

UL Evaluation Report

UL ER11783-01

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UL Category Code: ULEX

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DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Sub-level 2: 07 20 00 - Thermal Protection

Sub-level 3: 07 21 00 - Thermal Insulation

Sub-level 4: 07 21 13 - Board Insulation

Sub-level 3: 07 22 00 - Roof and Deck Insulation

Sub-level 4: 07 22 16 - Roof Board Insulation

DIVISION: 31 00 00 - Earthworks

Sub-level 3: 31 23 00 - Excavation and Fill

Sub-level 4: 31 23 23 - Fill

COMPANY:

**CARPENTER COMPANY
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1. SUBJECT:

CARPENTER EXPANDED POLYSTYRENE

2. SCOPE OF EVALUATION

- 2015, 2012 *International Building Code* ® (IBC)
- 2015, 2012 *International Residential Code* ® (IRC)
- 2015, 2012 *International Energy Code* ® (IECC)
- ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012
- ICC-ES Acceptance Criteria for Termite Resistant Foam Plastic (AC239), dated October 2008
- ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated June 2014

The products were evaluated for the following properties

- Surface Burning Characteristics (ANSI/UL723, ASTM E84)
- Physical Properties (ASTM C578)
- Physical Properties (ASTM E2430)
- Physical Properties (ASTM D6817)
- Roof Deck Construction Material With Resistance to Internal Fire Exposure (ANSI/UL1256)
- Roofing Systems for Exterior Fire Exposure (ANSI/UL790, ASTM E108)
- Flammability Testing for Use in Attics and Crawl Spaces (ICC-ES AC12, App. A and B)
- Termite-Resistance, (ICC-ES AC 239)
- Foam Plastic – Special Approval (ANSI/UL1715)

3. REFERENCED DOCUMENTS

■ ICC-ES:

- ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012
- ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated December 2014
- ICC-ES Acceptance Criteria for Termite-Resistant Foam Plastics (AC239), dated November 2008

■ ANSI/UL:

- ANSI/UL723 (ASTM E84), 10th edition, Test for Surface Burning Characteristics of Building Materials
- ANSI/UL790 (ASTM E108), 8th edition, Standard Test Methods for Fire Tests of Roof Coverings
- ANSI/UL1256, 4th edition, Standard for Fire Test of Roof Deck Constructions
- ANSI/UL1715, Fire Test of Interior Finish Material

■ ASTM:

- ASTM C578-15b, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- ASTM D6817-15, Standard Specification for Rigid Cellular Polystyrene Geofoam
- ASTM D7180-05, Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam in Geotechnical Projects
- ASTM D7557-09, Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens
- ASTM E2430-13, Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for Use in Exterior Insulation Finish Systems (EIFS)

4. USES

4.1 General

The products described in this report are used as nonstructural insulation on the interior or exterior of above grade walls, on the interior or exterior of below grade walls, below concrete slabs, around concrete slab edges, or as roof insulation. Installation shall be in accordance with Section 6 of this report.

Carpenter EPS may be used on walls in attics and crawl spaces when installation is in accordance with Section 6.4.

The insulation may be used as a vapor retarder when installation is in accordance with 6.2.

Carpenter EPS may be used in commercial and residential roofing systems classified for use in Class A, B, and C assemblies, when installed in accordance with 6.3. Refer to UL TGFU Listings for specific classifications.

The insulation may be used as a component in Exterior Insulation and Finish Systems (EIFS).

4.2 Carpenter Geofoam Blocks

Carpenter Geofoam Blocks may be used as lightweight structural fill in floor cavities. Installation shall be in accordance with Section 6.5 of this report.

5. PRODUCT DESCRIPTION

5.1 General

The products covered under this report are molded, closed-cell expanded polystyrene having a flame spread index not exceeding 25 and a smoke developed index not exceeding 450 for thicknesses up to 6 inches, when tested in accordance with UL723 (ASTM E84) as required by IBC [Section 2603.3](#) or IRC [Section 316.3](#), as applicable.

Products containing the additive Preventol® and identified as such on the product markings, have been treated for termite resistance in accordance with IBC [Section 2603.9 exception 2](#) (Section 2603.8 exception 2 in 2015 IBC) , or IRC Section [R318.4 exception 2](#), as applicable.

5.2 Carpenter EPS Insulation Boards

All Carpenter EPS board cores have been found to comply with ASTM C578. The boards are manufactured at minimum densities of 0.70, 0.90, 1.15, 1.35, 1.80, 2.40, and 3.00 lbs/ft³ and have ASTM C578 designations of Type XI, Type I, Type VIII, Type II, Type IX, Type XIV, and Type XV respectively. See excerpt from ASTM C578, Table 1 below for minimum Thermal Resistance values for each Type:

Table 1 – Thermal Resistance Values

ASTM TYPE	DENSITY, min., lb/ft ³	THERMAL RESISTANCE ¹ , min., ° F-ft ² -h/Btu
Type XI	0.70	3.1
Type I	0.90	3.6
Type VIII	1.15	3.8
Type II	1.35	4.0
Type IX	1.80	4.2
Type XIV	2.40	4.2
Type XV	3.00	4.3

¹Thermal resistance (R) values are based on tested values at 1 inch thickness and 75°F mean temperature and must be multiplied by the installed thickness for thicknesses greater than 1 inch.

Carpenter EPS Insulation Boards intended for use in EIFS systems have been found to comply with ASTM C578 and ASTM E2430. The boards are manufactured at a minimum density of 0.90 lbs/ft³ and have the ASTM C578 designation of Type I.

5.3 Carpenter Geofoam Blocks

Carpenter Geofoam Blocks have been found to comply with ASTM D6817. The blocks are manufactured at minimum densities of 0.70, 0.90, 1.15, 1.35, 1.80, 2.40, and 2.85 lbs/ft³ and have ASTM D6817 designations of EPS 12, EPS15, EPS19, EPS22, EPS29, EPS39, and EPS46 respectively. See excerpt from ASTM D6817, Table 2 below.

Table 2 – ASTM D6817 Physical Property Requirements for RCPS Geofoam

ASTM TYPE	DENSITY, min., lb/ft ³	COMPRESSIVE RESISTANCE, min., psi at 1 % Strain
Type EPS12	0.70	2.2
Type EPS15	0.90	3.6
Type EPS19	1.15	5.8
Type EPS22	1.35	7.3
Type EPS29	1.80	10.9
Type EPS39	2.40	15.0
Type EPS46	2.85	18.6

6. INSTALLATION

6.1 General

The products described in this report are installed in accordance with the manufacturer's published installation instructions and this evaluation report. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions shall be available on the jobsite during installation.

These products must be attached to the structure in a manner that will hold the insulation securely in place. The insulation boards must not be used structurally to resist transverse, axial or shear loads.

The interior of the building must be separated from the insulation with a thermal barrier as required by IBC [Section 2603.4](#) or IRC [Section 316.4](#), as applicable.

6.2 For Use as Vapor Retarders

The products described in this report may be used as vapor retarders based on perm values described in Table 3, when required in accordance with the applicable sections of the IBC, IRC and IECC. Vapor retarders are classified as follows:

Class I: 0.1 perm or less Class II: 0.1 <perm ≤ 1.0 perm Class III: 1.0 <perm ≤ 10 perms

Table 3 – Water Vapor Permeance of Carpenter Insulation Boards

ASTM TYPE	DENSITY, min. lb/ft ³	MAXIMUM PERMEANCE ¹
Type XI	0.70	5.0
Type I	0.90	5.0
Type VIII	1.15	3.5
Type II	1.35	3.5
Type IX	1.80	2.5
Type XIV	2.40	2.5
Type XV	3.00	2.5

¹Water vapor permeance values are based on 1 inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values may be calculated based on insulation thickness, by dividing the perm value shown by the installed thickness in inches.

6.3 For Use as Roof Insulation

Carpenter EPS may be used as a roofing insulation as follows:

- As part of a UL Classified Class A, B, or C roof-covering assembly in accordance with UL 790
- As part of a UL Classified Roof Deck Construction in accordance with UL 1256

6.4 For Use in Attics and Crawl Spaces

Carpenter EPS may be used on walls of attics and crawl spaces, without the coverings listed in IBC [Section 2603.4.1.6](#) or IRC [Section R316.5.3](#) and IRC [Section R316.5.4](#), as follows:

1. Entry to the attic or crawl space is limited to service of utilities, and no storage is permitted. Utilities include, but are not limited to, mechanical equipment, electrical wiring, fans, plumbing, gas or electric hot water heaters, and gas or electric furnaces.
2. Attic ventilation is provided when required by [Section 1203.2](#) of the IBC or IRC [Section R806](#), as applicable.
3. There are no interconnected crawl space areas
4. Air in the attic or crawl space is not circulated to other parts of the building.
5. Under-floor (crawl space) ventilation is provided when required by IBC [Section 1203.3](#) or IRC [Section R408.1](#), as applicable.
6. Combustion air is provided in accordance with IMC [Section 701](#).
7. Carpenter Insulation boards are limited to a maximum thickness of 5.7 inches (145 mm) for Type XI, a maximum thickness of 4 inches (102 mm) for Type I, a maximum thickness of 3.25 inches (82.6 mm) for Type VIII, a maximum thickness of 2.67 inches (67.8 mm) for Type II, a maximum thickness of 2 inches (51 mm) for Type IX, a maximum thickness of 1.6 inches (41 mm) for Type XIV, or a maximum thickness of 1.33 inches (34 mm) for Type XV.

6.5 For Use on the Exterior of Above Grade Walls

Carpenter and Carpenter StyroFold Insulation Boards may be used on the exterior of above grade walls as follows:

- Exterior Walls of One- and Two-Family Dwellings in accordance with the IRC.
- Exterior walls of one story buildings of Types I, II, III, or IV construction in accordance with IBC [Section 2603.4.1.4](#).
- Exterior walls of Type V construction in accordance with IBC [Section 2603.2](#), [Section 2603.3](#), and [Section 2603.4](#).

6.6 Carpenter Geofoam Blocks

Carpenter Geofoam Blocks are placed loosely on a level surface or existing structural slab. The blocks may be installed in a single layer or in multiple layers.

Structural loads on the Carpenter Geofoam Blocks shall not exceed the compressive resistance at 1% strain in accordance with ASTM D6817. Additional design considerations are included in ASTM D7180 Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam and ASTM D7557 Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens.

When Carpenter Geofoam Blocks are less than 4 inches in thickness, the interior of the building must be separated from the geofoam blocks with a thermal barrier as required by IBC [Section 2603.4](#) or IRC [Section R316.4](#), as applicable.

When Carpenter Geofoam blocks used in interior applications are greater than 4 inches in thickness, a minimum 1 inch concrete or masonry material must cover the geofoam blocks on all faces.

7. CONDITIONS OF USE

7.1 General

The products described in this report comply with, or are suitable alternatives to what is specified in the codes listed in Section 2 of this report, subject to the following conditions: the products must be produced, identified, and installed in accordance with the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions, this report governs.

In areas where the probability of termite infestation is defined as "very heavy", the products described in this report that have not been treated for termite resistance, as described in 5.1 must be installed in accordance with IBC [Section 2603.9](#) (Section 2603.8 in 2015 IBC) or IRC [Section R318.4](#), as applicable.

The products described in this report must be separated from the building interior with a thermal barrier, such as ½ in. gypsum board, as required by IBC [Section 2603.4](#) or IRC [Section 316.4](#), as applicable.

7.2 Carpenter Insulation Products

For a listing of applicable UL Certifications for Carpenter Insulation Boards, see the Online Certifications Directory for the following categories:

- See UL Online Certifications Directory for Foamed Plastic, UL Classified for Surface Burning Characteristics in accordance with UL723 ([BRYX](#)).
- See UL Online Certifications Directory for Polystyrene Thermal Insulation, Rigid Cellular, UL Classified in accordance with ASTM C578 ([QORW](#)).
- See UL Online Certifications Directory for Class A, B, or C roof-covering assemblies UL Classified in accordance with UL 790 ([TGFU](#)).
- See UL Online Certifications Directory for Roof Deck Constructions (Nos. [292](#), [458](#), [631](#), [666](#), [667](#), [669](#), [681](#), [683](#)).

7.3 Carpenter Geofoam Blocks

Carpenter Geofoam Blocks less than 4 in. in thickness must be separated from the building interior with a thermal barrier such as ½ in. gypsum board, as required by IBC [Section 2603.4](#) or IRC [Section 316.4](#), as applicable. Carpenter Geofoam Blocks greater than 4 in. in thickness must be separated from the building interior with a minimum 1 in. thick concrete or masonry on all faces as required by IBC [Section 2603.4.1.1](#).

Design loads to be resisted by the Carpenter Geofoam Blocks must be determined in accordance with the IBC or IRC, as applicable, and must not exceed the allowable loads noted in this report.

All construction documents specifying the Carpenter Geofoam Blocks must comply with the design limitations of this report. Design calculations and details for the specific applications must be furnished to the code official to verify compliance with this report and applicable codes. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

For a listing of applicable UL Certifications for Carpenter Geofoam Blocks, see the Online Certifications Directory for the following categories:

- See UL Online Certifications Directory for Foamed Plastic, UL Classified for Surface Burning Characteristics in accordance with UL723 ([BRYX](#)).
- See UL Online Certifications Directory for Polystyrene Thermal Insulation, Rigid Cellular, UL Classified in accordance with ASTM C578 ([QORW](#)).
- See UL Online Certifications Directory for Foamed Plastic, UL Classified for Interior Building Construction in accordance with UL 1715 ([OERU](#)).

7.4 Manufacturing Locations:

The products are manufactured at the following locations described in Table 6 under the UL LLC Listing or Classification and Follow-Up Service Program, which includes audits in accordance with ICC-ES Acceptance Criteria for Quality Documentation, AC 10.

Table 6 – Carpenter Manufacturing Locations

LOCATION	PLANT ID NO.
5100 Frontage Rd. Lakeland, FL 33815	91
57B Olin Way PO Box 129 Fogelsville, PA 18051	89
1021 E. Springfield Rd. High Point, North Carolina 27263	88

8. SUPPORTING EVIDENCE

8.1 Carpenter Insulation Products

- 8.1.1** Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012.
- 8.1.2** Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239), dated October 2008.
- 8.1.3** UL Classification reports in accordance with UL 723, ASTM C578, and UL 790. See UL Product Certification Categories (BRYX), (QORW), and (TGFU).

See links to UL’s On-Line Certification Directory in Section 7.2.

- 8.1.4** Documentation of quality system elements described in AC10, dated December 2014.

8.2 Carpenter Geofoam Blocks

8.2.1 UL Classification reports in accordance with UL 723, ASTM D6817, and UL 1715. See UL Product Certification Categories (BRYX), (QORW) and (OERU), respectively.

See links to UL's On-Line Certification Directory for BRYX and QORW in section 7.3.

8.2.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239), dated October 2008.

8.2.3 Documentation of quality system elements described in AC10, dated June 2014.

9. IDENTIFICATION

The products described in this evaluation report are identified by a marking bearing the report holder's name (Carpenter Company), the plant identification, the product name, the ASTM type designation, the UL Classification Mark, and the evaluation report number UL ER11783-01. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Classification Mark certificate.

10. USE OF UL EVALUATION REPORT

10.1 The approval of building products, materials or systems is under the responsibility of the applicable authorities having jurisdiction.

10.2 UL Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL.

10.3 The current status of this report, as well as a complete directory of UL Evaluation Reports may be found at UL.com via our On-Line Certifications Directory at www.ul.com/erdirectory

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