

**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**

**Section: 06 12 00—Structural Panels**

**REPORT HOLDER:**

**FOAM LAMINATES OF VERMONT**

**EVALUATION SUBJECT:**

**FOAM LAMINATES' STRUCTURAL INSULATED PANELS: WALL AND ROOF PANELS 8 FT. TO 16 FT. LONG, 6-1/2-IN. TO 10-1/4-IN. THICK**

**1.0 EVALUATION SCOPE**

**Compliance with the following codes:**

- 2015 and 2012 *International Building Code*® (IBC)
- 2015 and 2012 *International Residential Code*® (IRC)

**Property evaluated:**

Structural

**2.0 USES**

**2.1 General:**

*Foam Laminates' Structural Insulated Panels* are used as structural insulated wall and roof panels capable of resisting transverse, axial and in-plane shear loads.

**2.2 Construction Types:**

*Foam Laminates' Structural Insulated Panels* shall be considered combustible building elements when assessing construction type in accordance with IBC Chapter 6.

**2.3 Fire Resistive Assemblies:**

*Foam Laminates' Structural Insulated Panels* shall not be used as part of a fire-rated assembly unless suitable evidence and details are submitted and approved by the authority having jurisdiction.

**3.0 DESCRIPTION**

**3.1 General:**

*Foam Laminates' Structural Insulated Panels* are factory-assembled, engineered-wood-faced, structural insulated panels (SIPs) with an expanded polystyrene (EPS) foam plastic core. The panels are intended for use as load-bearing or non-loading bearing wall and roof panels. Panels are available in 6<sup>1</sup>/<sub>2</sub>-inch (165 mm) through 10<sup>1</sup>/<sub>4</sub>-inch (260 mm) overall thicknesses. The panels are custom made to the specifications for each use and are assembled under

factory-controlled conditions. The maximum product size is 8 feet (2.44 m) wide and up to 16 feet (4.88 m) in length.

**3.2 Materials:**

**3.2.1 Facing:** The facing consists of two single-ply oriented strand board (OSB) facings, a minimum of 7/16-inch thick (11.1 mm) conforming to the properties shown in Table 3. Additionally, the facing materials comply with DOC PS 2, Exposure 1, Rated Sheathing with a span index of 24/16. *Foam Laminates' Structural Insulated Panels* shall be manufactured with the strength axis of the facing oriented parallel to the direction of SIP bending.

**3.2.2 Core:** The core material is EPS foam plastic insulation conforming to ASTM C578, Type I. The foam plastic core has a flame spread rating not exceeding 75 and a smoke-developed rating not exceeding 450 in compliance with IBC Section 2603.3 Exception 4.

**3.2.3 Adhesive:** Facing materials are adhered to the core material using a thin-film adhesive. The adhesive is applied during the lamination process in accordance with the in-plant quality system documentation.

**3.2.4 Material Sources:** The facing, core and adhesive used in the construction of *Foam Laminates' Structural Insulated Panels* shall be obtained from approved sources as identified in the in-plant quality system documentation.

**3.2.5 Splines:** *Foam Laminates' Structural Insulated Panels* are interconnected with surface splines or block splines (Figure 1). Connections using dimensional lumber splines or engineered structural splines are not specifically addressed in this report and must be designed in accordance with accepted engineering practice to meet applicable code requirements.

**3.2.5.1 Surface Splines:** Surface splines (Figure 1) consist of 3-inch-wide-by-7/16-inch-thick (76.2 mm x 11.1 mm) OSB. At each panel joint between SIPs, one surface spline is inserted into each of two tight-fitting slots in the core. The slots in the core are located just inside the facing.

**3.2.5.2 Block Splines:** Block splines (Figure 1) are manufactured in the same manner as the SIP, except with an overall thickness that is approximately 1 inch (25.4 mm) less than the overall thickness of the SIPs to be joined.

**4.0 DESIGN AND INSTALLATION**

**4.1 Design:**

**4.1.1 General:** The scope of this report is limited to the evaluation of the SIP component. Panel connections and other details related to incorporation of the panel in the

overall structural system of a building are outside the scope of this report.

**4.1.2 Design Approval:** Where required by the authority having jurisdiction, structures using *Foam Laminates' Structural Insulated Panels* shall be designed by a registered design professional. Construction documents, including engineering calculations and drawings providing floor plans, window details, door details and connector details, shall be submitted to the code official when application is made for a permit. The individual preparing such documents shall possess the necessary qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken. Approved construction documents shall be available at all times on the jobsite during installation.

**4.1.3 Design Loads:** Design loads to be resisted by the SIPs shall be as required under the applicable building code. Loads on the panels shall not exceed the loads noted in this report.

**4.1.4 Allowable Loads:** Allowable axial, transverse, and racking loads may be calculated using the panel properties provided in Tables 1 and 2 or may be selected from Tables 4 through 6. Maximum and minimum panel heights, spans and thicknesses are limited as provided in Tables 2 and 4 through 6. Unless otherwise noted, all properties and allowable loads apply to panels joined with surface or block splines. Allowable loads for reinforced panel capacities shall be designed by a registered professional. Calculations demonstrating that the loads applied are less than the allowable loads described in this report shall be submitted to the code official for approval. For loading conditions not specifically addressed herein, structural members designed in accordance with accepted engineering practice shall be provided to meet applicable code requirements.

**4.1.5 Concentrated Loads:** Axial loads shall be applied to the SIP through continuous members such as structural insulated roof panels or repetitive members such as joists, trusses or rafters spaced at regular intervals of 24 inches (610 mm) on center or less. Such members shall be fastened to a rim board or similar member to distribute the load to the SIP. For other loading conditions, reinforcement shall be provided. This reinforcement shall be designed in accordance with accepted engineering practice.

**4.1.6 Eccentric and Side Loads:** Axial loads shall be applied concentrically to the top of the SIP. Loads shall not be applied eccentrically or through framing attached to one side of the panel (such as balloon framing) except where additional engineering documentation is provided.

**4.1.7 Openings:** Openings in panels shall be reinforced with wood or steel designed in accordance with accepted engineering practice to resist all loads applied to the opening as required by the applicable code. Details for door and window openings shall be provided to clarify the manner of supporting axial, transverse and/or racking shear loads at openings. Such details shall be shown on approved design documents and subject to approval by the local authority having jurisdiction.

**4.1.8 In-Plane Shear Design:** Shear walls utilizing block or surface splines shall be sized to resist all code required wind and seismic loads without exceeding the allowable loads provided in Table 6. Shear wall chords, hold-downs and connections to transfer shear forces between the wall and surrounding structure shall be designed in accordance with accepted engineering practice. Allowable strengths for shear walls with structural splines along each panel edge shall be designed in accordance with accepted engineering practice and subject to the limitations for wood sheathed

shear walls. The maximum panel height-to-width ratio shall be 2:1.

**4.1.9 Seismic Design:** The use of the shear wall configurations in Table 6 (racking shear) is limited to structures in Seismic Design Categories A, B and C. Where SIPs are used to resist seismic forces, the following factors shall be used for design: Response Modification Coefficient,  $R = 2.0$ ; System Overstrength Factor,  $\Omega_o = 2.5$ ; Deflection Amplification Factor,  $C_d = 2.0$ .

**4.1.10 Combined Loads:** Panels subjected to any combination of transverse, axial or in-plane shear loads shall be analyzed utilizing a straight line interaction.

## 4.2 Installation:

**4.2.1 General:** *Foam Laminates' Structural Insulated Panels* shall be fabricated, identified and erected in accordance with this report, the approved construction documents and the applicable code. In the event of a conflict between the manufacturer's published installation instructions and this report, this report shall govern. Approved construction documents shall be available at all times on the jobsite during installation.

**4.2.2 Splines:** *Foam Laminates' Structural Insulated Panels* are interconnected at the panel edges through the use of a spline. The spline type may be of any configuration listed in Section 3.2.5 as required by the specific design. The spline shall be secured in place with not less than 0.113-inch x 2<sup>3</sup>/<sub>8</sub>-inch (2.9 mm x 60.3 mm) nails, spaced 8 inches (203 mm) on center on both sides of the SIP and joint, minimum 3/4 inch (19 mm) edge distance, or an approved equivalent fastener. All joints shall be sealed in accordance with the SIP manufacturer's installation instructions. Alternate spline connections may be required for SIPs subjected to in-plane racking forces. Such SIPs shall be interconnected exactly as required in Table 6 or as directed by the designer.

**4.2.3 Plates:** The top and bottom plates of the SIPs shall be dimensional or engineered lumber sized to match the core thickness of the SIP. The plates shall be secured using not less than 0.113-inch x 2<sup>3</sup>/<sub>8</sub>-inch (2.9 mm x 60.3 mm) nails, spaced 8 inches (203 mm) on center on both sides of the SIP, minimum 3/4 inch (19.1 mm) edge distance, or an approved equivalent fastener.

A second plate composed of 1<sup>1</sup>/<sub>2</sub> inch (38.1 mm) minimum thick dimensional or engineered lumber with a specific gravity of 0.42 that is cut to the full thickness of the panel shall be secured to the first top plate using two rows of 0.168-inch x 3<sup>1</sup>/<sub>2</sub>-inch (4.3 mm x 88.9 mm) nails, spaced 16 inches (406 mm) on center, or an approved equivalent fastener.

**4.2.4 Cutting and Notching:** No field cutting or routing of the panels shall be permitted except as shown on approved drawings.

**4.2.5 Protection from Decay:** SIPs that rest on exterior foundation walls shall not be located within 8 inches (203 mm) of exposed earth. SIPs supported by concrete or masonry that is in direct contact with earth shall be protected from the concrete or masonry by a moisture barrier.

**4.2.6 Protection from Termites:** In areas subject to damage from termites, SIPs shall be protected from termites using an approved method. Panels shall not be installed below grade or in contact with earth.

**4.2.7 Heat-Producing Fixtures:** Heat-producing fixtures shall not be installed in the panels unless protected by a method approved by the code official or documented in test reports. This limitation shall not be interpreted to prohibit heat-producing elements with suitable protection.

**4.2.8 Voids and Holes:**

**4.2.8.1 Voids in Core:** In lieu of openings designed in accordance with section 4.1.7, the following voids are permitted. Voids may be provided in the panel core during fabrication at predetermined locations only. Voids parallel to the panel span shall be limited to a single 1-inch (25.4 mm) maximum diameter hole. Such voids shall be spaced a minimum of 4 feet (1.22 m) on center measured perpendicular to the panel span. Two ½-inch-diameter (12.7 mm) holes may be substituted for the single 1-inch (25.4 mm) hole provided they are maintained parallel and within 2 inches (50.8 mm) of each other.

Voids perpendicular to the panel span shall be limited to a single 1½-inch (38.1 mm) maximum diameter hole placed not closer than 10¼ inches (260.4 mm) from the support. Additional voids in the same direction shall be spaced not less than 6 inches (152.4 mm) on center.

**4.2.8.2 Holes in Panels:** Holes may be placed in panels during fabrication at predetermined locations only. Holes shall be limited to 4-inches x 4-inches (102 mm x 102 mm) square. The minimum distance between holes shall not be less than 4 feet (1.22 m) on center measured perpendicular to the panel span and 24 inches (610 mm) on center measured parallel to the panel span. Not more than three holes shall be permitted in a single line parallel to the panel span. The holes may intersect voids permitted elsewhere in this report.

**4.2.9 Panel Cladding:**

**4.2.9.1 Roof Covering:** The roof covering, underlayment and flashing shall comply with the applicable codes. All roofing materials must be installed in accordance with the manufacturer’s installation instructions. The use of roof coverings requiring the application of heat during installation shall be reviewed and approved by a registered design professional.

**4.2.9.2 Exterior Wall Covering:** Panels shall be covered on the exterior by a water-resistive barrier as required by the applicable code. The water-resistive barrier shall be attached with flashing in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer. The exterior facing of the SIP wall shall be covered with weather protection as required by the applicable building code or other approved materials.

**4.2.9.3 Interior Finish:** The SIP foam plastic core shall be separated from the interior of the building by an approved thermal barrier of ½-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier where required by IBC Section 2603.4.

**5.0 CONDITIONS OF USE**

*Foam Laminates’ Structural Insulated Panels* as described in this report comply with the codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** Installation complies with this report and the approved construction documents.
- 5.2** This report applies only to the panel thicknesses specifically listed herein.
- 5.3** In-use panel heights/spans shall not exceed the values listed herein. Extrapolation beyond the values listed herein is not permitted.
- 5.4** The panels are manufactured in the production facility in Starksboro, Vermont under a quality control program with inspections by ICC-ES.

**6.0 EVIDENCE SUBMITTED**

Reports of axial load, transverse load, and in-plane racking shear tests of panels in accordance with the general guidelines of ASTM E72.

**7.0 IDENTIFICATION**

**7.1** *Foam Laminates’ Structural Insulated Panels* are identified with the following information:

- 7.1.1** The ICC-ES Evaluation Report number (ESR-4532), or ICC NTA, LLC. certification mark (either NTA’s NER No. FLV012412-5, or NTA’s NER No. NER-1040)
- 7.1.2** Company name (Foam Laminates of Vermont)
- 7.1.3** Project or batch number

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

**FOAM LAMINATES OF VERMONT  
22 VARNEY HILL ROAD  
STARKSBORO, VERMONT 05487**

**TABLE 1—BASIC PROPERTIES<sup>1, 2</sup>**

PROPERTY	STRONG-AXIS BENDING
Allowable Tensile Stress, $F_t$ (psi)	495
Allowable Compressive Stress, $F_c$ (psi)	545
Elastic Modulus (Bending), $E_b$ (psi)	569000
Shear Modulus, $G$ (psi)	435
Allowable Core Shear Stress, $F_v$ (psi)	3.0
Core Compressive Modulus, $E_c$ (psi)	400
Reference Depth, $h_o$ (inches)	6.5
Shear Depth Factor Exponent, $m$	0.889

For **SI**: 1 inch = 25.4 mm; 1 psi = 6.8948 kPa.

<sup>1</sup>All properties are based on a minimum panel width of 24 inches.

<sup>2</sup>Refer to *Structural Insulated Panel (SIP) Engineering Design Guide (SIP-EDG01-19)* for details on engineered design using basic panel properties.

TABLE 2—SECTION PROPERTIES

PANEL THICKNESS <i>h</i> (inches)	CORE THICKNESS <i>c</i> (inches)	DEAD WEIGHT <i>w<sub>d</sub></i> (psf)	FACING AREA <i>A<sub>f</sub></i> (inches <sup>2</sup> /foot)	SHEAR AREA <i>A<sub>v</sub></i> (inches <sup>2</sup> /foot)	MOMENT OF INERTIA <i>I</i> (inches <sup>4</sup> /foot)	SECTION MODULUS <i>S</i> (inches <sup>3</sup> /foot)	RADIUS OF GYRATION <i>r</i> (inches)	CENTROID-TO-FACING DISTANCE <i>y<sub>c</sub></i> (inches)
6.50	5.63	3.3	10.5	72.8	96.5	29.7	3.03	3.25
8.25	7.38	3.5	10.5	93.8	160.2	38.8	3.91	4.13
10.25	9.38	3.6	10.5	117.8	252.7	49.3	4.91	5.13

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 psf = 0.0479 kPa.

TABLE 3—OSB FACING MINIMUM PROPERTIES

THICKNESS (inch)	FLATWISE STIFFNESS (lbf-inch <sup>2</sup> /foot)		FLATWISE STRENGTH (lbf-inch/foot)		TENSION (lbf/foot)		DENSITY (pcf)
	Along	Across	Along	Across	Along	Across	
7/16	54,700	27,100	950	870	6,800	6,500	35

For SI: 1 inch = 25.4 mm; 1 lbf-inch<sup>2</sup>/foot = 9.415 x 10<sup>-6</sup>kPa/m; 1 lbf-inch/foot = 3.707x10<sup>-4</sup> kN/m; 1 lbf/foot = 0.146 N/mm; 1 pcf = 16.018 kg/m<sup>3</sup>.

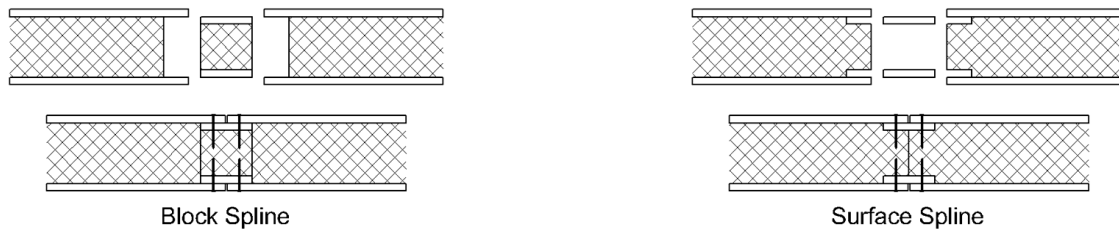


FIGURE 1—SIP SPLINE TYPES

TABLE 4—ALLOWABLE UNIFORM TRANSVERSE LOADS (psf)<sup>1,3</sup>

PANEL LENGTH (feet)	6 1/2-INCH-THICK SIP			8 1/4-INCH-THICK SIP			10 1/4-INCH-THICK SIP		
	Deflection Limit <sup>2</sup>			Deflection Limit <sup>2</sup>			Deflection Limit <sup>2</sup>		
	L/180	L/240	L/360	L/180	L/240	L/360	L/180	L/240	L/360
8	65.5	65.5	56.6	71.4	71.4	71.4	78.0	78.0	78.0
10	50.4	50.4	37.7	54.3	54.3	54.2	58.6	58.6	58.6
12	40.9	39.2	26.1	43.9	43.9	38.4	46.9	46.9	46.9
14	34.5	28.0	18.6	36.8	36.8	28.0	39.1	39.1	39.1
16	27.4	20.5	13.7	31.7	31.3	20.8	33.6	33.6	30.0

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 psf = 0.0479 kPa.

<sup>1</sup>Table values assume a simply supported panel with 1 1/2 inches (38.1 mm) of continuous bearing on facing at supports (*C<sub>v</sub>* = 1.0) with solid wood plates at bearing locations. Values do not include the dead weight of the panel. For wall panel capacities (6 1/2 inches (165 mm) thickness panels only) utilizing a zero bearing configuration (Figure 2) and installed in accordance with Section 4.2.3, the allowable load shall be calculated using *C<sub>v</sub>* = 0.81.

<sup>2</sup>Deflection limit shall be selected by building designer based on the serviceability requirements of the structure and the requirements of applicable building code. Values are based on loads of short duration only and do not consider the effects of creep.

<sup>3</sup>Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load.

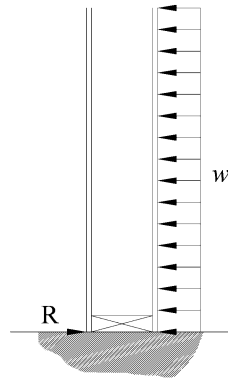


FIGURE 2—ZERO BEARING SUPPORT

TABLE 5—ALLOWABLE AXIAL LOADS (plf)<sup>1,2,3,4</sup>

LATERAL BRACE SPACING (feet)	PANEL THICKNESS
	6 1/2 inches
8	3800
10	3610
12	3380
14	3100
16	2810

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 plf = 14.6 N/m.

<sup>1</sup>Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load.

<sup>2</sup>All values are for normal duration and may not be increased for other durations.

<sup>3</sup>Axial loads shall be applied concentrically to the top of the panel through repetitive members spaced not more than 24 inches (609.6 mm) on center. Such members shall be fastened to a rim board or similar member to distribute the load along the top of the SIP.

<sup>4</sup>The ends of both facings must bear on the supporting foundation or structure to achieve the tabulated axial loads.

TABLE 6—ALLOWABLE IN-PLANE RACKING SHEAR STRENGTH FOR SIP SHEAR WALLS (WIND AND SEISMIC LOADS IN SEISMIC DESIGN CATEGORIES A, B AND C)<sup>1</sup>

SPLINE TYPE <sup>3</sup>	NOMINAL SIP THICKNESS (inches)	MINIMUM FACING CONNECTIONS <sup>4</sup>			ALLOWABLE SHEAR LOAD (plf)
		Chord <sup>2</sup>	Plate <sup>2</sup>	Spline <sup>3</sup>	
Block or Surface Spline	6.5	0.113"x 2 <sup>3</sup> / <sub>8</sub> " length round head ring shank nail 6" on center, <sup>3</sup> / <sub>4</sub> " edge distance	0.113"x 2 <sup>3</sup> / <sub>8</sub> " length round head ring shank nail 6" on center, <sup>3</sup> / <sub>4</sub> " edge distance	0.113"x 2 <sup>3</sup> / <sub>8</sub> " length round head ring shank nail 6" on center, <sup>3</sup> / <sub>4</sub> " edge distance	290

For SI: 1 inch = 25.4 mm; 1 plf = 14.6 N/m.

<sup>1</sup>Maximum shear wall dimensions ratio shall not exceed 2:1 (height: width) for resisting wind or seismic loads.

<sup>2</sup>Chords, hold downs and connections to other structural elements must be designed by a registered design professional in accordance with accepted engineering practice.

<sup>3</sup>Spline type at interior panel-to-panel joints only. Solid chord members are required at each end of each shear wall segment.

<sup>4</sup>Required connections must be made at each side of the panel. Dimensional or engineered lumber shall have an equivalent specific gravity of 0.42 or greater.