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FOAM LAMINATES' STRUCTURAL INSULATED PANELS FOR WALL AND ROOF PANELS

CSI Division:
06 00 00 WOOD PLASTICS AND COMPOSITES

CSI Section:
06 12 00 Structural Panels

1.0 RECOGNITION

Foam Laminates' Structural Insulated Panels recognized in this report have been evaluated for use as wall and roof panels to resist structural loads in Type V construction. The structural properties, flame spread, and smoke-developed indices of the insulated panels comply with the intent of the provisions of the following codes and regulations:

- 2021, 2018, 2015, and 2012 International Building Code® (IBC)
- 2021, 2018, 2015, and 2012 International Residential Code® (IRC)

2.0 LIMITATIONS

Use of the Foam Laminates' Structural Insulated Panels recognized in this report is subject to the following limitations:

2.1 The allowable loads in the tables in this report are limited to the panel thickness, width, and length as described in each table. The values found in this report shall not be extrapolated beyond these dimensions.

2.2 The Foam Laminates' Structural Insulated Panels shall be installed in accordance with the applicable code, the manufacturer's published installation instructions, and this report. Where there is a conflict, the most restrictive requirements shall govern.

2.3 The Foam Laminates' Structural Insulated Panels are limited to Seismic Design Categories A, B, and C when used to resist in-plane shear loads.

2.4 Panels used in axial loading applications shall be installed so that the axial loads are applied to the top of the panel concentrically. Panels shall be designed so that the loads are transferred through the facings in bearing.

2.5 The Foam Laminates' Structural Insulated Panels recognized in this report have not been evaluated as part of a fire-resistance-rated assembly. Panels may be used in fire-resistance-rated construction when appropriate evidence is submitted to and approved by the building official.

2.6 Structural calculations and construction documents shall be submitted to the building official for review and approval, when required by the building official. These calculations shall include but are not limited to allowable loads determined using properties found in Tables 1 and 2 of this report, evidence that the applied loads are less than allowable loads, and loading conditions that may not be specifically referenced in this report. Calculations and details shall establish the capacity of the panels and related connections to safely support and resist the design loads. Calculations and details shall be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project will be constructed.

2.7 The Foam Laminates' Structural Insulated Panels connections to the supporting building system are outside the scope of this report.

2.8 In areas where the probability of termite infestation is very heavy, installation is limited in accordance with 2021, 2018, and 2015 Section 2603.8 of the IBC and 2012 IBC Section 2603.9 or IRC Section 318.4.

2.9 Fixtures that produce heat that are installed in the panels shall be protected in accordance with the applicable code and approved by the building official.

2.10 The Foam Laminates' Structural Insulated Panels recognized in this report are produced by Foam Laminates of Vermont in Starksboro, Vermont.

3.0 PRODUCT USE

3.1 General: Foam Laminates' Structural Insulated Panels are used to resist lateral, axial, and transverse loads when used as wall panels. The Structural Insulated Panels may be used to resist transverse loads when used as roof panels.

3.2 Design: Allowable loads for all panel sizes are shown in Tables 3 through 5 of this report. Allowable loads may also be calculated using Tables 1 and 2 and in accordance with Section 2.6 of this report. Analyses and fastening schedules may also be provided as required by the building official to demonstrate acceptability for specific applications. The support members and the connection of the panels to the support members shall be designed to resist all applied forces.

3.3 When loading conditions result in simultaneously applied loads, the sum of ratios of imposed loads to allowable loads shall not exceed one.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.





3.4 Concentrated Axial Compression Loads: Concentrated loads shall not be applied directly to the top of the panels without the use of a framing member to distribute the concentrated load.

3.5 Panels Used in In-plane Shear Walls: The Structural Insulated Panels may be used to resist allowable in-plane (racking) shear loads from wind and earthquake in Seismic Design Categories A, B, and C as specified in Table 5 of this report. Panels used as shear walls resisting earthquake loads shall be designed using a Response Modification Coefficient, $R=2.0$, an Overstrength Factor, $\Omega_0=2.5$, and a Deflection Amplification Factor, C_d , in accordance with Item A.17 in Table 12.2-1 of ASCE 7. The maximum wall height to width ratio shall be 2:1. The maximum allowable in-plane shear load is 290 lbs/ft (131.54 kg) with a corresponding deflection of 0.125 inch (3.175 mm). Splines used to join panels may be block or surface splines. Structural splines at panel edges where they connect to the supporting structure shall be designed in accordance with the applicable code. Connections used to transfer the shear loads from the panels to the supporting structure are outside the scope of this report. Earthquake loads on light-framed walls with shear panels shall be determined in accordance with Section 1613 of the IBC.

3.6 Reinforced Openings: Exterior walls with openings shall be designed to resist superimposed loads in accordance with Section 1402.3 of the IBC, when applicable. All openings in panels shall be reinforced and designed in accordance with the applicable code to resist all superimposed loads. The details and design of the reinforced openings shall be provided to the building official for approval.

3.7 Manufactured Penetrations and Voids: The Panels may be fabricated with penetrations and voids at predetermined locations in accordance with Sections 3.7.1 through 3.7.3 of this report.

3.7.1 Voids in the Core Parallel to the Panel Span: 1-inch-diameter (25.4 mm) circular voids may be cut running the length (span) of the panel, spaced no less than 4 feet (1.22 m) on-center along the panel width.

3.7.2 Voids in the Core Perpendicular to the Panel Span: A 1½-inch-diameter (38.1 mm) circular void, running the width of the panel, may be located at not less than 10¼-inches (260.4 mm) from either supported end of the panel. An additional void may be cut at 16¼-inches (412.75 mm) from either supported end of the panel.

3.7.3 Penetrations Through the Thickness of the Panel: Penetrations may be located to coincide with the voids described in Section 3.7.1 and 3.7.2 of this report. The maximum penetration size through the panel shall be a 4-inch by 4-inch (102 mm x 102 mm) square. Penetrations shall be spaced no closer than 4 feet (1219.2 mm) on-center perpendicular to the span of the panel. A maximum of three

penetrations may be included, spaced at 2 feet (609.6 mm) on-center parallel to the span of the panel.

3.8 Installation:

3.8.1 Installation at Grade: Foam Laminates' Structural Insulated Panels shall not be installed as exterior walls below grade. Panels that are supported by exterior foundation walls shall be at least 8 inches (203 mm) above the exposed earth as required by Section 2304.12.1.2 of the IBC.

3.8.2 Field Cutting: Field cutting is not permitted unless the notching, cutting, or routing is included in the design drawings that have been approved by the building official.

3.8.3 Application with an Approved Thermal Barrier: Structural Insulated Panels shall be separated from the interior by an approved thermal barrier. The thermal barrier shall comply with and be installed in accordance with IBC Section 2603.4 and IRC Section R316.4.

3.8.4 Panel to Panel Connections: Structural Insulated Panels shall be connected to adjacent panels using splines at the panel joints. Spline types are defined in Section 4.6 of this report. The splines are to be fastened to the panel edges at the joints on both interior and exterior faces. The fastening shall be minimum of 2¾-inch-long (60.3 mm) x 0.113-inch (2.9 mm) nails. Nails shall be spaced at a maximum of 8 inches (213 mm) on-center with an edge distance of ¾ inch (19 mm). Joints shall be sealed in accordance with the manufacturer's installation instructions. Table 5 of this report lists spline connections when panels are used for in-plane racking performance.

3.8.5 Top and Bottom Plates and Connection to Panels: The top and bottom of the Structural Insulated Panels shall be attached to wall plates. The plates shall be sawn lumber or engineered lumber and the panels shall be attached using minimum 2¾-inch-long (60.3 mm) x 0.113-inch (2.9 mm) nails. The nails shall be spaced at a maximum of 8 inches (203 mm) on-center with a minimum edge distance of ¾ inch (19.1 mm). A second top plate, with a minimum specific gravity to 0.42, shall be attached to the first top plate with a minimum dimension of 1½ inch (38.1 mm) thick and attached to the first top plate using 3½-inch-long (88.9 mm) x 0.168-inch (4.3 mm) nails. Nails shall be placed in two rows along the length of the plate spaced at 16 inches (406 mm) on-center.

3.8.6 Weather Protection for Roof Panels: Panels shall be protected with an approved roof covering secured to the panel in accordance with roof cover manufacturer's approved instructions, and Chapter 15 of the IBC or Chapter 9 of the IRC, as applicable. Roof covering installation methods requiring heat shall be approved by the building official.

3.8.7 Weather Protection for Exterior Wall Panels: Exterior wall panels shall be protected with a water-resistive barrier in accordance with IBC Chapter 14 or IRC Section



R703. The exterior wall panels shall be protected with a code complying exterior wall covering. The exterior wall coverings shall be approved by the building official and installed in accordance with the manufacturer's recommendations.

4.0 PRODUCT DESCRIPTION

4.1 General: Foam Laminates' Structural Insulated Panels are manufactured using engineered-wood facings and expanded polystyrene (EPS) foam cores. The panel facings are adhered to the panel cores. All panels are constructed in factory conditions and are manufactured to specific project requirements and design requirements.

4.2 Panel Sizes: The panels are manufactured in 3 thicknesses: 6½ inches, 8¼ inches, and 10¼ inches. The thickness of the panel is the total thickness of facings and core when factory assembled. Panels may be manufactured up to a maximum size of 8 feet (2.44 m) wide, and a 16-foot (4.88 m) span length.

4.3 Panel Core: Expanded polystyrene (EPS) insulated foam plastic insulation used in the panel cores complies with IBC Section 2603 and IRC Section R316 as Type I in accordance with ASTM C578, and has a flame-spread rating of 75 or less and a smoke-density rating of 450 or less when tested in accordance with ASTM E84.

4.4 Panel Facings: The panel facings are fabricated from two single-ply OSB facings. Panel facings are 7/16-inch-thick (11.1 mm), Exposure 1, with a span rating of 24/16, and comply with 24/16 DOC PS 2. The facings used in the manufacturing of the panels shall be oriented so that the strength axis is parallel to the direction in which the panel is bending. The panel facings meet the minimum properties of ANSI/APA PRS 610.1 as required by the 2021 and 2018 IRC, the minimum requirements of Section 1610.3.2 of the 2015 IRC, and Section 1613.3.2 of the 2012 IRC.

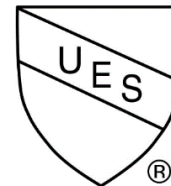
4.5 Adhesive: Panel Facings are adhered to panel cores during manufacturing using a sandwich panel adhesive as required by the manufacturer's quality system.

4.6 Splines: Panels are connected to each other laterally along the edges using surface or block splines. Surface splines are 7/16-inch-thick (76.2 mm) by 3-inch-wide (11.1 mm) OSB running the entire length of the panel inserted adjacent to each panel face. Block splines are constructed using 7/16-inch OSB with an EPS core similar to the SIP panel with a total thickness of 1 inch (25.4 mm) less than the panels it is joining.

5.0 IDENTIFICATION

Foam Laminates' Structural Insulated Panels are identified by the Foam Laminates of Vermont's name and trademark, product name, and evaluation report number (ER-786).

The IAPMO Uniform Evaluation Service Mark of Conformity may also be used as shown below:



IAPMO UES ER-786

6.0 SUBSTANTIATING DATA

6.1 Data in accordance with the Acceptance Criteria for Sandwich Panels (AC04), Approved June 2019, Editorially Revised December 2020.

6.2 Reports of room corner fire testing in accordance with NFPA 286.

6.3 Engineering Analysis.

6.4 Test reports are from laboratories in compliance with ISO/IEC 17025.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research completed by IAPMO Uniform Evaluation Service on Foam Laminates of Vermont's Structural Insulated Panels to assess conformance to the codes shown in Section 1.0 of this report and serves as documentation of the product certification. Products are manufactured at locations noted in Section 2.10 of this report under a quality control program with periodic inspection under the supervision of IAPMO UES.

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org



TABLE 1 -Basic Properties^{1,2}

Property	Strong-Axis Bending
Allowable Tensile Stress, F_t (psi)	495
Allowable Compressive Stress, F_c (psi)	545
Elastic Modulus (Bending), E_b (psi)	569,000
Shear Modulus, G (psi)	435
Allowable Core Shear Stress, F_v (psi)	3.0
Core Compressive Modulus, E_c (psi)	400

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

¹ All properties are based on a minimum panel width of 24 inches.

² Values may be used for design as required by this report using basic panel properties found in this table and Section 2.6 of this report.

TABLE 2 -Section Properties

Panel Thickness, h (in)	Core Thickness, c (in)	Weight of Panel (psf)	Facing Area(in ² /ft)	Shear Area(in ² /ft)	Moment of Inertia, I (in ⁴ /ft)	Section Modulus, S (in ³ /ft)	Radius of Gyration, r (in)	Centroid-to-Facing Distance, y_c (in)
6.5	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	7.38	3.6	10.5	117.8	252.7	49.3	4.91	5.13

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

TABLE 3 -Allowable Uniform Transverse Load(psf) ^{1,2,3,4}

Panel Length (ft)	6.5-inch-thick			8.25-inch-thick			10.25-inch-thick		
	Deflection Limit			Deflection Limit			Deflection Limit		
	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	53.4	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	18.7	36.8	36.8	28.0	39.1	39.1	39.1
16	27.4	20.5	13.7	31.7	31.3	20.9	33.6	33.6	30.0

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

¹ Allowable values were determined from the following limit states: Panel bending, shear, and deflection. The values found in this table are based on a continuous bearing on facing at supports of 1¹/₂ inches. 6.5-inch panels may have a zero bearing configuration when installed in accordance with Section 3.8.5 of this report and the shear strength design values will require an adjustment factor of 0.81.

² The values found in Table 3 are based on short duration, and therefore creep has not been evaluated.

³ The allowable loads do not include the weight of the panel as defined in Table 2 of this report.

⁴ When determining the allowable capacity, the dead load shall not be greater than half of the allowable loads presented in this table.



TABLE 4 -Allowable Axial Loads (plf) ^{1,2,3}

Lateral Brace Spacing (ft)	6.5-inch panel thickness
8	3800
10	3610
12	3380
14	3100
16	2810

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

¹ Values found in Table 4 are for a normal duration and shall not be increased. These values assume the entire panel thickness including the facings bear directly on the supporting structure.

² Section 3.4 has information for application of axial loads.

³ When determining the allowable capacity, the dead load shall not be greater than half of the allowable loads presented in this table.

TABLE 5 -Allowable In-Plane Racking Shear Strength (plf) ¹

Splines ²	Nominal SIP Thickness (in)	Minimum Facing Connections			Allowable Shear Load (plf)
		Chord	Plate	Spline	
Block or Surface Splines	6.5	0.113 in x 2 ³ / ₈ -in length round head ring shank nail, spaced at 6-in on- center with 3/4 in edge distance			290

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

¹ Section 3.5 of this report includes further details.

² Splines are for panel-to-panel connections only. The ends of panels shall be connected to solid chord members.

³ Connections not detailed in this report or this table shall be designed in accordance with Section 2.6 of this report.