

ICC-ES Evaluation Report

ESR-1615*

Reissued September 1, 2011

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**DIVISION: 07 00 00—THERMAL AND MOISTURE
PROTECTION**
Section: 07 21 00—Thermal Insulation
Section: 07 25 00—Water-resistive Barriers
REPORT HOLDER:
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EVALUATION SUBJECT:
**INSULSTAR® AND INSULBLOC® SPRAY-APPLIED
POLYURETHANE INSULATIONS**
1.0 EVALUATION SCOPE
Compliance with the following codes:

- 2012 and 2009 *International Building Code*® (IBC)
- 2012 and 2009 *International Residential Code*® (IRC)
- 2012 and 2009 *International Energy Conservation Code*® (IECC)
- Other Codes (see Section 8)

Properties evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Air permeability
- Water vapor transmission
- Water-resistive barrier
- Fire-resistance-rated construction
- Exterior walls in Type I through IV construction

2.0 USES

InsulStar and InsulBloc spray-applied polyurethane foam insulations are used as thermal insulating material. The insulation may be used in any type of construction under the IBC (use on walls required to be of Type I, II, III or IV construction is addressed in Section 4.5) and dwellings under the IRC. The insulations may be used in nonstructural applications in wall and floor/ceiling assemblies, and on the exterior side of foundations and the

underside of on-grade slabs; and may be used in attics and crawl spaces when installed as described in Section 4.3. The insulations may be used as vapor retarders (Section 3.5), air barriers (Section 3.4) and as air-impermeable insulation (Section 4.3). The insulations may be used as alternatives to the water-resistive barrier required in IBC Section 1404.2 and IRC Section R703.2 when installed as described in Section 4.4. The insulations may be used in fire-resistance-rated construction when installed as described in Section 4.6.

3.0 DESCRIPTION
3.1 General:

InsulStar® and InsulBloc® are two-component, closed-cell, one-to-one-by-volume spray polyurethane foam systems with a nominal density of 2 pcf (32 kg/m³). InsulStar® and InsulBloc® insulation's liquid components are supplied in nominally 55-gallon (208 L) drums, labeled as "A" component or "R" component. The insulation components have a shelf life of six months when stored at temperatures between 70°F (21°C) and 90°F (32°C).

3.2 Surface-burning Characteristics:

The insulation, at a maximum thickness of 4 inches (102 mm) and a nominal density of 2 pcf (32 kg/m³), has a flame-spread index of less than 25 and a smoke-developed index of less than 450 when tested in accordance with ASTM E84. Thicknesses of up to 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with minimum 1/2-inch-thick (13 mm) gypsum board or an equivalent thermal barrier complying with, and installed in accordance with, the applicable code.

3.3 Thermal Transmission R-values:

The InsulStar® and InsulBloc® insulations have thermal resistance R-values, at a mean temperature of 75°F (24°C), as shown in Table 1.

3.4 Air Permeability:

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations, at a minimum thickness of 1 inch (25.4 mm), are considered air-impermeable insulations in accordance with 2012 IRC Section R806.5 and 2009 IRC Section R806.4, based on testing in accordance with ASTM E283.

3.5 Vapor Retarder:

The foam plastic has a vapor permeance of less than 1 perm [5.7 x 10⁻¹¹ kg/(m²sPa)], when applied at a minimum thickness of 1⁵/₁₆ inches (33.3 mm) and qualifies as a Class II vapor retarder as defined in IRC Section R202.

*Revised August 2012

3.6 Aldocoat® 757 Intumescent Coating:

Aldocoat® 757 intumescent coating is manufactured by Aldo Products Company and is a water-based latex coating with specific gravity of 1.4. Aldocoat® 757 is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of six months when stored in a factory-sealed container at temperatures between 40°F (4.5°C) and 90°F (32°C).

3.7 DC 315 Fireproof Paint:

DC 315 Fireproof Paint is manufactured by International Fireproof Technology, Inc., and is a water-based coating supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums. The coating material has a shelf life of 24 months when stored in factory containers at temperatures between 50°F (10°C) and 90°F (32°C).

4.0 INSTALLATION

4.1 General:

InsulStar® and InsulBloc® insulations must be installed in accordance with the manufacturer's published installation instructions and this report. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

InsulStar® and InsulBloc® insulations must be spray-applied to a suitable substrate on the jobsite using a volumetric positive displacement pump as identified in the NCFI application manual. Preparation of the substrate must be in accordance with the manufacturer's instructions. The insulation components must be stored at temperatures between 70°F (21°C) and 90°F (32°C) for several days before application. The insulation must not be used in areas that have a maximum in-service temperature greater than 180°F (82°C). The foam plastic must not be used in electrical outlet or junction boxes or in direct continuous contact with water.

4.2 Thermal Barrier:

4.2.1 Application with a Prescriptive Thermal Barrier:

The InsulStar® and InsulBloc® insulations, with a maximum nominal thickness of 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities, must be separated from the interior of the building by an approved thermal barrier of minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with and installed in accordance with the applicable code. Within an attic or crawl space, installation must be in accordance with Section 4.3.

4.2.2 Application without a Prescriptive Thermal Barrier:

The prescriptive 15-minute thermal barrier may be omitted when installation is in accordance with this section. The insulation and coating may be spray-applied to the interior facing of walls and the underside of roof sheathing or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier or prescribed ignition barrier. The thickness of the foam plastic applied to the underside of the roof sheathing must not exceed 5½ inches (140 mm). The thickness of the foam plastic applied to vertical wall surfaces must not exceed 5½ inches (140 mm). The foam plastic must be covered on all surfaces with DC 315 Fireproof Paint at a minimum wet film thickness of 21 mils (0.53 mm). The coating must be applied over the InsulStar® or InsulBloc® insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean and free of dirt, loose debris and other substances that

could interfere with adhesion of the coating. The coating is applied in one coat with brush, roller or low-pressure airless equipment.

4.3 Attics and Crawl Spaces:

4.3.1 Application with a Prescriptive Ignition Barrier:

When InsulStar® and InsulBloc® insulations are installed within attics or crawl spaces where entry is made only for service of utilities; an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code, and must be installed in a manner so that the foam plastic insulation is not exposed. InsulStar® and InsulBloc® insulations as described in this section may be installed in unvented attics and unvented enclosed rafter spaces in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4.

4.3.2 Application without a Prescriptive Ignition Barrier:

Where InsulStar® and InsulBloc® insulations are installed in accordance with Section 4.3.2.1, 4.3.2.2, or 4.3.3, the following conditions apply:

- Entry to the attic or crawl space is 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 IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with 2012 Section R806.5 or 2009 IRC Section R806.4. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.
- Combustion air is provided in accordance with IMC (International Mechanical Code®) Section 701.

4.3.2.1 Application with Intumescent Coating:

In attics, InsulStar® and InsulBloc® insulations may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces; and in crawl spaces, InsulStar® and InsulBloc® insulations may be spray-applied to the underside of floors and/or vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 16 inches (406 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed 10 inches (254 mm). The foam plastic must be covered with a minimum nominally 10-mil (0.25 mm) wet film thickness of the Aldocoat® 757 intumescent coating described in Section 3.6. The Aldocoat® 757 intumescent coating must be applied over the InsulStar® insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris and any other substances that could interfere with adhesion of the coating. The Aldocoat® 757 coating is applied with a medium-size nap roller, soft brush or conventional airless spray equipment at a rate of 1 gallon (3.38 L) per 100 square feet (9.3 m²) to obtain a recommended minimum dry film thickness of 7.5 mils (0.19 mm) [10 wet mils (0.25 wet mm)]. The coating must be applied when ambient and substrate temperatures are within a range of 50°F (10°C) to 90°F (32°C), and requires a 24-hour curing time. The insulations may be installed in unvented attics as described in this section in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4.

4.3.2.2 Application without Intumescent Coating: InsulStar® and InsulBloc® insulations may be spray-applied to the underside of roof sheathing or roof rafters, and/or vertical surfaces; and in crawl spaces, InsulStar® and InsulBloc® insulations may be spray-applied to the underside of floors and/or vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 16 inches (406 mm). The thickness of the foam plastic applied to vertical surfaces must not exceed 11.5 inches (292 mm). The foam plastic insulation may be left exposed and does not require covering with a prescriptive ignition barrier or an intumescent coating. The insulations may be installed in unvented attics as described in this section in accordance with 2012 IRC Section R806.5 or 2009 IRC Section R806.4.

4.3.3 Use on Attic Floors: InsulStar® and InsulBloc® insulations may be installed exposed at a maximum thickness of 11.5 inches (292 mm) between joists in attic floors. The InsulStar® insulation must be separated from the interior of the building by an approved thermal barrier. The ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R316.5.3 may be omitted.

4.4 Water-resistive Barrier:

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations may be used as the water-resistive barrier prescribed in IBC Section 1404.2 and IRC Section R703.2, when installed on exterior walls as described in this section. InsulStar® and InsulBloc® foam plastic must be spray-applied to the exterior side of sheathing, masonry or other suitable exterior wall substrates to form a continuous layer of 1 inch (25.4 mm) minimum thickness. All construction joints and penetrations are to be completely sealed with InsulStar® or InsulBloc®.

4.5 Exterior Walls of Type I, II, III, and IV Construction:

4.5.1 General: When used on walls of Type I, II, III and IV exterior wall construction, the InsulStar® and InsulBloc® spray-applied foam insulations must comply with Section 2603.5 of the IBC and this section (Section 4.5), and the insulation must be installed at a maximum thickness of 5 inches (127 mm). The potential heat of InsulStar® and InsulBloc® spray-applied foam plastic insulations is 1989 Btu/ft² (22.6 MJ/m²) per inch of thickness when tested in accordance with NFPA 259.

4.5.2 Specific Wall Assemblies: Wall assemblies complying with Section 4.5 must be as described in Table 2.

4.6 One-hour Fire-resistance-rated Wall Assemblies (Load-bearing):

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations may be installed on load-bearing one-hour fire-resistance-rated walls (see Figures 1 and 2), provided the system is installed in accordance with the following:

4.6.1 Wood Framing: Minimum nominally 2-by-4 wood studs (kiln dried No. 2 spruce-pine-fir) spaced a maximum of 16 inches (406 mm) on center.

4.6.2 Wall Finish (both faces): Two layers of 5/8-inch-thick (16 mm) Type X gypsum sheathing complying with ASTM C36 or ASTM C1396, 4-foot-wide (1219 mm), installed vertically as follows: Base layer fastened to studs (with joints centered over studs) and plates with 6d coated nails, 1 7/8-inch-long (48 mm) spaced 7 inches (178 mm) on center or 1 7/8 inches (48 mm) long Type S or W steel screws spaced 6 inches (152 mm) on center. Face layer fastened to base layer at the edges with 1 5/8-inch-long (41 mm) Type G screws at 8 inches (203 mm) on center and to studs with 2 1/2-inch-long (64 mm) Type S steel

screws at 12 inches (305 mm) on center in the field, or face layer fastened to studs with 2 1/2 inch-long (64 mm) Type S steel screws at 8 inches (203 mm) on center on the edges and 12 inches (305 mm) on center in the field. Face layer joints must be offset a minimum of 24 inches (610 mm) from base layer joints. All joints, screw or nail heads must be covered with joint tape and two coats of joint compound in accordance with GA-216 or ASTM C840. As shown in Figure 1, the exterior face of the exterior wall can be finished with one layer of 7/16-inch (11 mm) oriented strand board (OSB) in lieu of two layers of Type X gypsum sheathing as shown in Figure 2. The OSB must be fastened to studs with 1 7/8-inch-long (48 mm), 6d coated nails spaced 7 inches (178 mm) on center.

4.6.3 Insulation: InsulStar® or InsulBloc® foam is applied in the stud cavity at any thickness from partially filling to completely filling the stud cavity.

5.0 CONDITIONS OF USE

The InsulStar® and InsulBloc® insulations 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** InsulStar® and InsulBloc® insulations must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. The instructions within this report govern if there are any conflicts between the manufacturer's published installation instructions and this report.
- 5.2** InsulStar® and InsulBloc® insulations must be separated from the interior of the building by an approved 15-minute thermal barrier, as described in Section 4.2, except when installation is as described in Section 4.2.2 or in attics and crawl spaces as described in Section 4.3.
- 5.3** The surfaces to which spray-applied insulations are applied must be protected from the weather during application.
- 5.4** The spray-applied insulations must be applied by installers certified by NCFI Polyurethanes.
- 5.5** Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with 2012 IBC Section 2603.9, 2009 IBC Section 2603.8 or IRC Section R318.4, as applicable.
- 5.6** Jobsite certification and labeling of the insulation must comply with IRC Sections N1101.4 and N1101.4.1 and IECC Sections, 303.1.1. and 303.1.2, as applicable.
- 5.7** InsulStar® and InsulBloc® insulations at a 1 5/16-inch (33.3 mm) thickness or greater is a Class II vapor retarder as defined in IRC Section R202 and IECC Section 202.
- 5.8** When InsulStar® and InsulBloc® insulations are used as water-resistive barriers, they must be protected from ultraviolet (UV) light exposure in accordance with NCFI's written instructions.
- 5.9** When use is on buildings of Type I, II, III or IV, construction must be as described in Section 4.5.
- 5.10** Use of the insulations in fire-resistance-rated construction must be in accordance with Section 4.6.
- 5.11** InsulStar® and InsulBloc® insulations are produced in Mount Airy, North Carolina, and Clearfield, Utah, under a quality control program with inspections by UL LLC (AA-668).

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated June 2011 including reports of tests in accordance with Appendix X of AC377.
- 6.2 Reports on room corner fire tests in accordance with NFPA 286.
- 6.3 Reports on air leakage tests in accordance with ASTM E283.
- 6.4 Reports on water vapor transmission tests in accordance with ASTM E96.
- 6.5 Reports on fire tests in accordance with ASTM E119.
- 6.6 Reports of potential heat tests in accordance with NFPA 259.
- 6.7 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels Used as Water-resistive Barriers (AC71), dated February 2003 (editorially revised March 2011).
- 6.8 Reports of fire propagation characteristics tests in accordance with NFPA 285.

7.0 IDENTIFICATION

Components of the InsulStar® and InsulBloc® insulations are identified with the manufacturer's name (NCFI Polyurethanes), address and telephone number; the product trade name (InsulStar® or InsulBloc®), use and application instructions; the density; the flame-spread and smoke-development indices; the evaluation report number (ESR-1615); and the name of the inspection agency (UL LLC).

Intumescent coatings are identified with the manufacturer's name and address, the product name and use instructions.

8.0 OTHER CODES

8.1 Evaluation Scope:

In addition to the codes referenced in Section 1.0, the products in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2006 *International Energy Conservation Code*® (2006 IECC)

8.2 Uses:

The products comply with the above-mentioned codes as described in Sections 2.0 through 7.0 of this report, with the revisions noted below:

- **Application with a Prescriptive Thermal Barrier:** See Section 4.2.1, except the approved thermal barrier must be installed in accordance with Section R314.4 of the 2006 IRC.
- **Application with a Prescriptive Ignition Barrier:** See Section 4.3.1, except attics must be vented in accordance with Section 1203.2 of the 2006 IBC, and crawl space ventilation must be in accordance with Section 1203.3 of the 2006 IBC, as applicable. Additionally, an ignition barrier must be installed in accordance with Section R314.5.3 or R314.5.3 of the 2006 IRC, as applicable.
- **Application without a Prescriptive Ignition Barrier:** See Section 4.3.2, except attics must be vented in accordance with Section 1203.2 of the 2006 IBC or Section R806 of the 2006 IRC, and crawl space ventilation must be in accordance with Section 1203.3 of the 2006 IBC or Section R408 of the 2006 IRC, as applicable.
- **Protection Against Termites:** See Section 5.5, except use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with Section R320.5 of the 2006 IRC.
- **Jobsite Certification and Labeling:** See Section 5.6, except jobsite certification and labeling must comply with Sections 102.1.1 and 102.1.11, as applicable, of the 2006 IECC.

TABLE 1—THERMAL RESISTANCE (R-VALUES¹)

THICKNESS (inches)	R-VALUES (°F.ft ² .h/Btu)
1	6.8
2	13
3	19
3.5	22
4	25
4.75	30
5	32
6	38
7	45
7.5	48
8	51
9	57
10	64
11	70
11.5	73
12	76
16	102

For **SI**: 1 inch = 25.5 mm; 1 °F.ft².h/Btu = 0.176 110 °K.m²/W.

¹R-values are calculated based on tested K-values at 1- and 4-inch thicknesses.

TABLE 2—NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES

Wall Component	Materials ¹
Base Wall System – Use either 1, 2 or 3	1 – Concrete wall 2 – Concrete masonry wall 3 – 1 layer 5/8-inch-thick Type X gypsum wallboard complying with ASTM C36 or C1396 on the interior, installed over minimum 3 5/8-inch-deep, No. 20 gage, C-shaped steel studs, spaced a maximum of 24 inches on center. Gypsum wallboard must be attached with No. 6, 1 1/4-inch-long self-tapping screws located 8 inches on center along the perimeter and in the field of wallboard. Gypsum wallboard joints must be taped and treated with joint compound in accordance with ASTM C840 or GA-216.
Floorline Firestopping	4 pcf mineral wool (e.g., Thermafiber) in each stud cavity at each floorline, attached with Z-clips
Cavity Insulation – Use either 1, 2 or 3	1 – None 2 – Full cavity depth or less of InsulBloc® or InsulStar® applied using exterior sheathing as substrate and covering the width of the cavity and inside the stud flange 3 – Fiberglass batt insulation (faced or unfaced)
Exterior Sheathing – Only for Base Wall System No.3 – Use either 1 or 2	1 – 1/2-inch-thick, exterior-type gypsum sheathing 2 – 5/8-inch-thick, exterior-type gypsum sheathing
Exterior Insulation – Use either 1 or 2	1 – None 2 – InsulStar® or InsulBloc® insulation spray-applied foam insulation up to a maximum nominal thickness of 3 inches
Exterior Wall Covering – Use either 1, 2, 3 or 4	1 – Brick - standard nominally 4-inch-thick clay brick; brick veneer anchors – standard types installed a maximum of 24 inches OC vertically on each stud – Maximum 2-inch air gap between exterior insulation and brick 2 – Stucco - minimum 3/4-inch-thick, exterior cement plaster and lath. A secondary water-resistive barrier may be installed between the exterior insulation and the lath. The secondary water-resistive barrier must not be full-coverage asphalt or butyl- based self-adhered membranes. 3 – Minimum 2-inch-thick limestone, natural stone or minimum 1 1/2-inch-thick cast artificial stone. Any standard non-open-jointed installation technique such as ship-lap, etc., may be used. 4 – Terracotta cladding – Use any terracotta cladding system in which the terracotta is a minimum of 1 1/4 inches thick. Any standard non-open-jointed installation technique such as ship-lap, etc., may be used.

For **SI**: 1 inch = 25.5 mm; 1 pcf = 16.018 kg/m³.

FIGURE 1
NON-SYMMETRICAL ONE-HOUR FIRE RESISTANCE-RATED WALL ASSEMBLY

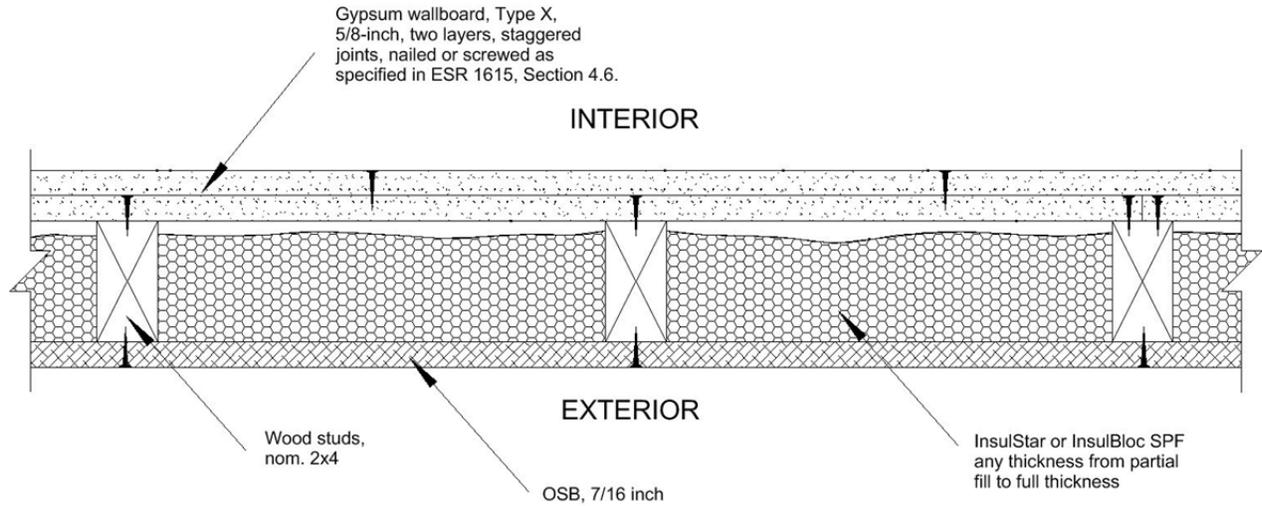
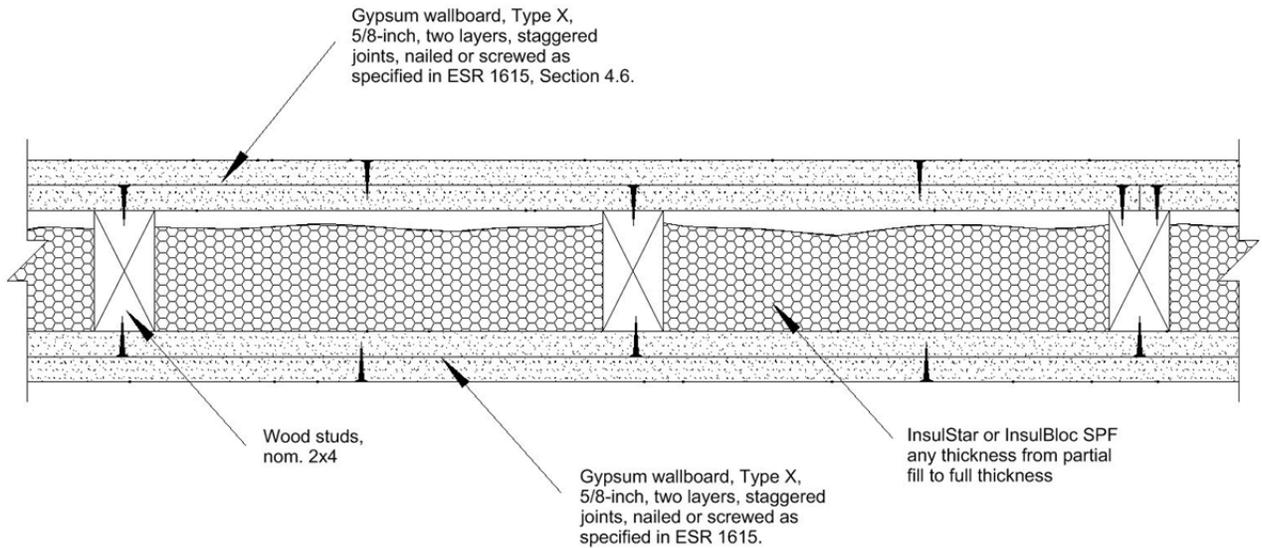


FIGURE 2
SYMMETRICAL ONE-HOUR FIRE RESISTANCE-RATED WALL ASSEMBLY



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REPORT HOLDER:

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EVALUATION SUBJECT:**INSULSTAR® AND INSULBLOC® SPRAY-APPLIED POLYURETHANE INSULATIONS****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2007 *Florida Building Code—Residential*
- 2007 *Florida Building Code—Building*

Properties Evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance
- Attic and crawl space installation
- Air permeability
- Water vapor transmission
- Water-resistive barrier
- Fire resistance-rated construction
- Exterior walls in Type I through IV construction

2.0 PURPOSE OF THIS SUPPLEMENT

This supplement is issued to indicate that the InsulStar® and InsulBloc® spray-applied polyurethane foam insulations described in Sections 2.0 through 7.0 of the master report comply with the 2007 *Florida Building Code—Building* and the 2007 *Florida Building Code—Residential*, when designed and installed in accordance with the master evaluation report under the following conditions:

InsulStar® and InsulBloc® spray-applied polyurethane foam insulations used in exterior walls of multistory buildings located in the High-Velocity Hurricane Zones must comply with Section 2612.3.2.4 of the *Florida Building Code—Building*.

For products falling under Florida Rule 9N-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the master report reissued September 1, 2011.