



ICC-ES Evaluation Report

ESR-1282

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This report is subject to renewal August 2024.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 12 00—Structural Panels

DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION

Section: 07 41 13—Metal Roof Panels

DIVISION: 10 00 00—SPECIALTIES

Section: 10 73 00—Protective Covers

REPORT HOLDER:

PLYMOUTH FOAM INC.

EVALUATION SUBJECT:

CLIMATE MASTER, ALUMA-R, AND SHINGLEABLE LAMINATED ROOF PANEL SYSTEMS FOR PATIO COVERS, AND ENGINEERED STRUCTURAL PANELS FOR FLOORS

1.0 EVALUATION SCOPE

1.1 Compliance with the following code:

- 2021, 2018, 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)

Properties evaluated:

- Structural
- Thermal barrier

1.2 Evaluation to the following green code(s) and/or standards:

- 2022 California Green Building Standards Code (CALGreen), Title 24, Part 11
- 2020, 2015, 2012 and 2008 ICC 700 *National Green Building Standard*™ (ICC 700-2020, ICC 700-2015, ICC 700-2012 and ICC 700-2008)

Attributes verified:

- See Section 3.1

2.0 USES

The Climate Master, Aluma-R, and Shingleable Laminated Roof Panel Systems are used as structural roof panel systems for patio covers complying with IRC Appendix H.

The Engineered Structural Panels are used as structural insulated floor panels of enclosed structures installed over nonhabitable space.

An engineering design in accordance with IRC Section R301.1.3 is required.

3.0 DESCRIPTION

3.1 General:

The Climate Master, Aluma-R and Shingleable Laminated Roof Panel Systems consist of factory-assembled sandwich panels and mullions. The Climate Master and Aluma-R sandwich panels consist of aluminum facings adhered to an expanded polystyrene (EPS) foam plastic core. The panels are 36 inches (914 mm) to 48 inches (1218 mm) wide, have a maximum length of 20 feet (6096 mm), and are 3 or 3³/₄ inches (76 or 95 mm) thick. The Shingleable sandwich panel consists of aluminum facings adhered to an EPS foam plastic core. Additionally, a 7/16-inch-thick (11.1 mm) oriented strand board (OSB) is factory-adhered between the foam core and exterior aluminum facer. The panels are 36 inches (914 mm) to 48 inches (1218 mm) wide, have a maximum length of 20 feet (6096 mm), and are 6 inches (152 mm) thick. The panel systems are field-installed, with mullions along the longitudinal joints of the panels.

The Engineered Structural Panels are factory-assembled structural insulated panels consisting of OSB facers adhered to an EPS foam plastic core. The panel width is 4 feet (1219 mm) and the length ranges from 8 to 24 feet (2438 to 7316 mm). The panel core thickness ranges from 5⁵/₈ to 9³/₈ inches (143 to 238 mm). The panels are connected together along longitudinal panel joints with solid-sawn dimensional lumber splines.

The attributes of the panel system have been verified as conforming to the provisions of (i) CALGreen Section A4.404.3.3 for premanufactured building systems; (ii) ICC 700-2020, 700-2015 and ICC 700-2012 Sections 601.5 and 11.601.5 for prefabricated components; and (iii) ICC 700-2008 Section 601.5 for prefabricated components. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

3.2 Materials:

3.2.1 Panel Core: The foam plastic core for the Climate Master, Aluma-R and Shingleable Laminated Roof Panel Systems is EPS foam plastic that complies with ASTM C578 as Type II. The EPS foam plastic has a 1.5 pcf (24 kg/m³) nominal density, and has a flame-spread index of 25 or less

and a smoke-density index of 450 or less when tested in accordance with ASTM E84.

The foam plastic core for the Engineered Structural Panels is Type I EPS foam plastic that complies with ASTM C578 and has a nominal density of 1.0 lb./ft³ (16.02 kg/m³), a flame-spread index of 75 or less, and a smoke-density index of 450 or less, when tested in accordance with ASTM E84.

3.2.2 Panel Facings:

3.2.2.1 Aluminum: The aluminum facing material is 0.024-inch-thick (0.61 mm) 3105-H254 aluminum alloy conforming to ASTM B209 and having minimum tensile and yield strength values of 22,000 and 18,000 psi (151.7 MPa and 124.1 MPa), respectively.

3.2.2.2 OSB: The oriented strand board (OSB) facers is ⁷/₁₆-inch-thick (11.1 mm) classified as Exposure 1 sheathing, having a span rating of 24/16 and complying with U.S. DOC PS 2 and manufactured by an approved supplier noted in the approved quality documentation. The strength axis of the OSB board must be parallel to the panel's length. No splices are permitted on the OSB.

3.2.3 Adhesive: The panel facings are factory-adhered to the panel core with a Type II, Class 2, adhesive as specified in the approved quality control documentation that complies with the ICC-ES Acceptance Criteria for Sandwich Panel Adhesives (AC05).

3.2.4 Mullions: The mullions used to interconnect the panels along their longitudinal edges are extruded from 6063-T5 aluminum alloy complying with ASTM B221. The flanges are a minimum of 0.055 inch (1.4 mm) thick and 1.75 inches (44.5 mm) wide.

3.2.5 Splines and End Plates: For the Engineered Structural Panels, the lumber spline must be two nominally 2-by solid-sawn dimensional lumber members nailed together and sized in depth to match the panel core thickness. The solid-sawn dimensional lumber must be a minimum of No. 2 or better spruce-pine-fir (SPF) having a minimum specific gravity of 0.42.

The end plates for the Engineered Structural Panels must be nominally 2-by solid-sawn dimensional lumber sized in depth to match the panel core thickness, and must be a minimum of No. 2 or better SPF having a minimum specific gravity of 0.42.

4.0 DESIGN AND INSTALLATION

4.1 Design:

For use in allowable stress design (ASD), Tables 1, 2 and 3 show allowable uniform superimposed gravity loads, for roof live loads, snow loads, and wind uplift and downward loads for the Climate Master, Aluma-R and Shingleable Laminated Roof panels used as roof panels. Table 4 lists the ASD allowable uniform superimposed gravity loads for dead loads and live loads for the Engineered Structural Panels used as floor panels. The design loads to be resisted by the panels must be determined in accordance with the applicable code and must not exceed the tabulated allowable loads noted in this evaluation report. Use of the panels to resist axial loads due to horizontal wind, or to resist in-plane shear loads when the panels are used as a roof or floor diaphragm, is outside the scope of this report.

4.2 Installation:

4.2.1 Roof Panels: The roof panel and mullion length must be continuous in the direction of the roof slope, with no transverse joints. A thermal barrier as specified by the code is not required to be installed on the interior side of the roof panels. The foam plastic must be encapsulated with

minimum 0.024-inch-thick (0.61 mm) aluminum. The panels must be installed with a minimum roof slope as indicated in Tables 1, 2 and 3. Longitudinal panel edges are connected to adjacent panel edges using tight-fitting mullions described in Section 3.2.4. Supports at each end of the panel span must provide the panels with a minimum 1-inch (25.4 mm) continuous bearing width, to provide support for panels subjected to gravity loads, and upward and downward wind loads. As an alternative restraint for Climate Master and Aluma-R panels subjected to wind uplift loads, the panels must be fastened using No. 14 corrosion-resistant steel screws installed with 1-inch-outside-diameter (25.4 mm) corrosion-resistant steel washers with neoprene inserts, spaced according to Tables 1 and 2. At least two fasteners per panel are required at each support. Connection of the panels to the structure must be substantiated to the satisfaction of the code official.

Roof covering installed over the Shingleable panels must comply with Chapter 9 of the IRC.

4.2.2 Floor Panels: The Engineered Structural Panels must be installed as the floor of the enclosed structures over nonhabitable space, with the panel length perpendicular to the supporting members and without transverse joints. The panels must be connected to each other at the panel longitudinal edges with solid-sawn dimensional lumber splines as described in Section 3.2.5 of this evaluation report. The splines are attached to panels with 8d box nails [0.113-inch-diameter-by-2¹/₂-inch-long (2.9 by 63.5 mm)] or 14 gauge staples [minimum ⁷/₁₆ inch (11.1 mm) outside dimension crown width by 1¹/₂ inches (38 mm) long] spaced at 6 inches (152 mm) on center. See Figure 1 for connection details. Supports at each end of the panel span must provide the panels with a minimum 1¹/₂-inch (38 mm) continuous bearing width, to resist uniform superimposed gravity loads. Connection of the panels to the supporting structure must be substantiated to the satisfaction of the code official.

5.0 CONDITIONS OF USE

The Climate Master, Aluma-R, Shingleable Laminated Roof Panel Systems, and Engineered Structural Panels described in this report comply with, or are suitable alternatives to what is specified in, the code indicated in Section 1.0 of this report, subject to the following conditions:

- 5.1** The panel's fabrication, identification and installation must comply with this report and the manufacturer's published installation instructions. In the event of conflicts between this report and the manufacturer's published instructions, this report governs.
- 5.2** The Climate Master, Aluma-R, and Shingleable Laminated Roof Panel Systems are limited to use as roof panels of patio covers regulated under IRC Appendix H.
- 5.3** The Engineered Structural Panels must be installed in interior, well ventilated dry locations subject to approval by the code official.
- 5.4** Panel connections to the supporting structure must be designed in accordance with the applicable code.
- 5.5** The remaining portions of the structure must be designed and constructed in accordance with the applicable code.
- 5.6** Calculations and drawings demonstrating compliance with this report must be submitted to the code official for approval. The calculations and drawings must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

- 5.7 The Climate Master, Aluma-R, and Shingleable Laminated Roof Panel Systems are limited to installations where a nonclassified roof covering is permitted.
- 5.8 Minimum roof slope for the Climate Master, Aluma-R, and Shingleable Laminated Roof Panel Systems must be in accordance with minimum roof slope requirements as noted in Tables 1 through 3.
- 5.9 The panels are fabricated 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 Sandwich Panels (AC04), dated June 2019 (editorially revised December 2020).
- 6.2 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2015 (editorially revised Decemebr 2020).

7.0 IDENTIFICATION

- 7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-1282) along with the name, registered trademark, or registered logo of the report holder must be included in the product label

- 7.2 In addition, each panel must be identified by a label bearing the panel type, and the statement "For Use in One- and Two-Family Dwellings Only." Each package of mullions is identified by a label bearing the evaluation report number (ESR-1282).

- 7.3 The report holder's contact information is the following:

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TABLE 1—CLIMATE MASTER AND ALUMA-R PANELS ALLOWABLE SPAN AND UPLIFT FASTENER SPACING^{1,2}
(3.0 inch – 0.024 inch – 1.5 pcf EPS – 0.024 inch)

LOADING TYPE	APPLIED PRESSURE FOR DESIGN (psf)										MINIMUM PANEL SLOPE ⁴ (Per Foot of Projection) ⁴
	10	15	20	25	30	35	40	45	50	55	
Live	15'-6"	13'-5"	12'-0"	11'-0"	10'-2"	9'-6"	8'-10"	8'-1"	7'-3"	6'-7"	3/8" / foot
Wind (Upward)	16'-6"	14'-0"	12'-5"	11'-3"	10'-5"	9'-8"	9'-1"	8'-4"	7'-6"	6'-10"	n/a
Wind (Downward)	15'-6"	13'-5"	12'-0"	11'-0"	10'-2"	9'-6"	8'-10"	8'-1"	7'-3"	6'-7"	n/a
Snow			11'-1"	10'-0"	9'-2"	8'-6"	7'-11"	7'-6"	7'-1"	6'-7"	1/2" / foot
Fastener Spacing ³ for Uplift Wind Loads	12"	10"	8"	7"	6"	5"	5"	4"	4"	4"	

For SI: 1 inch = 25.4 mm; 1 pcf = 16.04 kg/m³; 1 foot = 305 mm; 1 psf = 47.9 N/m².

Notes:

- ¹Roof panels are intended for use with a patio enclosure as defined in Appendix Chapter H of the *International Residential Code*[®].
- The Applied Pressure for Design (column headings) shown in the table is an "equivalent" uniform load. Consideration shall be given to load combinations presented in the code and site specific conditions such as drifting and sliding snow. After determination of the applied pressure, the allowable panel span is determined for each load type using the greatest calculated pressure for all load combinations which include the specific load type. This process is repeated for each of the four (4) load types. The minimum allowable span calculated for each of the 4 load types shall be the "Allowable Span" used for the proposed application.
- Unless otherwise noted, the maximum eave projection of the roof system is 24-inches.
- ²Panel spans are based on a maximum temperature differential between the two panel skins of 10°F.
- ³Fasteners shall be #14 corrosion-resistant steel screws with 1.0" diameter corrosion-resistant washer plates and neoprene inserts.
- ⁴Minimum roof slopes are based on panel deflection only. Increased slopes will be required where panel accessories, such as mullions or flashing, can increase ponding caused by irregularities in the water flow path.

TABLE 2—CLIMATE MASTER AND ALUMA-R PANELS ALLOWABLE SPAN AND UPLIFT FASTENER SPACING^{1,2}
(3.75 inch – 0.024 inch – 1.5 pcf EPS – 0.024 inch)

LOADING TYPE	APPLIED PRESSURE FOR DESIGN (psf)										MINIMUM PANEL SLOPE ⁴ (Per Foot of Projection) ⁴
	10	15	20	25	30	35	40	45	50	55	
Live	17'-11"	15'-6"	13'-11"	12'-8"	11'-9"	10'-10"	10'-2"	9'-7"	8'-10"	8'-1"	3/8" / foot
Wind (Upward)	18'-0"	16'-3"	14'-5"	13'-1"	12'-1"	11'-2"	10'-5"	9'-10"	9'-2"	8'-4"	n/a
Wind (Downward)	17'-11"	15'-6"	13'-11"	12'-8"	11'-9"	10'-10"	10'-2"	9'-7"	8'-10"	8'-1"	n/a
Snow			12'-9"	11'-5"	10'-6"	9'-9"	9'-1"	8'-7"	8'-2"	7'-9"	1/2" / foot
Fastener Spacing ³ for Uplift Wind Loads	12"	9"	7"	6"	5"	5"	4"	4"	4"	3"	

For SI: 1 inch = 25.4 mm; 1 pcf = 16.04 kg/m³; 1 foot = 305 mm; 1 psf = 47.9 N/m².

Notes:

- ¹Roof panels are intended for use with a patio enclosure as defined in Appendix Chapter H of the *International Residential Code*[®].
- The Applied Pressure for Design (column headings) shown in the table is an "equivalent" uniform load. Consideration shall be given to load combinations presented in the code and site specific conditions such as drifting and sliding snow. After determination of the applied pressure, the allowable panel span is determined for each load type using the greatest calculated pressure for all load combinations which include the specific load type. This process is repeated for each of the four (4) load types. The minimum allowable span calculated for each of the 4 load types shall be the "Allowable Span" used for the proposed application.
- Unless otherwise noted, the maximum eave projection of the roof system is 24-inches.
- ²Panel spans are based on a maximum temperature differential between the two panel skins of 10°F.
- ³Fasteners shall be #14 corrosion-resistant steel screws with 1.0" diameter corrosion-resistant washer plates and neoprene inserts.
- ⁴Minimum roof slopes are based on panel deflection only. Increased slopes will be required where panel accessories, such as mullions or flashing, can increase ponding caused by irregularities in the water flow path.

TABLE 3—ALLOWABLE UNIFORM TRANSVERSE LOAD FOR SHINGLEABLE ROOF PANELS⁵
(6.0-inch-0.024 inch-1.5 pcf EPS-⁷/₁₆ inch OSB-0.024 inch)

PANEL SPAN (ft)	ALLOWABLE UNIFORM APPLIED LOAD ^{1, 4} (psf)			
	Deflection Limit ²	Gravity Loads		Wind Uplift Load ³
		Roof Live Load and Downward Wind Load	Snow Load ²	
8.0	L/120	142	101	83
	L/180	110	67	83
	L/240	83	50	83
10.0	L/120	114	76	53
	L/180	80	50	53
	L/240	60	38	53
11.0	L/120	103	67	44
	L/180	69	44	44
	L/240	52	33	44
12.0	L/120	90	59	38
	L/180	60	39	38
	L/240	45	29	38
13.0	L/120	79	53	32
	L/180	53	35	32
	L/240	39	26	32
14.0	L/120	69	47	28
	L/180	46	31	28
	L/240	35	23	28
15.0	L/120	61	42	25
	L/180	41	28	25
	L/240	31	21	25
16.0	L/120	54	38	22
	L/180	36	25	22
	L/240	27	19	22
17.0	L/120	48	34	20
	L/180	32	23	20
	L/240	24	17	20

For SI: 1 inch = 25.4 mm; 1 pcf = 16.04 kg/m³; 1 foot = 305 mm; 1 psf = 47.9 N/m².

Notes:

¹Shingleable roof panels are intended for use with a patio enclosure as defined in Appendix Chapter H of the IRC.

-The Allowable Uniform Applied Load (column headings) shown in the table is an "equivalent" uniform load. Consideration must be given to load combinations presented in the code and site-specific conditions such as drifting and sliding snow.

-Where non-uniform loads are applied to the panel, an "equivalent" uniform load must be determined for comparison with the values within this table.

²Deflection limitations are based on load combinations presented in Table 1604.3 of the *International Building Code*[®] (IBC) with the exception that creep of the foam core has been considered when panels are subjected to long term snow loads.

³Uplift connections must be designed by a registered design professional. When fasteners are used to restrain the panels from uplift loads, the fastener spacing must not exceed 12".

⁴Dead load (DL) of the panel has been considered in the determination of allowable applied loads. Where additional dead loads, such as roofing, are added to the panels, these loads must be subtracted from the allowable loads presented in Table 3 to determine the allowable load combination which may be applied to the panel.

⁵Minimum roof slopes are based on panel deflection only. Increased slopes will be required where panel accessories, such as mullions or flashing, can increase ponding caused by irregularities in the flow path. Minimum roof slope is ³/₈ inch per foot of horizontal projection for live loads and ¹/₂ inch per foot of horizontal projection for snow loads, unless the code or the roofing manufacturer requires a more restrictive minimum roof slope.

TABLE 4—ALLOWABLE UNIFORM SUPERIMPOSED GRAVITY LOADS FOR FACE-SUPPORTED ENGINEERED STRUCTURAL PANELS WITH DIMENSIONAL LUMBER SPLINES^{1,2,3,4} (psf)
 (⁷/₁₆ inch OSB-1.0 pcf EPS-⁷/₁₆ inch OSB)

PANEL CORE THICKNESS (in.)	DEFLECTION LIMIT	PANEL SPAN (ft.)						
		10	12	14	16	18	20	22
5 ⁵ / ₈	L/360	58	45	32	---	---	---	---
	L/240	90	70	49	41	32	---	---
	L/180	116*	90	64	54	42	---	---
7 ³ / ₈	L/360	---	73	57	41	34	---	---
	L/240	---	112	87	61	51	40	---
	L/180	---	119*	100	80	66	52	---
9 ³ / ₈	L/360	---	95	82	68	56	44	32
	L/240	---	124*	110	96*	80	65	49
	L/180	---	124*	110	96*	83	70	57*

For SI: 1 inch = 25.4 mm; 1 pcf = 16.04 kg/m³; 1 foot = 305 mm; 1 psf = 47.9 N/m².

¹Floor panels must have a minimum ³/₄-inch-thick top skin or a minimum ⁷/₁₆-inch-thick top skin overlaid with minimum ⁷/₁₆-inch-thick finish flooring perpendicular to the panels.

²The tabulated values are for panels installed as floor panels with simply supported single span conditions with panels supported at each end on a minimum 1¹/₂-inch-wide continuous support in contact with the panel face. Tabulated values are applicable to panels installed with the strong axis of the OSB panel facers parallel to the panel span.

³Allowable loads with an asterisk, *, indicates a capacity based on the average peak test load divided by 3.

⁴Panels spanning 4 feet must be a minimum of 8 feet long spanning a minimum of two 4 foot spans. No single span conditions shall be permitted.

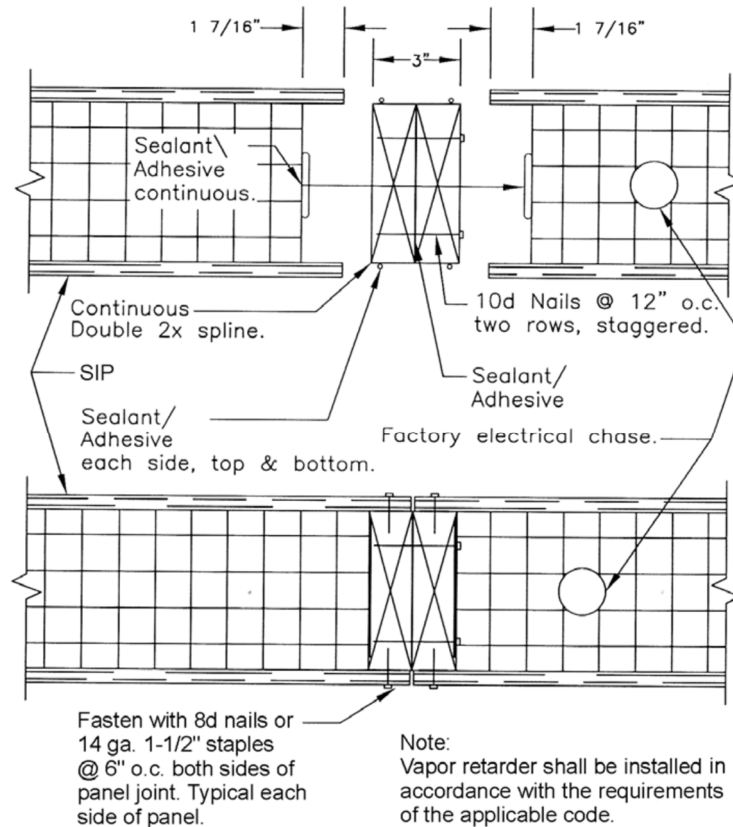


FIGURE 1—CONNECTION DETAIL FOR PANELS CONNECTED WITH DIMENSIONAL LUMBER SPLINES