 03-2003

Posted on Thursday, May 19, 2011 - 04:29 pm:

Which manufacturers did you check?

These have values:

http://www.cecodoor.com/default.aspx?Doc=products/polydrs.htm
http://www.steelcraft.com/app_sol_art_03_coreofhollowmetaldoors.asp

George A. Everding, AIA, CSI, CCS, CCCA
Senior Member
Username: geverding

Post Number: 597
Registered: 11-2004

Posted on Thursday, May 19, 2011 - 04:30 pm:

I have that in our Steelcraft Technical Manual. It varies depending on configuration of the door from 0.48 to 0.69 according to SDI 113-01 thermal performance tests. Send me your email address to geverdin@irco.com and I'll send you the page from the manual, or the whole manual if you need it.

George A. Everding AIA CSI CCS CCCA
Ingersoll Rand Security Technologies
St. Louis, MO

George A. Everding, AIA, CSI, CCS, CCCA
Senior Member
Username: geverding

Post Number: 598
Registered: 11-2004

Posted on Thursday, May 19, 2011 - 04:43 pm:

Note that there is a dramatic difference between calculated thermal values (by ASTM C 518) and tested thermal values (by ASTM C 1363). The websites posted above give calculated values - the values I listed are tested values.

There are also significant differences between the old ASTM C236-89(93) "Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box" and the current standard,

Exhibit 20

Fi-Foil Wall Product Thermal Performance Evaluation History

Per SBCCI Evluation Report No. 2133, 2001

Product	Framing Dimension	O.C. Framing Spacing, in.	Cavity Depth, in	Listed *R-value	Mean Test Temp., F	Temp. Diff., F	**ASTM Test Method	Referenced Test Lab	Lab Report #	Lab Report Date	Comments
Alfol Type 1A	Nominal 1x2 Furring	16	0.750	4.28	NL	NL	C236	Geoscience, Ltd.	GLM 621	3/4/97	Listed R-value is for "insulation & cavity", horizontal wall test, evaluated to ASTM 1224 by Geoscience, Ltd.
AA-2 Vapor Shield (Non-Perforated)	Nominal 1x2 Furring	16	0.750	4.2	75.7	29.24	C236	Geoscience, Ltd.	GLM 669	Apr-00	Listed R-value is for "insulation & cavity", horizontal wall test, evaluated to ASTM 1224 by Geoscience, Ltd.
	7/8 x 1.5 Furring (Actual)	16	0.875	4.7	74.7	31.2	C236	Geoscience, Ltd.	GLM 653	Sep-98	
	1.5 x 1.5 Furring (Actual)	16	1.50	5.2	71.0	24.7	C236	Geoscience, Ltd.	GLM 645	Sep-97	
VR Plus Shield (Non-perforated)	1 x 1.5 Furring (Actual)	16	1.00	5.2	71.0	28.3	C236	Geoscience, Ltd.	GLM 661-C	Sep-00	Listed R-value is for "insulation & cavity", horizontal wall test, evaluated to ASTM 1224 by Geoscience, Ltd.
	(1+0.5) x 1.5 Furring (Actual)	16	1.50	7.1	73.8	30.6	C236	Geoscience, Ltd.	GLM 646-B	Nov-00	

Per ICC Evaluation Service, Inc., Legacy Report, Report No. 2133A, Issued 2003

Product	Framing Dimension	O.C. Framing Spacing, in.	Cavity Depth, in	Listed *R-value	Mean Test Temp., F	Temp. Diff., F	**ASTM Test Method	Referenced Test Lab	Lab Report #	Lab Report Date	Comments
Alfol Type 1A	Nominal 1x2 Furring	16	0.750	4.28	NL	NL	C236	Geoscience, Ltd.	GLM 621	3/4/97	R-values are identical to SBCCI 2133, 2001 listing - no new testing reported
AA-2 Vapor Shield (Non-Perforated)	Nominal 1x2 Furring	16	0.750	4.2	75.7	29.24	C236	Geoscience, Ltd.	GLM 669	Apr-00	R-value identical to SBCCI 2133, 2001 listing - no new testing reported
	7/8 x 1.5 Furring (Actual)	16	0.875	4.7	74.7	31.2	C236	Geoscience, Ltd.	GLM 653	Sep-98	
	1.5 x 1.5 Furring (Actual)	16	1.50	5.2	71.0	24.7	C236	Geoscience, Ltd.	GLM 645	Sep-97	
AA-2 Vapor Shield (Perforated)	Nominal 1x2 Furring	16	0.750	4.1	NL	NL	NL	NL	NL	NL	New perforated offering - Listed as a calculated R-value - no thermal testing cited
	7/8 x 1.5 Furring (Actual)	16	0.875	4.6	NL	NL	NL	NL	NL	NL	
	1.5 x 1.5 Furring (Actual)	16	1.50	5.1	NL	NL	NL	NL	NL	NL	
VR Plus Shield (Non-perforated)	1 x 1.5 Furring (Actual)	16	1.00	5.2	71.0	28.3	C236	Geoscience, Ltd.	GLM 661-C	Sep-00	R-value identical to SBCCI 2133, 2001 listing - no new testing reported
	(1+0.5) x 1.5 Furring (Actual)	16	1.50	7.1	73.8	30.6	C236	Geoscience, Ltd.	GLM 646-B	Nov-00	
VR Plus Shield (Perforated)	1 x 1.5 Furring (Actual)	16	1.00	5.1	NL	NL	NL	NL	NL	NL	New perforated offering - Listed as a calculated R-value - no thermal testing cited
	(1+0.5) x 1.5 Furring (Actual)	16	1.50	7.0	NL	NL	NL	NL	NL	NL	

Per IAMPO-ES Evaluation Report No. 0291, 5/2/2013, Revisions 7/18/2014, 5/29/2015, 6/6/2016

Product	Framing Dimension	O.C. Framing Spacing, in.	Cavity Depth, in	*R-value	Mean Test Temp., F	Temp. Diff., F	**ASTM Test Method	Referenced Test Lab	Lab Report #	Lab Report Date	Comments
AA-2 Vapor Shield (Non-Perforated)	Nominal 1x2 Furring	16	0.750	4.2	75	NL	C1363	NL	NL	NL	R-values are identical to ICC 2133A 2003 listing - no new testing reported
	7/8 x 1.5 Furring	16	0.875	4.7	75	NL	C1363	NL	NL	NL	
	1.5 x 1.5 Furring	16	1.500	5.2	75	NL	C1363	NL	NL	NL	
AA-2 Vapor Shield (Perforated)	Nominal 1x2 Furring	16	0.750	4.1	75	NL	C1363	NL	NL	NL	R-values are identical to ICC 2133A 2003 listing - no new testing reported
	7/8 x 1.5 Furring	16	0.875	4.6	75	NL	C1363	NL	NL	NL	
	1.5 x 1.5 Furring	16	1.500	5.1	75	NL	C1363	NL	NL	NL	
VR Plus Shield (Non-perforated)	1 x 1.5 Furring (Actual)	16	1.00	NL			C1363	NL	NL	NL	Non-perforated R-value not listed
	(1+0.5) x 1.5 Furring (Actual)	16	1.50	7.1			C1363	NL	NL	NL	
VR Plus Shield (Perforated)	1 x 1.5 Furring (Actual)	16	1.00	5.0			C1363	NL	NL	NL	Perforated R-value bumped down to 5.0 from ICC 2133A 2003 listing of 5.1
	(1+0.5) x 1.5 Furring (Actual)	16	1.50	7.0			C1363	NL	NL	NL	
M-Shield	Nominal 1x2 Furring	16	0.750	4.1	75		C1363	NL	NL	NL	New wall product added - No test report listed
	7/8 x 1.5 Furring (Actual)	16	0.875	4.6	75		C1363	NL	NL	NL	
	1.5 x 1.5 Furring (Actual)	16	1.500	5.1	75		C1363	NL	NL	NL	

Per IAMPO-ES Evaluation Report No. 0291, 5/2/2013, Revision 4/5/2018

Product	Framing Dimension	O.C. Framing Spacing, in.	Cavity Depth, in	*R-value	Mean Test Temp., F	Temp. Diff., F	**ASTM Test Method	Referenced Test Lab	Lab Report #	Lab Report Date	Comments
AA-2 Vapor Shield (Non-Perforated)	Nominal 1x2 Furring	16 and 24	0.750	4.2	75	NL	C1363	NL	NL	NL	24" wide product added with same R-value as 16" wide product - no indication 24" wide actually tested
	7/8 x 1.5 Furring	16 and 24	0.875	4.7	75	NL	C1363	NL	NL	NL	
	1.5 x 1.5 Furring	16 and 24	1.500	5.2	75	NL	C1363	NL	NL	NL	
AA-2 Vapor Shield (Perforated)	Nominal 1x2 Furring	16 and 24	0.750	4.1	75	NL	C1363	NL	NL	NL	24" wide product added with same R-value as 16" wide product - no indication 24" wide actually tested
	7/8 x 1.5 Furring	16 and 24	0.875	4.6	75	NL	C1363	NL	NL	NL	
	1.5 x 1.5 Furring	16 and 24	1.500	5.1	75	NL	C1363	NL	NL	NL	
VR Plus Shield (Non-perforated)	1 x 1.5 Furring (Actual)	16 and 24	1.00	NL			C1363	NL	NL	NL	24" wide product added with same R-value as 16" wide product - no indication 24" wide actually tested
	(1+0.5) x 1.5 Furring (Actual)	16 and 24	1.50	7.1			C1363	NL	NL	NL	
VR Plus Shield (Perforated)	1 x 1.5 Furring (Actual)	16 and 24	1.00	5.2			C1363	NL	NL	NL	24" wide product added, R-value of perforated product bumped up from 5 to 5.2, no test reference
	(1+0.5) x 1.5 Furring (Actual)	16 and 24	1.50	7.0			C1363	NL	NL	NL	
M-Shield	Nominal 1x2 Furring	16 and 24	0.750	4.1	75		C1363	NL	NL	NL	24" wide product added with same R-value as 16" wide product - no indication 24" wide actually tested
	7/8 x 1.5 Furring (Actual)	16 and 24	0.875	4.6	75		C1363	NL	NL	NL	
	1.5 x 1.5 Furring (Actual)	16 and 24	1.500	5.1	75		C1363	NL	NL	NL	

* The listed R-value should be for the reflective insulation contained inside the wall cavities only. This is a calculated value per ASTM C1224 when testing is done in accordance with the listed ASTM test method. ASTM C1224 was originally approved as a Standard Specification by ASTM in 1993.

** The testing done in accordance with the listed test method. In 1997, ASTM C236 and ASTM C976 were combined into ASTM C1363. ASTM C976 was withdrawn from the 4.06 ASTM Annual Book of Standards in 2001. ASTM C976 was withdrawn in 2002.

Exhibit 21

Intertek | Architectural Testing

21

ASTM C1224 / C1363 THERMAL PERFORMANCE TEST REPORT

Rendered to:

INTERNATIONAL INSULATION PRODUCTS, LLC

SERIES/MODEL: AA2 Vapor Shield Wall Reflective Insulation

TYPE: Reflective Insulation

Summary of Results				
Series / Model	**Heat Flow Direction**	**$R_{specimen}$ ASTM C1363**	**$R_{Air\text{-}to\text{-}Air}$ ASTM C1363**	**$R_{Insulation}$ ASTM C1224**
AA2 Vapor Shield	Horizontal	3.8	4.5	3.1

Reference should be made to ATI Report No. E9293.01-116-46 dated 09/28/15 for complete test specimen description and data.

130 Derry Court
York, PA 17406

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

p. 717.764.7700
f. 717.764.4129

Intertek | Architectural Testing

ASTM C1224 / C1363 THERMAL PERFORMANCE TEST REPORT

Rendered to:

INTERNATIONAL INSULATION PRODUCTS, LLC
7101 Presidents Drive Suite 300
Orlando, Florida 32809

Report No:	E9293.01-116-46
Test Date:	07/17/15 through 07/20/15
Report Date:	09/28/15

Test Sample Identification:

Series/Model: AA2 Vapor Shield Wall Reflective Insulation

Type: Reflective Insulation

Overall Size: 96" x 96"

Test Sample Submitted By: Client

Test Procedure: The product was tested in general accordance with ASTM C 1363-11, *Standard Test Method for the Thermal Performance of Building Assemblies by Means of Hot Box Apparatus, as prescribed* in *ASTM C1224-11, Standard Specification for Reflective Insulation for Building Applications.* The thermal resistance of the insulation ($R_{insulation}$) was determined in accordance with ASTM C1224. The thermal resistance ($R_{specimen}$) and overall thermal resistance ($R_{air\ to\ air}$) of the complete wall assembly were determined in accordance with ASTM C1363.

Test Conditions Summary:

1.	Average warm side ambient air temperature	101.6	°F
2.	Average cold side ambient air temperature	53.2	°F
3.	Average warm side cavity surface temperature	90.0	°F
4.	Average cold side cavity surface temperature	60.0	°F

5. 15 mph dynamic wind applied to test specimen exterior.
6. 0.00" ± 0.04"H_2O static pressure drop across specimen.

Test Sample Description: AA2 Vapor Shield Wall Reflective Insulation

Overall Size: 96" x 96"

AA2 Vapor Shield: The material was in a roll form, and was cut to length. The laminated material consisted of a perforated kraft paper sheet (interior), and a reflective foil sheet (exterior). The sheets were adhered together near the stapling flange edges so that seperation between the sheets would occur when the pleats on the back sheet were activated during the installation process. The activation formed a 2-layer reflective insulation composite.

Construction: The wall was comprised of a 3/4 inch lathe wood vertical studs, with the studs mounted on 16 inch centers. The exterior of the wall assembly was sheathed with 1/2 inch (OSB) oriented strand board, and screwed to the lathe with 1-5/8 inch drywall screws every 12 inches. The 16 inch wide AA2 Vapor Shield was cut to length to fit between the 16 inch on center lathe wood frame assembly, and stapled in place. Once in place, the AA2 Vapor Shield created a 3/4 inch air cavity between the exterior OSB sheet. The interior of the wall assembly was sheathed with 1/2 inch OSB on top of the AA2 Vapor Shield, and screwed to the latch with 1-5/8 inch drywall screws every 12 inches.

Test #1: AA2 Vapor Shield Reflective Insulation Wall Assembly
Measured Test Data

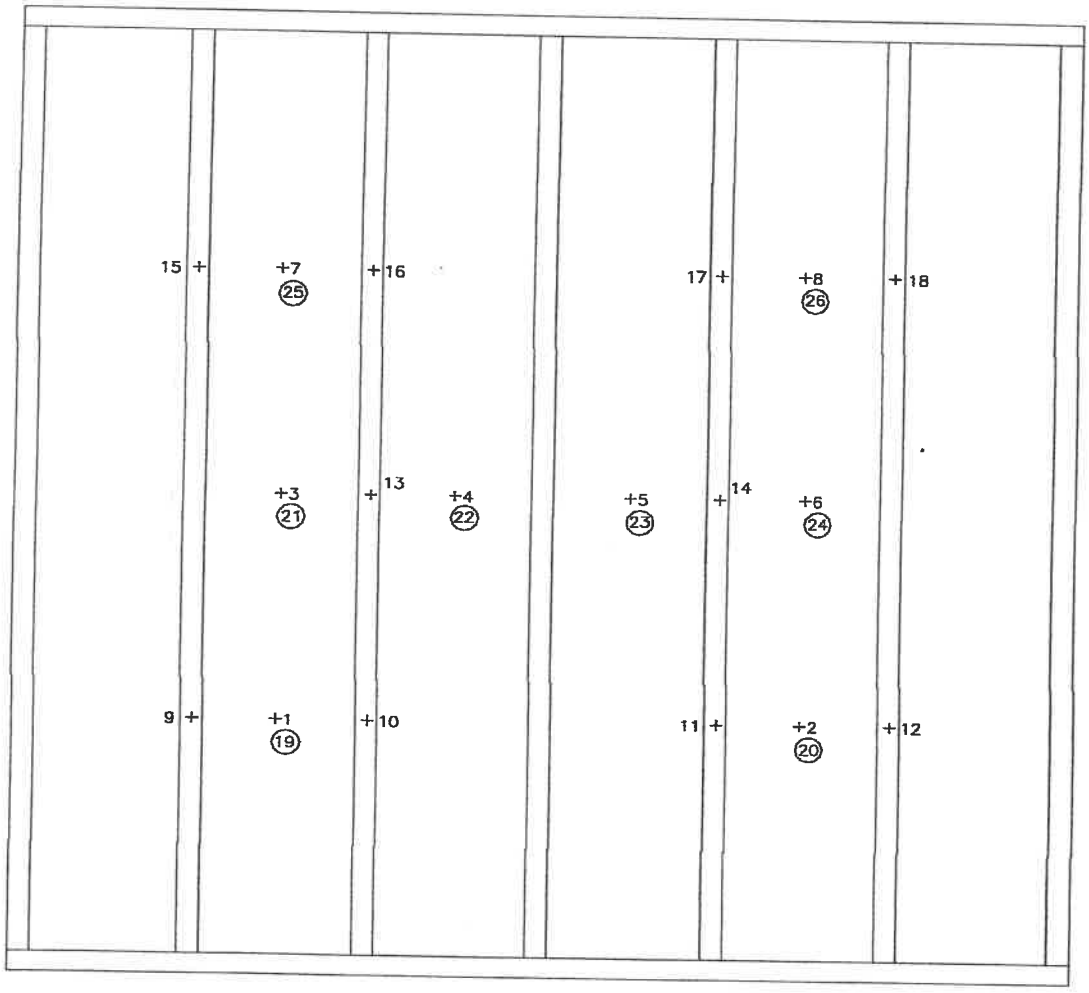
Input		
Warm Room Heat	701.968	BTU/Hr
Warm Room Fan	36.863	BTU/Hr
Loss		
Mask Wall	13.269	BTU/Hr
Metering Box Area	75.110	Ft^2
Mask Wall Area	11.110	Ft^2
Mask Wall Warm Temperature	98.521	°F
Mask Wall Cold Temperature	53.138	°F
Mask Wall Thickness	8.0	inches
Mask Wall R-Value	38.000	Hr-Ft2-F/BTU
Wall Loss ***(Negative indicates a heat input)***	4.615	BTU/Hr
Warm Room EMF	-0.0023	mV
EMF Slope	-2087.67	BTUH/mV
EMF Y-Intercept	-0.224	BTU/Hr
Flanking	39.587	BTU/Hr
Total Heat Flow Through the Specimen	681.360	BTU/Hr
Specimen Area	64.000	Ft^2
Warm Side Air Temperature	101.55	°F
Cold Side Air Temperature	53.15	°F
Air Temperature Difference	48.40	°F
Mean Air Temperature	77.35	°F
Warm Side Specimen Temperature	95.43	°F
Cold Side Specimen Temperature	54.53	°F
Specimen Temperature Difference	40.90	°F
Mean Specimen Temperature	74.98	°F
Specimen Thermal Transmittance (U)	0.22	BTU/Hr-Ft2-F
Specimen Overall Thermal Resistance ($R_{Air\text{-}to\text{-}Air}$)	4.55	Hr-Ft2-F/BTU
Specimen Thermal Resistance ($R_{specimen}$)	3.84	Hr-Ft2-F/BTU
Warm Side Surface Conductance (hh)	2.04	BTU/Hr-Ft2-F
Warm Side Surface Resistance (Rh)	0.49	Hr-Ft2-F/BTU
Cold Side Surface Conductance (hc)	4.68	BTU/Hr-Ft2-F
Cold Side Surface Resistance (Rc)	0.21	Hr-Ft2-F/BTU

Framing Heat Flow Contribution	146.810	BTU/Hr
Total Framing Area (A_{frame})	8.781	Ft^2
Warm Side Framing Temperature	78.88	°F
Cold Side Framing Temperature	65.97	°F
Framing Temperature Difference (ΔT_{frame})	12.91	°F
Mean Framing Temperature	72.43	°F
Framing R-Value (R_{frame})	0.77	Hr-Ft2-F/BTU
Heat Flow Rate Across Insulated Cavity (Q_{ins})	146.810	BTU/Hr
Area of Insulated Cavity (A_{ins})	55.219	Ft^2
Warm Side Cavity Temperature	89.95	°F
Cold Side Cavity Temperature	59.98	°F
Cavity Temperature Difference (ΔT_{ins})	29.97	°F
Mean Cavity Temperature	74.97	°F
Thermal Resistance of Reflective Insulation (R_{ins})	3.10	Hr-Ft2-F/BTU

Test Duration

1. The environmental systems were started at 6:54 AM on 7/17/2015 .
2. The test parameters were considered stable from 22:58 PM on 7/19/2015 to 6:55 AM on 7/2/2015 .
3. The thermal performance test results were derived from a four hour period ending at 6:55 AM on 7/2/2015 .

Thermocouple (TC) Locations (Interior View)



Surface Temperatures (Interior View) °F

(reference Thermocouple (TC) Locations (Interior View)

TC #	Cavity Warm Side	Cavity Cold Side
1	89.11	60.17
2	89.04	60.66
3	90.23	59.06
4	91.13	59.79
5	90.09	60.19
6	89.96	60.79
7	90.93	59.24
8	89.11	59.94
AVG.	**89.95**	**59.98**

	Framing Warm Side	Framing Cold Side
9	77.83	65.48
10	79.76	67.21
11	79.01	66.92
12	78.05	64.29
13	78.46	66.43
14	79.98	66.99
15	76.52	63.79
16	78.20	65.97
17	80.12	66.53
18	80.88	66.06
AVG.	**78.88**	**65.97**

	Specimen Warm Side	Specimen Cold Side
19	94.85	53.89
20	94.23	54.71
21	95.64	54.26
22	96.03	54.57
23	95.39	55.09
24	95.21	54.86
25	96.28	54.38
26	95.79	54.47
AVG.	**95.43**	**54.53**

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.61%.

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

A calibration of the ATI 'thermal test chamber' in York, Pennsylvania was conducted in May 2015.

Architectural Testing, Inc. will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Architectural Testing, Inc. for the entire test record retention period. The test record retention end date for this report is 7/23/2018.

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

For ARCHITECTURAL TESTING, INC.

Shon W. Einsig

Digitally Signed by: Shon W. Einsig

Shon W. Einsig
Senior Technician

Michael J Thoman / PAM

Digitally Signed for: Michael J. Thoman by Paige Markley

Michael J. Thoman
Director - Simulations and Thermal Testing
Individual-In-Responsible-Charge

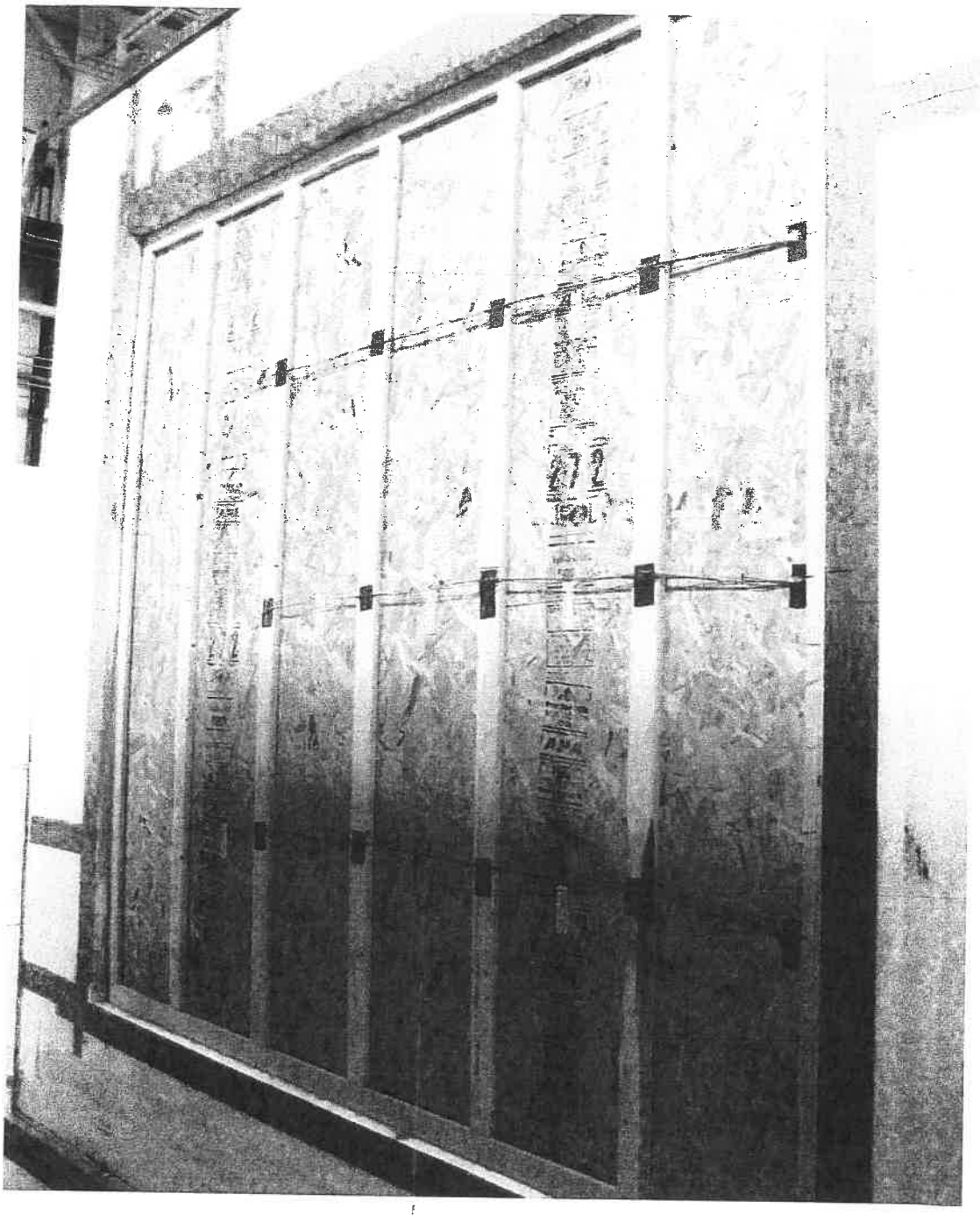
SWE:pam
E9293.01-116-46

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Pictures (6)

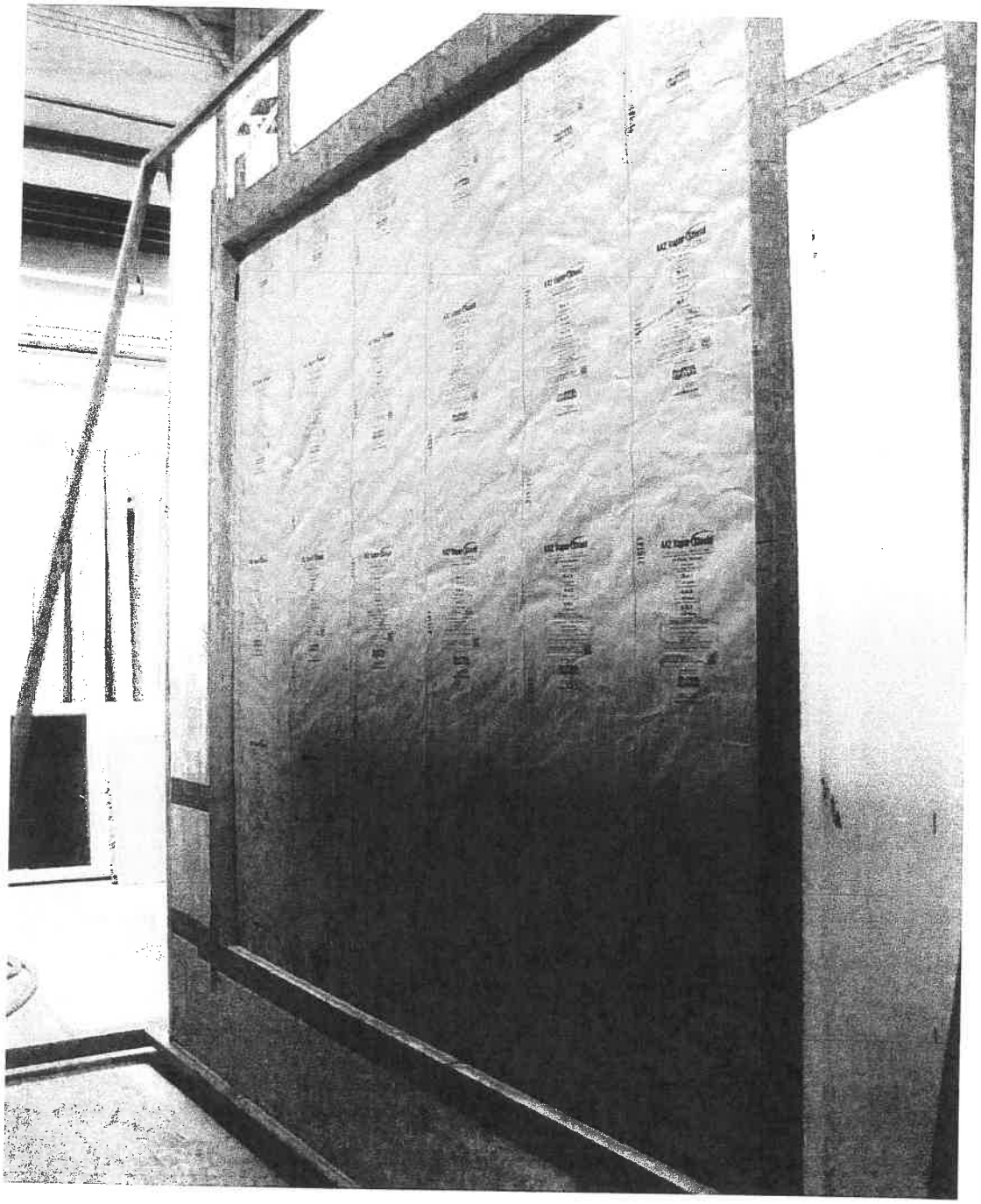
Revision Log

Rev. #	Date	Page(s)	Revision(s)
.01R0	09/28/15	All	Original Report Issue. Work requested by Dermot Ennis of International Insulation Products, LLC

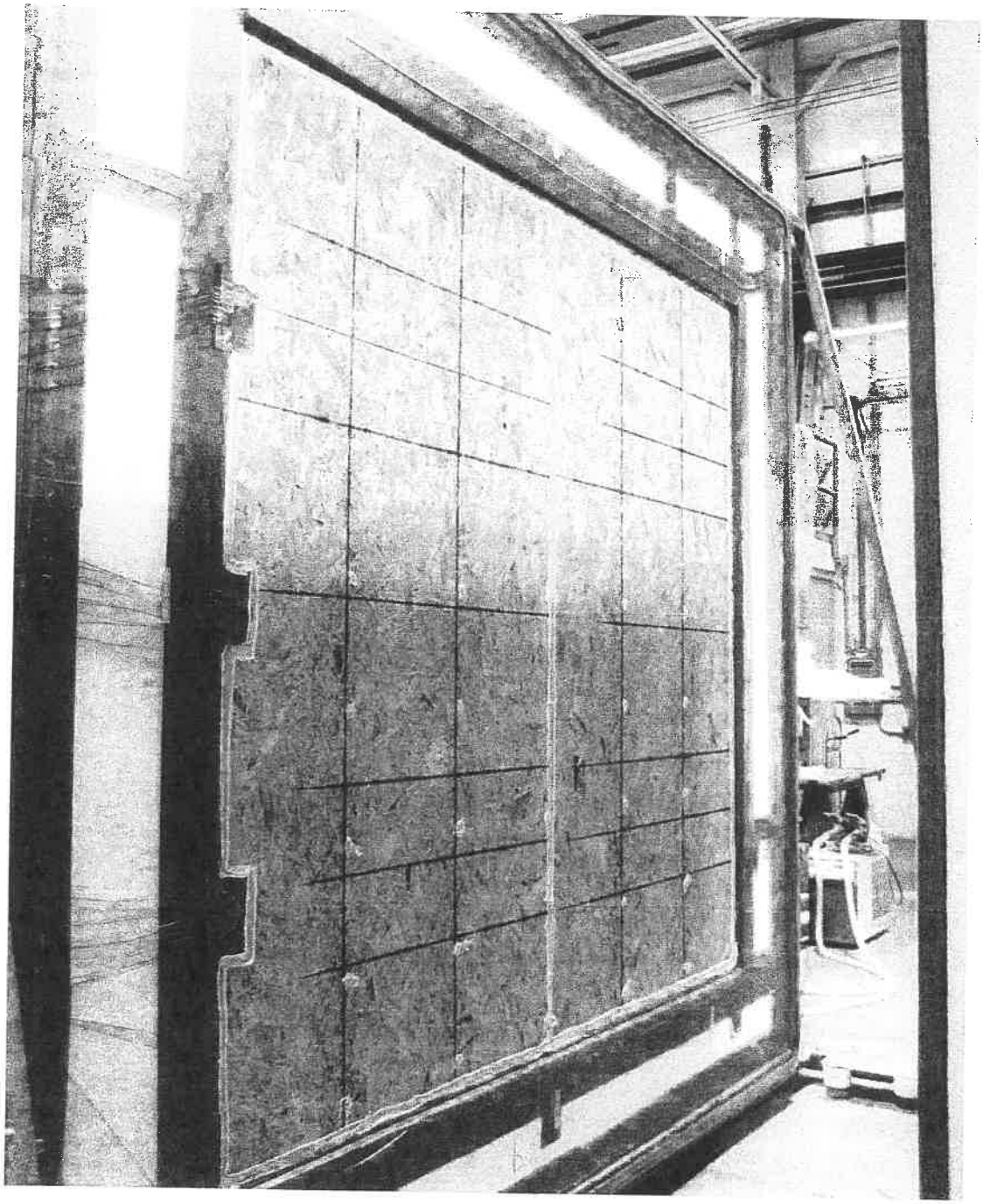
Appendix A: Pictures



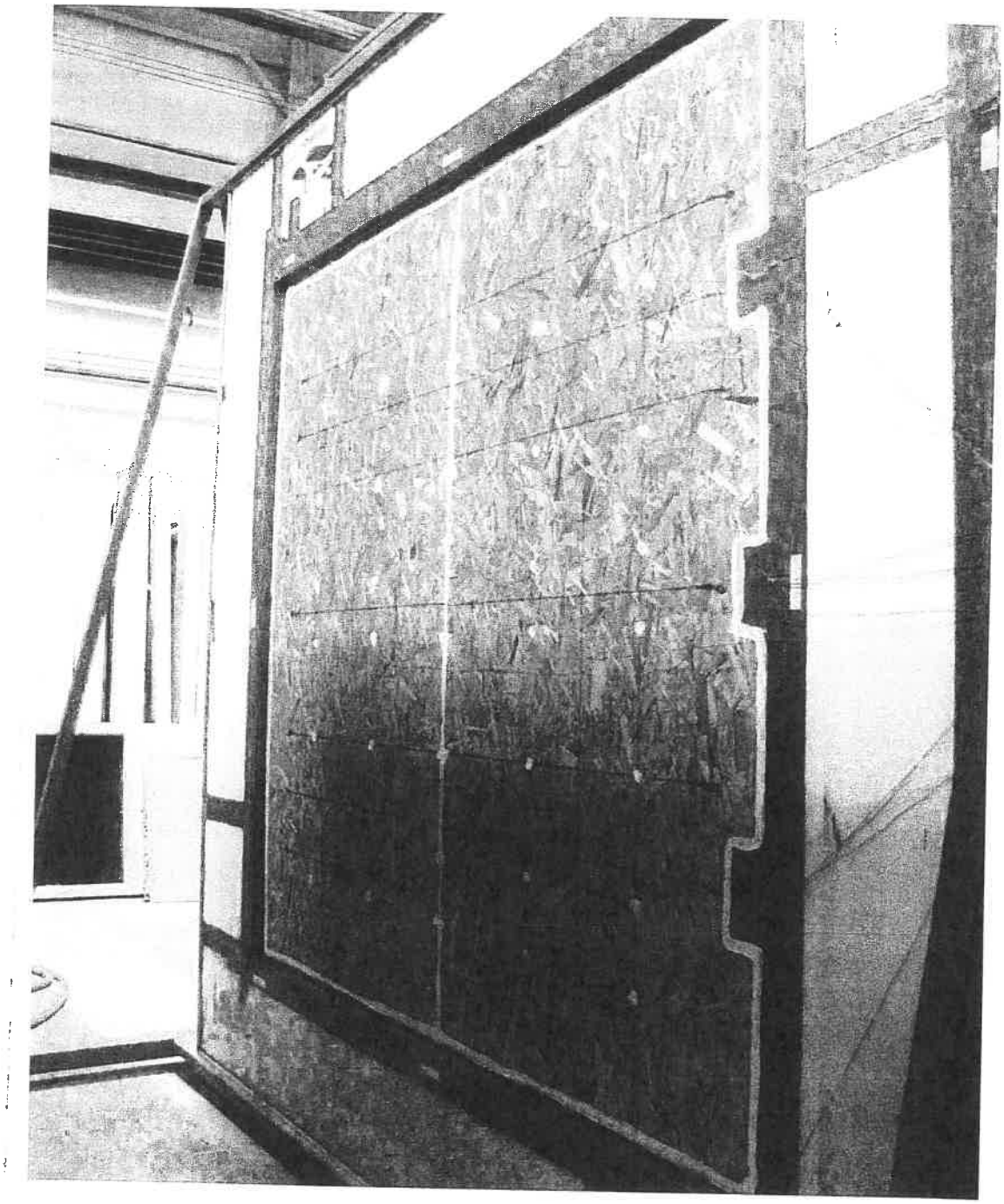
Interior side of wall assembly during construction



AA2 Vapor Shield installed on to the lathe



Exterior of completed assembly



Interior of completed assembly

Exhibit 22

6/4/20

search

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