DrJ Research Report

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Foam Plastic Insulating Sheathing Used as an Air Barrier Material in an Air Barrier Assembly

Trade Secret Report Holder:

Foam Sheathing Committee (FSC) Members

americanchemistry.com/industry-groups/foam-sheathing-committee-fsc

continuousinsulation.org

CSI Designations:

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION Section: 07 21 00 - Thermal Insulation Section: 07 27 00 - Air Barriers

1 Innovative Products Evaluated[1]

1.1 Foam Plastic Insulating Sheathing (FPIS) products from the following manufacturers are listed in **Table 1** and recognized in this report:

1.1.1 Atlas Roofing Corporation

1.1.2 BASF Corporation

1.1.3 DuPont de Nemours, Inc.

1.1.4 Hunter Panels

1.1.5 Insulfoam

1.1.6 Kingspan Insulation, LLC

1.1.7 Owens Corning

1.1.8 Progressive Foam Technologies Inc.

1.1.9 Rmax, a Business Unit of Sika Corporation

2 Evaluation Scope

2.1 This research report provides a central location for the identification of products that have been approved for use as an air barrier material in an air barrier assembly.

2.1.1 The products listed in this report have been identified in code evaluation reports as approved for use as an air barrier material or as a component of an air barrier assembly.

2.2 This research report supplements existing product certifications and is intended only to provide information on the products approved for the manufacturers listed in **Section 1.1**. For the purposes of this report, DrJ is not certifying the products, but rather is providing the user with direction on where to obtain specific information for the products shown. For details on the products found in **Table 1**, see manufacturer code evaluation reports or listings.

2.3 Any code compliance issues not specifically addressed in this section are outside the scope of this DRR.

2.4 Any engineering evaluation conducted for this DRR was performed within DrJ's professional scope of work on the dates provided herein.

3 Definitions

3.1 New Materials[2] are defined as building materials, equipment, appliances, systems, or methods of construction not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[3] The design strengths and permissible stresses shall be established by tests[4] and/or engineering analysis.[5]

3.2 Duly Authenticated Reports[6] and Research Reports[7] are test reports and related engineering evaluations, which are written by an approved agency[8] and/or an approved source.[9]

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).[10]

3.3 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory.

3.4 An approved source is "approved" when a professional engineer (i.e., Registered Design Professional) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[11]

3.5 The regulatory authority shall enforce[12] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[13] stating the nonconformance and the path to its cure.

3.6 The regulatory authority shall accept Duly Authenticated Reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[14]

3.7 Approval equity is a fundamental commercial and legal principle.[15]

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation[16]

4.1 *Standards*

4.1.1 *ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*

4.1.2 *ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*

4.1.3 *ASTM E1677: Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls*

4.1.4 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*

4.1.5 *ASTM E2357: Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies*

4.1.6 *ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*

4.2 *Regulations*

4.2.1 *IBC – 18, 21, 24: International Building Code®*

4.2.2 *IRC – 18, 21, 24: International Residential Code®*

4.2.3 *IECC – 18, 21, 24: International Energy Conservation Code®*

5 Code Compliance Assessment for Use as Air Barrier

5.1 *Code Requirements for the Use of Foam Plastic Insulation as an Air Barrier*

5.1.1 Requirements for the use of foam plastic insulation as an air-impermeable insulation are given in IRC Section N1101.10.5, IECC Section R303.1.5, and IECC Section C402.6.2.3.1.[17]

5.1.2 Requirements for the use of foam plastic insulation in an air barrier assembly are given in IECC Section C402.6.2.3.2.[18]

5.1.3 It is the responsibility of the user to apply the requirements of the specific edition of the building code used in the jurisdiction where the structure is to be built.

5.1.4 It is also the responsibility of the user to verify the certifications listed in code evaluation reports, along with the details found therein, for compliance with that listing.

5.2 *Product Code Compliance*

5.2.1.1 **Table 1** shows the FPIS products from the manufacturers listed in **Section 1.1** that have met the requirements for use as continuous air barriers for the opaque building envelope, provided they are installed as air barriers, in accordance with the manufacturer installation instructions as required in IECC Section C402.6.2.3.1.[19]

5.2.1.1.1 The code evaluation reports or manufacturer installation instructions generally provide details on the use of joint sealing tapes, flashing materials, and sealants that are approved for use with the product to achieve performance as an air barrier assembly.

5.3 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

Table 1. Foam Sheathing Product Code Compliance as an Air Barrier Material

Manufacturer	Report Number	Product(s)[1,2]	Type of Application	
			IECC Section C402.6[20]	IECC Section R402.5[21] / IRC Section N1102.5[22]
Atlas Roofing Corporation	ESR-1375	EnergyShield® EnergyShield® XR EnergyShield® CGF EnergyShield® CGF Pro EnergyShield® PanelCast	Y	Y
	TER 1905-02 ULEX.R16529-01	ThermalStar® LCi ThermalStar® LWi ThermalStar® SWi	Y	Y
BASF Corporation	ESR-4431	Neopor® ThermaPlus™	Y	Y

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			IECC Section C402.6[20]	IECC Section R402.5[21] / IRC Section N1102.5[22]
DuPont de Nemours, Inc.	CCRR-0435	Thermax™ Sheathing Thermax™ Light Duty Thermax™ Heavy Duty Thermax™ XARMOR (ci) Thermax™ Metal Building Thermax™ White Finish Thermax™ ci Exterior	Y	Y
	CCRR-0440	Thermax™ Metal Building Board NH Thermax™ White Finish NH Thermax™ Heavy Duty NH Thermax™ Light Duty NH Interior/Exterior Thermax™ Basic NH	Y	Y
	ESR-4755	Styrofoam™ Duramate™ Plus Styrofoam™ Residential Sheathing Styrofoam™ Residing Board Styrofoam™ Utilityfit Styrofoam™ Scoreboard Styrofoam™ Sheathing Material Styrofoam™ Square Edge Styrofoam™ Tongue and Groove Styrofoam™ Cavitymate™ Ultra Styrofoam™ Ultra SL DuPont High Performance Underlayment BLUECOR™ DuPont Protection Board III	Y	Y
	ESR-3089	Tuff-R™ Tuff-R™ C Super Tuff-R™ Super Tuff-R™ C ISOCAST™ R	Y	Y
Hunter Panels	TER 1402-01	Xci CG (Class A) Xci Foil (Class A) Xci Foil (Class A) PLUS Xci 286	Y	Y
	TER 1402-02	Xci CG	Y	Y
Insulfoam	TER 2309-01	Blueskin VP Tech	Y	Y
Kingspan	TER 1011-01	GreenGuard® Insulation Board CM GreenGuard® Insulation Board LG CM GreenGuard® Insulation Board SL GreenGuard® Insulation Board LG SL GreenGuard® Insulation Board SLX GreenGuard® Insulation Board LG SLX GreenGuard® PGU	Y	Y

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Manufacturer	Report Number	Product(s)[1,2]	Type of Application	
			IECC Section C402.6[20]	IECC Section R402.5[21] / IRC Section N1102.5[22]
Owens Corning	ULEX.R8811	FOAMULAR® FOAMULAR® NGX™	Y	Y
Progressive Foam Technologies Inc.	ULEX.R18532	Proboard® FR Proboard® Original Proboard® Versa™ Proboard® Versa™ VP	Y	Y
Rmax, a Business Unit of Sika Corporation	TER 1212-03	ECOMAXci® FR Air Barrier EVOMAXci™	Y	Y
	TER 1207-01	Thermasheath®-SI Thermasheath®	Y	Y
	TER 1309-03	Thermasheath® ECOMAXci® FR ECOMAXci® FR White TSX-8500 TSX-8510	Y	Y
	TER 1504-04	ECOMAXci® Ply	Y	Y
	TER 1811-02	ECOMAXci® FR Ply	Y	Y
	TER 1504-05	ThermaBase-CI™	Y	Y
	TER 2202-02	Durasheath®	Y	Y

1. Pursuant to IECC Section C402.6.2.3.1 (3),[23] XPS insulation board having a thickness of not less than 1/2" are deemed to comply as air barrier materials in accordance with IECC Section C402.6.2.3.1,[24] provided joints are sealed and materials are installed as air barriers in accordance with the manufacturer instructions.
2. Pursuant to IECC Section C402.6.2.3.1 (4),[25] foil-back polyisocyanurate insulation board having a thickness of not less than 1/2" are deemed to comply as air barrier materials in accordance with IECC Section C402.6.2.3.1,[26] provided joints are sealed and materials are installed as air barriers in accordance with the manufacturer instructions.
3. Products listed are code compliant and may be used as an air barrier based on:
   - Footnote 1 of this table,
   - Footnote 2 of this table,
   - Evaluated as air barrier materials in accordance with ASTM E2178, or
   - Evaluated as part of an air barrier assembly in accordance with ASTM E2357, ASTM E1677, or ASTM E283.

   See manufacturer research reports for additional details.
4. The IRC and residential sections of the IECC (i.e., IECC Section R402.5[27] / IRC Section N1102.5[28]) do not provide specific requirements for air barrier materials. Blower door tests on the completed building are required. The products listed as compliant here are based on their approval as continuous air barriers in accordance with deemed to comply provisions of IECC Section C402.6[29] or testing completed in accordance with ASTM E2178, ASTM E2357, ASTM E1677, or ASTM E283.

5.4 Where the application falls outside of the performance evaluation, conditions of use, and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

5.5 Any regulation specific issues not addressed in this section are outside the scope of this report.

6 Installation

6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, the manufacturer code compliance report, and the applicable building code.

6.2 In the event of a conflict between the manufacturer installation instructions and the manufacturer code compliance report, the more restrictive shall govern.

6.3 The products listed in this research report shall be used in accordance with the manufacturer installation instructions and the referenced research reports in **Table 1**. Areas of consideration required for a complete air barrier system include, but are not limited to the following:

6.3.1 Board orientation

6.3.2 Fastener selection and spacing

6.3.3 Joint and corner treatment (tapes, flashings, etc.)

6.3.4 Penetrations

6.3.5 Integration of fenestration products

6.3.6 General flashing

6.4 For applications outside the scope of this research report or the referenced research reports, an alternate means of code compliance is required.

7 Substantiating Data

7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as indicated the in manufacturer research reports listed in **Table 1**.

7.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or RDPs. Accuracy of external test data and resulting analysis is relied upon.

7.3 Where pertinent, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent[30] to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

7.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or Duly Authenticated Reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in Duly Authenticated Reports, may be dependent upon published design properties by others.

7.5 Testing and engineering analysis: The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.[31]

7.6 Where additional condition of use and/or regulatory compliance information is required, please search for Foam Plastic Insulating Sheathing (FPIS) products on the DrJ Certification website.

8 Findings

8.1 As outlined in **Section 5**, Foam Plastic Insulating Sheathing (FPIS) products have performance characteristics that were tested and/or meet applicable regulations and are suitable for use pursuant to its specified purpose.

8.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, Foam Plastic Insulating Sheathing (FPIS) products shall be approved for the following applications:

8.2.1 Air barriers in accordance with the requirements of IRC Section N1101.10.5, IECC Section R303.1.5, and IECC Section C402.6.2.3.1,[32] or IECC Section C402.6.2.3.2[33] as described in the individual research reports listed in **Table 1**.

8.3 Any application specific issues not addressed herein can be engineered by an RDP.

8.4 IBC Section 104.2.3[34] (IRC Section R104.2.2[35] and IFC Section 104.2.3[36] are similar) in pertinent part states:

> **104.2.3 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved.

8.5 **Approved**:[37] Building regulations require that the building official shall accept Duly Authenticated Reports.[38]

8.5.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited.

8.5.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce.

8.5.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

9 Conditions of Use

9.1 Material properties shall not fall outside the boundaries defined in manufacturer research report(s) listed in **Table 1**.

9.2 At a minimum, this product shall be installed per **Section 6** of this DRR.

9.3 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:

9.3.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

9.3.2 This report and the installation instructions shall be submitted at the time of permit application.

9.3.3 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.

9.3.4 These Foam Plastic Insulating Sheathing (FPIS) products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 110.4, IBC Section 104.7.2,[39] IBC Section 1703, IRC Section R109,[40] and IRC Section R109.2.

9.3.5 The application of these Foam Plastic Insulating Sheathing (FPIS) products in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.

9.4 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, "the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.2.3,"[41] all of IBC Section 104 and IBC Section 105.4. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[42] stating the nonconformance.

9.5 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

10 Identification

10.1 The Foam Plastic Insulating Sheathing (FPIS) products from the manufacturers listed in **Section 1.1** are identified by a label on the board or packaging material bearing the manufacturer name, product name, label of the third-party inspection agency, and other information to confirm code compliance.

10.2 Additional technical information can be found at the respective FSC member websites provided at americanchemistry.com/industry-groups/foam-sheathing-committee-fsc.

11 Review Schedule

11.1 This report is subject to periodic review and revision. For the latest version, visit drjengineering.org.

11.2 For information on the status of this report, please contact DrJ Engineering.

Notes

1 For more information, visit drjengineering.org or call us at 608-310-6748.

2 2021 IBC Section 1702

3 Alternative Materials, Design, and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission AND 2021 IBC Section 104.11.

4 2021 IBC Section 1706

5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice: 2021 IBC Section 1706.1.

6 2021 IBC Section 1707.1

7 2021 IBC Section 1703.4.2

8 2021 IBC Definitions: Approved Agency

9 2021 IBC Definitions: Approved Source

10 All ideas, engineering analysis, and test data are proprietary intellectual property (IP) and trade secrets (TS) and should not be provided to anyone. In particular, public regulatory officials are subject to freedom of information act requests – federal and state public records acts. This means that IP and TS will be in the public domain when any information is provided. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA), where providing test reports, engineering analysis, and/or other related IP/TS is subject to prison of not more than 10 years and/or a $5,000,000 fine or 3 times the value of the IP and TS. To follow DTSA and to comply with state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please visit http://www.drjengineering.org/AppendixC and https://www.drjcertification.org/cornell-2016-protection-trade-secrets.

11 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

12 2021 IBC Section 104

13 2021 IBC Section 104.11 AND 2021 IBC Section 105.3.1

14 2021 IBC Section 1707.1

15 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

16 Unless otherwise noted, all references in this Listing are from the 2024 version of the codes and the standards referenced therein. This material, product, design, service, and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

17 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

18 2021 IECC Section C402.5.1.4, 2018 IECC Section C402.5.1.2.2

19 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

20 2021 IECC Section C402.5

21 2021 IECC Section R402.4

22 2021 IRC Section N1102.4

23 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

24 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

25 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

26 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

27 2021 IECC Section R402.4

28 2021 IRC Section N1102.4

29 2021 IECC Section C402.5

30 2021 IBC Section 104.11

31 See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

32 2021 IECC Section C402.5.1.3, 2018 IECC Section C402.5.1.2.1

33 2021 IECC Section C402.5.1.4, 2018 IECC Section C402.5.1.2.2

34 2021 IBC Section 104.11

35 2021 IRC Section R104.11

36 2021 IFC Section 104.10, 2018 IFC Section 104.9

37 Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

38 2021 IBC Section 1707.1

39 2021 IBC Section 110.4

40 2021 IRC Section R104.4

41 2021 IBC Section 104.11

42 2021 IBC Section 104.11, 2021 IBC Section 105.3.1