



Polyisocyanurate Insulation Producing FSC Members

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Atlas Roofing Corporation – atlasroofing.com

Dow Building Solutions – building.dow.com

GAF – gaf.com

Hunter Panels – hpanels.com

Johns Manville – johnsmanville.com

Rmax Operating, L.L.C. – rmaxinc.com

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation

1. Product Lines Evaluated:

1.1. Polyisocyanurate Insulating Sheathing (polyiso) Products Evaluated – Manufacturer’s “Trade Names”:¹

1.1.1. Polyisocyanurate Products (polyiso) – Type 1, ASTM C1289

1.1.1.1. Atlas Roofing Corporation– “Energy Shield®”, “Energy Shield® Pro”, “Energy Shield® Pro2”, “RBoard® Pro”, “ThermalStar® Chrome”, “ThermalStar® CVT”, and “ThermalStar® LCi”

1.1.1.2. Dow – “THERMAX™” and “STYROFOAM™” Brand Insulation Boards

1.1.1.3. GAF – “EnergyGuard™”

1.1.1.4. Hunter Panels – “Xci Foil”, “Xci CG”, “Xci Class A”, “Xci 286” and “Xci Ply”

1.1.1.5. Johns Manville – “JM AP Foil™-Faced” and “JM CI Max®”

1.1.1.6. Rmax – “Durasheath®”, “ECOMAXci® Ply”, “ECOMAXci® Wall Solution”, “Thermasheath®”, “Thermasheath®-XP”, “ECOMAXci® FR”, and “ECOMAXci® FR White”

1.2. For the most recent version of this report, visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.

¹ 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](#).

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2. Applicable Codes and Standards:²

- 2.1. 2009, 2012 and 2015 International Building Code (IBC)
- 2.2. 2009, 2012 and 2015 International Residential Code (IRC)
- 2.3. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
- 2.4. NFPA 259 – Standard Test Method for Potential Heat of Building Materials
- 2.5. NFPA 268 – Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source
- 2.6. NFPA 285 – Standard Test Method for 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 polyiso products 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 Table 503](#).
- 3.2. The use of polyiso products in or on exterior walls in Types V construction as defined by the *IBC* is covered in separate research reports.³
- 3.3. The use of polyiso products 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 Type I-IV 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 evaluation.

4. Applications:

4.1. Code requirements for polyiso sheathing 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 building code 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 polyiso products in or on exterior walls of buildings of any height are given in [IBC Section 2603.5](#). The requirements for use in Type I, II, III or IV construction are given in the first sentence.

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 also 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.

4.2. Product Code Compliance

- 4.2.1. The referenced code sections require specific labeling and physical properties.
- 4.2.2. [Table 1](#) shows the polyiso products from [Section 1](#) that meet the listed requirements in [IBC Section 2603.5.1](#) through [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](#).

² Unless otherwise noted, all references in this research report are from the 2012 version of the codes and the standards referenced therein, including, but not limited to, ASCE 7, SDPWS and WFCM. This product also complies with the 2000-2009 and 2015 versions of the *IBC* and *IRC* and the standards referenced therein. As required by law, where this research report is not approved, the building official shall respond in writing, stating the reasons this research report was not approved.

³ [DRR No. 1404-02: Polyiso Sheathing in Type V Construction](#) and [DRR No. 1404-01: NFPA 285 Tested Assemblies Using Polyiso Sheathing Products](#)

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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 good technical judgment.

Product Code Compliance									
Manufacturer	Product	Code Evaluation Report	2603.5.1	2603.5.2	2603.5.3	2603.5.4	2603.5.5	2603.5.6	2603.5.7
			ASTM E 119 ¹	Thermal Barrier Req'd	NFPA 259	FSI / SDI ²	NFPA 285	Label Req'd	NFPA 268
Atlas Roofing	Energy Shield®	ESR 1375³	N	Y	N	Y	N	Y	N
	Energy Shield® Pro	ESR 1375							
	Energy Shield® Pro2	TER No. 1306-03 Intertek Warnock Hersey Directory	Y	N	Y	Y	Y	Y	N
	RBoard® Pro	TER No. 1306-03	Y	Y	Y	Y	Y	Y	N
	ThermalStar® Chrome	BRYX.R16529	Y	Y	Y	Y	Y	Y	N
	ThermalStar® CVT		Y	N	Y	Y	N	Y	N
	ThermalStar® LCI		Y	N	Y	Y	Y	Y	N
Dow	THERMAX™	ESR 1659	Y	N ⁴	Y	Y	Y	Y	N
	THERMAX™ ci Exterior Insulation	ESR 1659 TER No. 1105-01	N	N	Y	Y	Y	Y	N
	Thermax™ Total Wall System	ESR 1659	N	Y	Y	Y	Y	Y	N
	STYROFOAM™	ESR 2142	N	N ⁴	Y	Y	Y	Y	N
Hunter	Xci Class A	TER No. 1402-01	N	Y	Y	Y	Y	Y	N
	Xci 286								
	Xci Foil	TER No. 1402-02	N	Y	Y	N ⁶	Y	Y	N
	Xci CG								
	Xci Ply		N	N	Y	N ⁶	Y	Y	N
Johns Manville	JM AP Foil™-Faced	ESR 3398	N	Y	Y	Y	Y	Y	N
	JM CI Max®		N	Y	N	Y	N	Y	N
Rmax	ECOMAXci® Wall Solution	TER No. 1212-03	N	Y	Y	Y	Y	Y	N
	Durasheath®	ROL/BI 30-03 , TER No. 1309-03	N	Y	N	N	N	Y	N
	Thermasheath®								
	Thermasheath®-XP	TER No. 1309-03	N	N ⁵	N	N	Y	Y	N
	ECOMAXci® FR	TER No. 1309-03	N	N ⁵	Y	Y	Y	Y	Y
	ECOMAXci® FR White								
	ECOMAXci® Ply	TER No. 1504-04	N	N ⁷	N	N ⁶	Y	Y	N

1. For products indicating that ASTM E119 testing has been done, contact manufacturer for testing details. To contact a manufacturer, see company websites listed on [Page 1](#).
2. Flame Spread Index / Smoke Developed Index.
3. Report based on 2003 IBC and IRC standards, subject to renewal March 1, 2016.
4. Depends on type and thickness.
5. This product has been tested in accordance with [IBC Section 2603.10](#) and is approved for use without a thermal barrier for thicknesses up to 4 1/2" thick in walls and 12" thick in ceilings.
6. 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.
7. Thermal Barrier required when installed with FRT plywood facing exterior

Table 1: Product Code Compliance

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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 polyiso products used in or on exterior walls in Type I, II, III or IV construction.

Code Requirements		
Code Section	Section Title	Summary of Requirements
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 also 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.
2603.5.1	Fire-resistance-rated walls	Where the wall is required to have a fire-resistance rating, data based on tests conducted in accordance with <i>ASTM E 119</i> or <i>UL 263</i> shall be provided to substantiate that the fire-resistance rating is maintained.
2603.5.2	Thermal barrier	Any foam plastic insulation shall be separated from the building interior by a thermal barrier meeting the provisions of Section 2603.4, unless special approval is obtained on the basis of Section 2603.9. Exception: One-story buildings complying with Section 2603.4.1.4.
2603.5.3	Potential heat	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/m ²) 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/m ²). Exception: One-story buildings complying with Section 2603.4.1.4.
2603.5.4	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.
2603.5.5	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.
2603.5.6	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.
2603.5.7	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</i> only- 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.

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Code Requirements		
Code Section	Section Title	Summary of Requirements
2603.4.1.4	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
2603.4	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.
2603.10	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. BC 2015 only- 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.

Table 2: Code Requirements

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 and 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.
 - 6.2.2. Report 05CA2541, NC2650; Underwriters Laboratories, Inc.
 - 6.2.3. Report No. 01.13537.01.106; Southwest Research Institute.
- 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 DrJ relies on to be accurate as it undertakes its engineering analysis.
- 6.8. DrJ has reviewed and found the data provided by other professional sources are credible. This information has been approved in accordance with DrJ's procedure for acceptance of data from approved sources.
- 6.9. DrJ's responsibility for data provided by approved sources is in accordance with professional engineering law.
- 6.10. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS*, etc.). This includes review of code provisions and any

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related test data that helps with comparative analysis or provides support for equivalency to an intended end-use application.

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](#) and [IRC Section R104.11](#) ([IFC Section 104.9](#) is similar) state:

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, at least 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*.⁴

8. Conditions of Use:

- 8.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.
- 8.2. The products covered by this research report shall be installed in accordance with this report and the manufacturer's installation instructions.
- 8.3. Design
 - 8.3.1. Building Designer Responsibility
 - 8.3.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., Owner, Registered Design Professional, etc.) for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
 - 8.3.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section R301](#) and [IBC Section 1603](#).
 - 8.3.2. Construction Documents
 - 8.3.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.
- 8.4. Responsibilities
 - 8.4.1. The information contained herein is a product, engineering or building code compliance research report performed in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering procedures, experience and good technical judgment.
 - 8.4.2. DrJ research reports provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated section.
 - 8.4.3. The engineering evaluation was performed on the dates provided in this research report, within DrJ's professional scope of work.
 - 8.4.4. This product is manufactured under a third-party quality control program in accordance with [IRC Section R104.4](#) and [R109.2](#) and [IBC Section 104.4](#) and [110.4](#).
 - 8.4.5. The actual design, suitability and use of this research report for any particular building is the responsibility of the Owner or the Owner's authorized agent, and the report shall be reviewed for code compliance by the Building Official.
 - 8.4.6. The use of this research report is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party inspection process, proper installation per the manufacturer's instructions, the Building Official's

⁴ The last sentence is adopted language in the 2015 codes.

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inspection and any other code requirements that may apply to assure accurate compliance with the applicable building code.

9. Identification:

- 9.1. The products listed in [Section 1](#) in this research report 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
- 9.2. Additional technical information and related research reports can be found at the company websites listed on [Page 1](#) and from [DrJ Engineering](#).

10. Review Schedule:

- 10.1. This research report is subject to periodic review and revision. For the most recent version of this report, visit drjengineering.org.
- 10.2. For information on the current status of this report, contact [DrJ Engineering](#).