



DrJ Research Report

DRR 1202-04

Foam Plastic Insulating Sheathing
Products in Exterior Walls of Type I, II,
III, or IV Construction

Foam Sheathing Committee (FSC) Members

Product:

Foam Plastic Insulating Sheathing (FPIS)

Issue Date:

May 7, 2012

Revision Date:

July 1, 2020



REPORT HOLDER
INFORMATION:

Foam Sheathing Committee (FSC) Members¹

fsc.americanchemistry.com/Members

continuousinsulation.org

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

SECTION: 07 21 00 - Thermal Insulation

1 PRODUCTS EVALUATED²

1.1 Foam Plastic Insulating Sheathing (FPIS) Products Evaluated – Manufacturer’s Trade Names:³

- 1.1.1 Atlas Roofing Corporation – Energy Shield®, Energy Shield® Pro, Energy Shield® Pro2, Energy Shield® CGF Pro, ThermalStar® Chrome, ThermalStar® CVT, and ThermalStar® LCi
- 1.1.2 BASF Corporation – Neopor®
- 1.1.3 DuPont de Nemours, Inc. – Thermax™ and Styrofoam™ Brand Insulation Boards
- 1.1.4 Hunter Panels – Xci Foil (Class A), Xci CG (Class A), Xci 286, Xci Ply (Class A), Xci Foil, Xci CG, Xci Ply
- 1.1.5 Kingspan Insulation, LLC – GreenGuard® Insulation Boards: CM, SL and SB
- 1.1.6 Rmax – Durasheath®, ECOMAXci® Ply, ECOMAXci® Wall Solution, ECOMAXci® FR Ply, Thermasheath®, Thermasheath®-XP, ECOMAXci® FR, ECOMAXci® FR White, TSX-8500, and TSX-8510

2 APPLICABLE CODES AND STANDARDS^{4,5}

2.1 Codes

- 2.1.1 *IBC—12, 15, 18: International Building Code®*
- 2.1.2 *IRC—12, 15, 18: International Residential Code®*

2.2 Standards and Referenced Documents

- 2.2.1 *ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials*
- 2.2.2 *NFPA 259: Standard Test Method for Potential Heat of Building Materials*

¹ The Foam Sheathing Committee (FSC) of the American Chemistry Council sponsors research and tools to support the reliable, efficient, and economic design and installation of foam sheathing. This report is developed by DrJ from a grant provided by FSC. Learn more about foam sheathing at continuousinsulation.org.

² Building codes require data from valid [research reports](#) be obtained from [approved sources](#). Work of licensed [registered design professionals](#) (RDPs) meets the [code requirements](#) for approval by the [building official](#).

Building official approval of a licensed RDP is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant [jurisdiction](#). Therefore, the work of licensed RDPs is accepted by [building officials](#), except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this DRR is not approved, the [building official](#) responds in writing stating the reasons for [disapproval](#).

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjengineering.org or call us at 608-310-6748.

³ Foam plastic insulation types listed in this research report are minimums. Substitution of products with equal or greater performance shall be permitted in accordance with Section 4.

⁴ Unless otherwise noted, all references in this DRR are from the 2018 version of the codes and the standards referenced therein (e.g., ASCE 7, NDS, ASTM). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

⁵ All terms defined in the applicable building codes are italicized.



- 2.2.3 *NFPA 268: Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source*
- 2.2.4 *NFPA 285: Standard Fire Test Method for the Evaluation of Fire Propagation Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components*

3 EVALUATION SCOPE

- 3.1 This research report covers the use of FPIS when used as exterior wall sheathing or in exterior walls in Type I, II, III, and IV construction as defined by the *IBC* and detailed in [IBC Section 504](#) and [Section 506](#).⁶
- 3.2 The use of FPIS in or on exterior walls in Type V construction as defined by the *IBC* is covered in separate research reports.⁷
- 3.3 The use of FPIS as a water-resistive barrier (WRB) or air barrier as defined by the *IBC* is outside the scope of this research report.
- 3.4 Products certified for use in all Types of construction are included in Table 1.
- 3.5 This research report is a code compliance evaluation report that is intended to supplement existing product certifications and is intended only to provide information on the products approved for the manufacturers listed in Section 1 of this report. For the purposes of this report, DrJ is not certifying the products, but rather is providing the user with direction on where they can obtain specific information for the products shown. For specific details on the products found in Table 1, see the manufacturer's code evaluation reports or listings.
- 3.6 Any code compliance issues not specifically addressed in this section are outside the scope of this DRR.
- 3.7 Any engineering evaluation conducted for this DRR was performed on the dates provided in this DRR and within DrJ's professional scope of work.

4 APPLICATIONS

- 4.1 *Code Requirements for Foam Plastic Insulation when Used in or on Exterior Walls in Type I, II, III, or IV Construction*
 - 4.1.1 It is the responsibility of the user to apply the requirements of the specific edition used in the jurisdiction where the structure is to be built.
 - 4.1.2 It is also the responsibility of the user to verify the certifications listed in code evaluation reports.
 - 4.1.3 Requirements for foam plastic insulation in or on exterior walls of buildings of any height are given in [IBC Section 2603.5](#).
 - 4.1.3.1 The requirements for use in Type I, II, III, or IV construction are given in the first sentence (emphasis added).

2603.5 Exterior walls of buildings of any height. Exterior walls of buildings of Type I, II, III or IV construction of any height shall comply with Sections 2603.5.1 through 2603.5.7. Exterior walls of cold storage buildings required to be constructed of noncombustible materials, where the building is more than one story in height, shall comply with the provisions of Sections 2603.5.1 through 2603.5.7. Exterior walls of buildings of Type V construction shall comply with Sections 2603.2, 2603.3 and 2603.4. Fireblocking shall be in accordance with Section 718.2.

4.2 *Product Code Compliance*

- 4.2.1 The referenced code sections require specific labeling and physical properties.

⁶ [2012 IBC Table 503](#)

⁷ [DRR 1202-01](#), [DRR 1202-04](#)



- 4.2.2 Table 1 shows the FPIS products from Section 1 that meet the listed requirements in IBC Section 2603.5.1 through Section 2603.5.7 for use in Type I, II, III, or IV construction.
- 4.2.3 The specific requirements of these sections are found in Section 4.3 and Table 2.
 - 4.2.3.1 Consult the manufacturer’s installation instructions and associated evaluation report for details specific to the intended application.
- 4.2.4 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. PRODUCT CODE COMPLIANCE

Manufacturer	Product	Evaluation Report	2603.5.1 ASTM E119	2603.5.2 Thermal Barrier Req.	2603.5.3 NFPA 259	2603.5.4 FSI / SDI ²	2603.5.5 NFPA 285	2603.5.6 Label Req.	2603.5.7 NFPA 268
Atlas Roofing Corporation	Energy Shield®	<u>ESR-1375³</u>	N	Y	N	Y	N	Y	Y
	Energy Shield® Pro	<u>TER 1306-03</u> <u>ESR-1375</u>	Y	N	Y	Y	Y	Y	Y
	Energy Shield® Pro 2	Intertek Warnock Hersey Directory							
	Energy Shield® CGF Pro	<u>TER 1306-03</u>	Y	Y	Y	Y	Y	Y	Y
	ThermalStar® Chrome	<u>BRYX.R16529</u>	Y	Y	Y	Y	Y	Y	Y
	ThermalStar® CVT	<u>BRYX.R16529</u>	Y	N	Y	Y	N	Y	Y
	ThermalStar® LCi	<u>BRYX.R16529</u>	Y	N	Y	Y	Y	Y	Y
BASF Corporation	Neopor®	<u>ESR-4431</u> <u>ULEX.R5817-02</u>	N	Y	N	Y	Y	Y	N
DuPont de Nemours, Inc.	Thermax™	<u>ESR-1659</u>	Y	N ⁴	Y	Y	Y	Y	Y
	Thermax™ ci Exterior Insulation	<u>ESR-1659</u> <u>TER 1105-01</u>	N	N	Y	Y	Y	Y	Y
	Thermax™ Total Wall System	<u>ESR-1659</u>	N	Y	Y	Y	Y	Y	Y
	Styrofoam™	<u>ESR-2142</u>	N	N ⁴	Y	Y	Y	Y	Y
Hunter Panels	Xci Foil (Class A) Xci CG (Class A)	<u>TER 1402-01</u>	N	Y	Y	Y	Y	Y	Y
	Xci 286 Xci Ply (Class A)								
	Xci Foil	<u>TER 1402-02</u>	N	Y	Y	N ⁶	Y	Y	Y
	Xci CG								
	Xci Ply	<u>TER 1402-02</u>	N	N	Y	N ⁶	Y	Y	Y
Kingspan	GreenGuard® CM	<u>TER 1407-05</u>	N	Y ⁷	N	Y	Y	Y	Y
	GreenGuard® SL								
	GreenGuard® SB								





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Rmax	ECOMAXci® Wall Solution	TER 1212-03	N	Y	Y	Y	Y	Y	Y
	Durasheath®	ROL/BI 30-03	N	Y	N	N	N	Y	Y
	Thermasheath®	TER 1309-03	N	Y	N	N	N	Y	Y
	Thermasheath®-XP	TER 1309-03	N	N ⁵	N	N	Y	Y	Y
	ECOMAXci® FR	TER 1309-03	N	N ⁵	Y	Y	Y	Y	Y
	ECOMAXci® FR White								
	TSX-8500								
	TSX-8510								
	ECOMAXci® Ply	TER 1504-04	N	N ⁸	N	N ⁶	Y	Y	Y
	ECOMAXci® FR Ply	TER 1811-02	N	N ⁵	Y	Y	Y	Y	Y

- For products indicating that *ASTM E119* testing has been done, contact manufacturer for testing details. To contact a manufacturer, see company websites.
- Flame Spread Index / Smoke Developed Index
- This product has been tested in accordance with [IBC Section 2603.9](#) and is approved for use without a thermal barrier for thicknesses up to 4-1/4" thick.
- Depends on type and thickness
- This product has been tested in accordance with [IBC Section 2603.9](#) and is approved for use without a thermal barrier for thicknesses up to 4-1/2" thick in walls and 12" thick in ceilings.
- This is a Class B product with a flame spread index less than 75, but it is approved for use in this application based on full-scale fire tests. See code evaluation report for details.
- Thermal or ignition barrier not required in attics and crawl spaces in accordance with [IBC Section 2603.4.1.6](#)
- Barrier required when installed with FRT plywood facing exterior
- These products comply with [IBC Section 2603.7](#) when installed in assemblies protected on the outside with one of the listed materials.

4.3 Code Requirements

4.3.1 All of [IBC Section 2603.5](#) is applicable to exterior walls.

4.3.2 Table 2 summarizes the code requirements for foam plastic insulation used in or on exterior walls in Type I, II, III, or IV construction.

TABLE 2. CODE REQUIREMENTS

Code Section	Section Title	Summary of Requirements
2603.5.3	Potential heat	<p>The potential heat of foam plastic insulation in any portion of the wall or panel shall not exceed the potential heat expressed in Btu per square feet (mJ/m²) of the foam plastic insulation contained in the wall assembly tested in accordance with Section 2603.5.5. The potential heat of the foam plastic insulation shall be determined by tests conducted in accordance with <i>NFPA 259</i> and the results shall be expressed in Btu per square feet (mJ/m²).</p> <p>Exception: One-story buildings complying with Section 2603.4.1.4.</p>





Code Section	Section Title	Summary of Requirements
<u>2603.5.4</u>	Flame spread and smoke-developed indexes	Foam plastic insulation, exterior coatings and facings shall be tested separately in the thickness intended for use, but not to exceed 4" (102 mm), and shall each have a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with <i>ASTM E 84</i> or <i>UL 723</i> . Exception: Prefabricated or factory-manufactured panels having minimum 0.020" (0.51 mm) aluminum facings and a total thickness of 1/4" (6.4 mm) or less are permitted to be tested as an assembly where the foam plastic core is not exposed in the course of construction.
<u>2603.5.5</u>	Vertical and lateral fire propagation	The exterior wall assembly shall be tested in accordance with and comply with the acceptance criteria of <i>NFPA 285</i> . Exception: One-story buildings complying with Section 2603.4.1.4.
<u>2603.5.6</u>	Label required	The edge or face of each piece, package or container of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number or definitive information describing the product or materials' performance characteristics and approved agency's identification.
<u>2603.5.7</u>	Ignition	Exterior walls shall not exhibit sustained flaming where tested in accordance with <i>NFPA 268</i> . Where a material is intended to be installed in more than one thickness, tests of the minimum and maximum thickness intended for use shall be performed. Exception: Assemblies protected on the outside with one of the following: <ol style="list-style-type: none"> 1. A thermal barrier complying with Section 2603.4 2. A minimum 1" (25 mm) thickness of concrete or masonry 3. Glass-fiber-reinforced concrete panels of a minimum thickness of 3/8" (9.5 mm) 4. Metal-faced panels having minimum 0.019"-thick (0.48 mm) aluminum or 0.016"-thick (0.41 mm) corrosion-resistant steel outer facings 5. A minimum 7/8" (22.2 mm) thickness of stucco complying with Section 2510. 6. <i>IBC 2015 and 2018 only</i>-A minimum 1/4-inch (6.4 mm) thickness of fiber-cement lap, panel or shingle siding complying with Section 1405.16 and 1405.16.1 or 1405.16.
<u>2603.4.1.4</u>	One-story buildings	Installation: <ul style="list-style-type: none"> • Separation from interior of building by ignition barrier • Flame spread index of not more than 25 • Smoke-developed index of not more than 450 • Less than 4" thickness • Covered by aluminum or steel of required thickness • Building sprinklered per 903.3.1.1
<u>2603.4</u>	Thermal barrier	Except as provided for in Sections 2603.4.1 and 2603.9, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 1/2" (12.7 mm) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of <i>NFPA 275</i> . Combustible concealed spaces shall comply with Section 717.
<u>2603.9</u>	Special approval	Compliance with requirements of Sections 2303.4 through 2303.8 are not required where the product has been specifically approved based on large-scale testing (<i>NFPA 286</i> , <i>FM 4880</i> , <i>UL 1040</i> or <i>UL 1715</i>) that relates to the actual end-use configuration using the maximum thickness intended for use. (<i>IBC 2015 and 2018 only</i>) Foam plastic shall not be required to comply with the requirements of Sections 2603.4 or those of Section 2603.6 where specifically approved based on large-scale tests such as, but not limited to, <i>NFPA 286</i> (with the acceptance criteria of Section 803.2), <i>FM 4880</i> , <i>UL 1040</i> or <i>UL 1715</i> . Such testing shall be related to the actual end-use configuration and be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use.





5 INSTALLATION

- 5.1 The products listed in this report shall be used in accordance with the manufacturer's installation instructions.
- 5.2 For applications outside the scope of this research report, an engineered design is required.

6 TEST ENGINEERING SUBSTANTIATING DATA

- 6.1 The Extruded Polystyrene Foam Association (XPSA) has sponsored several *NFPA 285* fire tests on various exterior wall systems that incorporated extruded polystyrene foam plastic insulation.
 - 6.1.1 These tests were successful and met the requirements of *NFPA 285*.
- 6.2 The test configurations are detailed in the following test reports:
 - 6.2.1 Report No. 01.06440.01.001; Southwest Research Institute; May, 2003.
 - 6.2.2 Report 05CA2541, NC2650; Underwriters Laboratories, Inc.; January 10, 2005.
 - 6.2.3 Report No. 01.13537.01.106; Southwest Research Institute; September 26, 2008.
- 6.3 Manufacturer reports as listed in Table 1.
- 6.4 Manufacturer DrJ Technical Evaluation Reports as listed in Table 1.
- 6.5 Manufacturer UL Evaluation Reports and Classification Listings as listed in Table 1.
- 6.6 Manufacturer Intertek Classification Listings as listed in Table 1.
- 6.7 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC Section 1703* and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.
- 6.8 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC*, *IRC*, *NDS®*, and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

7 FINDINGS

- 7.1 When used in accordance with this research report and the manufacturer's installation instructions, the products covered in this report are a suitable alternative to the requirements of *IBC Section 2603.5*.
- 7.2 *IBC Section 104.11* (*IRC Section R104.11* and *IFC Section 104.9* are similar) states:
 - 104.11 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*. 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, not less than the equivalent of that prescribed in this code...Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.
- 7.3 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.
 - 7.3.1 No known variations



8 REFERENCES

- 8.1 The Foam Sheathing Committee (FSC) of the American Chemistry Council sponsors research and tools to support the reliable, efficient, and economic design and installation of foam sheathing. This report is developed by DrJ from a grant provided by FSC. Learn more about foam sheathing at [continuousinsulation.org](https://www.continuousinsulation.org).

9 CONDITIONS OF USE

- 9.1 Where required by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this DRR and the installation instructions shall be submitted at the time of permit application.
- 9.2 Any generally accepted engineering calculations needed to show compliance with this DRR shall be submitted to the AHJ for review and approval.
- 9.3 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the Building Designer (e.g., owner or registered design professional).
- 9.4 At a minimum, this product shall be installed per Section 5 of this DRR.
- 9.5 This product is manufactured under a third-party quality control program in accordance with IBC Section 104.4 and 110.4 and IRC Section R104.4 and R109.2.
- 9.6 The actual design, suitability, and use of this DRR, for any particular building, is the responsibility of the owner or the owner's authorized agent. Therefore, the DRR shall be reviewed for code compliance by the building official for acceptance.

10 IDENTIFICATION

- 10.1 The product(s) listed in Section 1 are identified by a label on the board or packaging material bearing the manufacturer's 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 found at [fsc.americanchemistry.com/Members](https://www.fsc.americanchemistry.com/Members).

11 REVIEW SCHEDULE

- 11.1 For the most recent version or current status of this DRR, visit [drjengineering.org](https://www.drjengineering.org) or contact [DrJ Engineering](https://www.drjengineering.org).