

# ICC-ES Evaluation Report


ESR-2687

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<p><b>DIVISION: 07 00 00— THERMAL AND MOISTURE PROTECTION.</b></p> <p><b>Section: 07 21 00— Thermal Insulation</b></p> <p><b>Section: 07 22 00—Roof and Deck Insulation</b></p>	<p><b>REPORT HOLDER: PLYMOUTH FOAM</b></p>	<p><b>EVALUATION SUBJECT: PLYMOUTH FOAM EXPANDED POLYSTYRENE INSULATION BOARDS</b></p>	
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## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2018, 2015, 2012, 2009 and 2006 [International Building Code® \(IBC\)](#)
- 2018, 2015, 2012, 2009 and 2006 [International Residential Code® \(IRC\)](#)
- 2018, 2015, 2012, 2009 and 2006 [International Energy Conservation Code® \(IECC\)](#)
- 2013 *Abu Dhabi International Building Code (ADIBC)*<sup>†</sup>

<sup>†</sup>The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

**Properties evaluated:**

- Surface-burning characteristics
- Thermal performance (*R*-values)
- Physical properties
- Attic and crawl space installation
- Elimination of thermal barrier (roofing)

## 2.0 USES

Plymouth Foam expanded polystyrene (EPS) insulation boards are foam plastic boards recognized for use as nonstructural thermal insulation sheathing. The boards are intended for use in wall cavities, behind exterior wall coverings on exterior walls, and in roofing applications. The insulation boards may also be directly exposed in attics and crawl spaces without a covering when installed as described in Section 4.2. The insulation may be used as roof insulation when specifically recognized for such use in a current ICC-ES evaluation report or when installed as described in Section 4.3.

## 3.0 DESCRIPTION

**3.1 General:**

Plymouth Foam EPS insulation boards are sold in various sizes with both tapered and square edges, and are available in thicknesses up to 6 inches (152 mm). The boards are Type I, VIII, II and IX complying with ASTM C578, with nominal densities, respectively, of 1.0, 1.25, 1.5 and 2.0 pcf. All boards have a flame-spread rating of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84.

### 3.2 Thermal Performance:

The EPS boards have thermal resistance ( $R$ -values), when tested in accordance with ASTM C518, as follows:

EPS TYPE	MINIMUM DENSITY (pcf)	R-VALUE PER INCH OF THICKNESS ( $^{\circ}\text{F}\cdot\text{ft}^2\cdot\text{h}/\text{Btu}$ )
I	0.90	3.6
VIII	1.15	3.8
II	1.35	4.0
IX	1.80	4.2

For SI:  $1^{\circ}\text{F}\cdot\text{ft}^2\cdot\text{h}/\text{Btu} = 0.176 \text{ K}\cdot\text{m}^2/\text{W}$ ,  $1 \text{ pcf} = 16.02 \text{ kg}/\text{m}^3$ .

## 4.0 INSTALLATION

### 4.1 General:

Installation of the foam plastic insulation must comply with the manufacturer's published installation instructions and this report. The manufacturer's instructions must be available on the jobsite at all times during installation.

The interior of the building must be separated from the insulation boards with a thermal barrier as required in IBC Section 2603.4 and 2018, 2015, 2012 and 2009 IRC Section R316.4 and 2006 IRC Section R314.4. A vapor barrier may be required by the code official in accordance with 2018 IBC Section 1404.3 (2015, 2012 and 2009 IBC Section 1405.3 and 2006 IBC Section 1403.2), 2018, 2015 and 2012 IRC Section R702.7, 2009 IRC Section R601.3, or 2006 IRC Sections R318.1 and R703.1, as applicable. A water-resistive barrier in compliance with 2018 IBC Section 1403.2 (2015, 2012, 2009 and 2006 IBC Section 1404.2) or IRC Section R703.2, is required and, when applied over wood-based sheathing under exterior cement plaster (stucco), must comply with IBC Section 2510.6 or 2018 and 2015 IRC Section R703.7.3 (2012, 2009 and 2006 IRC Section R703.6.3). The insulation board may be applied to exterior faces of walls to a maximum thickness of  $1\frac{1}{2}$  inches (38 mm), except insulation board thicknesses of more than  $1\frac{1}{2}$  inches (38 mm) may be permitted if such installation is recognized in an ICC-ES evaluation report on a wall covering. The attachment of finish materials over the insulation board must provide a minimum 1-inch (25.4 mm) penetration of the fasteners into wood framing members. Wall covering over the insulation must be structurally adequate to resist the horizontal forces perpendicular to the wall.

The insulation boards must not be used structurally to resist transverse, vertical or in-plane loads. The boards must not be used as exterior stud wall bracing. All walls must be braced in accordance with 2018 and 2015 IBC 2308.6 (2012, 2009 and 2006 IBC Sections 2308.9.3 and 2308.12.4) or IRC Section R602.10, as applicable.

The insulation boards must not be used as a nailing base for exterior siding materials. All fastening must be made through the boards and either into the wall framing or into structural sheathing, as required by the siding manufacturer's published installation instructions, or in accordance with the applicable code.

The insulation boards may be used as roof insulation and in exterior wall coating systems when specifically recognized as a component of the assembly or system in a current ICC-ES evaluation report.

### 4.2 Use in Attics and Crawl Spaces:

The Plymouth Foam EPS insulation boards may be used on walls in attics and crawl spaces without a covering applied to the attic or crawl-space side of the foam plastic, provided *all* of the following conditions are met:

- Entry to the attic or crawl space is only to service utilities, and no storage is permitted.
- There are no interconnected attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Attic ventilation is provided when required by 2018 IBC Section 1202.2 (2015, 2012, 2009 and 2006 IBC Section 1203.2) or IRC Section R806, as applicable. Under-floor (crawl space) ventilation is provided when required by 2018 IBC Section 1202.4 [(2015 IBC Section 1203.4 (2012, 2009 and 2006 IBC Section 1203.3)] or IRC Section R408.1, as applicable.
- The boards have a maximum nominal density of 1.0 pcf and a maximum thickness of 4 inches (102 mm).
- Combustion air is provided in accordance with 2018, 2015, 2012 and 2009 IMC Section 701 (2006 IMC Sections 701 and 703).

### 4.3 Application Directly to Steel Roof Decks without a Thermal Barrier:

Under the IBC, Plymouth Foam EPS insulation boards may be used as components of a Class A, B or C roof covering installed on steel decks without a thermal barrier, when installed in accordance with this section (Section 4.3).

#### 4.3.1 Materials:

**4.3.1.1 Steel Deck:** The steel roof decking must be minimum No. 22 gage [0.030 inch (0.76 mm)], 1½-inch-deep (38 mm), unperforated, galvanized steel decking with flutes spaced a maximum of 6 inches (152 mm) on center. The deck must be welded or mechanically fastened to structural supports in accordance with the applicable code.

**4.3.1.2 Foam Plastic Insulation:** Plymouth Foam EPS boards are recognized for use on steel decks without a thermal barrier. The insulation boards may have maximum thicknesses up to 9 inches (229 mm) for Type I, 6 inches (152 mm) for Type II, 7.2 inches for Type VIII and 4½ inches (114 mm) for Type IX.

**4.3.1.3 Cover Board:** When used, the cover board in the roof covering system must be either ¼-inch-thick (6.4 mm) DensDeck® Roof Board manufactured by Georgia-Pacific Gypsum LLC, or ½-inch-thick (12.7 mm) wood fiberboard.

**4.3.1.4 Roof Covering:** The roof covering membrane must be either an EPDM or a thermoplastic membrane, recognized in a current ICC-ES evaluation report as part of a Class A, B or C roof covering system. The membrane must be mechanically attached, fully adhered, or ballasted. Thermoplastic membranes include polyvinyl chloride (PVC), modified PVC, chloro-sulphonated polyethylene (CSPE), and thermoplastic polyolefin (TPO). The membrane is limited to a maximum nominal thickness of 0.045 inch (1.14 mm). The evaluation report on the roof covering system must specify one of the following systems as the only classified roof covering system permitted:

- a. A generic EPS insulation board having the same density and installed thickness as the roof insulation boards recognized in Section 4.3.1.2 of this report; the cover board described in Section 4.3.1.3; and the mechanically attached roof covering membrane described in Section 4.3.1.4, installed over the steel deck described in Section 4.3.1.1.
- b. A generic EPS insulation board having the same density and installed thickness as the roof insulation boards recognized in Section 4.3.1.2; the mechanically attached roof covering membrane described in Section 4.3.1.4; and stone ballast installed over the steel deck described in Section 4.3.1.1.

**4.3.2 Installation:** The Plymouth Foam EPS roof insulation boards are loosely laid directly over the steel deck in single or multiple layers, to a maximum total thickness as noted in Section 4.3.1.2. The top layer of insulation must be placed so that the special wording required by Section 7.0, for roof coverings, is facing up. The optional cover board described in Section 4.3.1.3 must be laid over the insulation. The cover board is optional, depending on system requirements, when the method of attaching the roof is either mechanical fastening or adhesion. A cover board is not permitted in the system when the roof membrane is ballasted.

The method of attaching the roof covering, cover board or ballast, and insulation boards to the steel roof deck must be in accordance with the ICC-ES evaluation report on the roof covering membrane, and as described in Section 4.3.1.4.

**4.3.3 Reroofing:** New roofing must not be applied over existing roof covering systems as described in this report, since the fire performance of the systems is directly affected by the materials covering the foam plastic insulation. The components of the existing roofing that are to remain on the roof deck must be inspected to determine compliance with 2018 and 2015 IBC Section 1511 (2012, 2009 and 2006 IBC Section 1510) and 2018 and 2015 IRC Section R908 (2012, 2009 and 2006 IRC Section R907). The existing roof covering membrane and, if necessary, the cover board must be removed before new roofing materials are installed. The new roofing materials must have characteristics specifically described in this report.

## 5.0 CONDITIONS OF USE:

The Plymouth Foam Expanded Polystyrene Insulation boards described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The insulation boards must be produced, identified, and installed in accordance with this report, the manufacturer's published installation instructions and the applicable code. In the event of a conflict between this report and the manufacturer's instructions, this report governs.

- 5.2 The boards must be separated from the building interior with a thermal barrier complying with the applicable code, such as 1/2-inch-thick (12.7 mm) gypsum wallboard installed in accordance with the applicable code, except as described in Sections 4.2 and 4.2 of this report.
- 5.3 When applied on exterior walls, the boards must be protected by a water-resistive barrier complying with 2018 IBC Section 1403.2 (2015, 2012, 2009 and 2006 IBC Section 1404.2) or IRC Section R703.2, and by wall coverings that provide the necessary structural resistance to wind and seismic forces in spanning between wall framing members.
- 5.4 Walls on which the boards are applied must be braced in accordance with the applicable code.
- 5.5 Where the probability of termite infestation is “very heavy” and the foam plastic insulation is used with wood construction, the foam plastic must be installed in accordance with 2018, 2015, 2009 and 2006 IBC Section 2603.8 (2012 IBC Section 2603.9), 2018, 2015, 2012 and 2009 IRC Section R318.4 or 2006 IRC Section R320.5, as applicable.
- 5.6 When the Plymouth Foam insulation boards are installed directly to a steel roof deck without a thermal barrier, the following conditions apply:
  - a. The insulation boards must be part of a Class A, B or C roof covering system as described in Section 4.3 of this report. The boards may be installed without the thermal barrier addressed in IBC Section 2603.4.1.5. The system is not permitted under the IRC.
  - b. Reroofing must be in accordance with Section 4.3.3.
- 5.7 Jobsite certification and labeling must comply with 2018, 2015 or 2012 IECC Sections C303.1.1.1 or R303.1.1.1 (2009 IECC Sections 303.1.1 and 303.1.2 or 2006 IECC Sections 102.1.1 and 102.1.11).
- 5.8 The boards are manufactured at the Plymouth Foam facilities in Plymouth, Wisconsin, and Gnadenhutzen, Ohio, under a quality control program with inspections by ICC-ES.

## 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the [ICC-ES Acceptance Criteria for Foam Plastic Insulation \(AC12\)](#), dated June 2015 (editorially revised October 2017), including data in accordance with Appendix B.
- 6.2 Data in accordance with UL1256.

## 7.0 IDENTIFICATION

- 7.1 The EPS insulation boards are packaged in bundles that are labeled with the manufacturer’s name (Plymouth Foam) and address, the date of manufacture, the evaluation report number (ESR-2687), the density or type, the thermal resistance (*R*-value), and the surface-burning characteristics. In addition, when the boards are used in roof covering assemblies attached directly to steel roof decks under Section 4.3 of this report, the bundles must also bear the wording “When used in reroofing applications, limits exist for cover board and membrane. See ICC-ES evaluation report ESR-2687 before reroofing;” and the words “THIS SIDE UP” must be printed on the individual boards, or on a permanent label affixed to one face of each insulation board.

Insulation boards used for installations in attics and crawl spaces as described in Section 4.2 must be identified as being produced from NOVA, Styropek, StyroChem or Flint Hills Resources LP beads.

- 7.2 The report holder’s contact information is the following:

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