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DrJ Research Report

DRR 1707-02

Attachment of Exterior Wall Coverings through Foam Plastic Insulating Sheathing to Cold-formed Steel Wall Framing

Foam Sheathing Committee (FSC) Members

Product:

Attachment of exterior wall coverings through foam plastic insulating sheathing (FPIS) to cold-formed steel wall framing

Issue Date:

August 18, 2014

Revision Date:

October 16, 2020

For current information on this topic refer to
Quick Guide: Cladding Connections to Steel Frame Walls with FPIS ci

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REPORT HOLDER INFORMATION:

Foam Sheathing Committee (FSC) Members

fsc.americanchemistry.com/Members

continuousinsulation.org

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

SECTION: 07 21 00 - Thermal Insulation

SECTION: 07 40 00 - Roofing and Siding Panels

SECTION: 07 46 00 - Siding

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1 PRODUCT EVALUATED[1]

1.1 Attachment of exterior wall coverings through foam plastic insulating sheathing (FPIS) to cold-formed steel wall framing

2 APPLICABLE CODES AND STANDARDS[2,3]

2.1 *Codes*

2.1.1 *IBC—12, 15, 18: International Building Code®*

2.1.2 *IRC—12, 15, 18: International Residential Code®*

2.2 *Standards and Referenced Documents*

2.2.1 *AISI S100: North American Specification for the Design of Cold-formed Steel Structural Members*

2.2.2 *AISI S240: North American Standard for Cold-Formed Steel Structural Framing*

2.2.3 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

2.2.4 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

2.2.5 *ASTM C1063: Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster*

2.2.6 *ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*

2.2.7 *ASTM C1513: Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections*

2.2.8 *ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*

2.2.9 *ASTM C847: Standard Specification for Metal Lath*

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[1] Building codes require data from valid research reports be obtained from *approved sources*. Work of licensed *registered design professionals* (RDPs) meets the code requirements for approval by the *building official*.

Building official approval of a licensed RDP is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant *jurisdiction*. Therefore, the work of licensed RDPs is accepted by *building officials*, except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this DRR is not approved, the *building official* responds in writing stating the reasons for disapproval.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjengineering.org or call us at 608-310-6748.

[2] Unless otherwise noted, all references in this DRR are from the 2018 version of the codes and the standards referenced therein (e.g., *ASCE 7, NDS, ASTM*). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

[3] All terms defined in the applicable building codes are italicized.

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2.2.10 *SBCA ANSI/FS 100: Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies*

3 Evaluation Scope

3.1 This research report examines the attachment of exterior wall coverings through FPIS, with thickness up to 4", to cold-formed steel wall studs.

3.2 This research report also provides a step-by-step approach for the design process of attaching exterior wall coverings through FPIS to steel wall framing.

3.3 This evaluation and design methodology considers only the weight of the exterior covering on fasteners cantilevered though the FPIS and into wall framing.

3.4 Wind pressure resistance of the exterior covering is outside the scope of this research report. Consult the cladding manufacturer for cladding and attachment instructions for required wind pressure resistance. For wind pressure resistance of FPIS, consult the FPIS manufacturer's installation instructions and wind pressure resistance data complying with *ANSI/SBCA FS100*.

3.4.1 The intent of this research report is not to reduce minimum fastener sizes, penetrations, and spacings required to resist wind loads. Where fastener requirements for wind load resistance are more stringent than those included herein for the purpose of supporting cladding weight, they shall control the design.

3.5 Attachment of window flanges over FPIS is outside the scope of this research report. For this application see DRR 1304-01.

3.6 Any code compliance issues not specifically addressed in this section are outside the scope of this DRR.

3.7 Any engineering evaluation conducted for this DRR was performed on the dates provided in this DRR and within DrJ's professional scope of work.

4 Product Description and Materials

4.1 FPIS products used in accordance with this research report shall comply with the following material standards:

4.1.1 Expanded polystyrene (EPS) manufactured in compliance with *ASTM C578*

4.1.2 Extruded polystyrene (XPS) manufactured in compliance with *ASTM C578*

4.1.3 Polyisocyanurate (Polyiso) manufactured in compliance with *ASTM C1289*

4.2 FPIS products used in accordance with this research report shall have a minimum compressive strength of 15 psi.

4.3 Where wind pressure resistance is required, FPIS products used in accordance with this research report shall comply with *ANSI/SBCA FS100*.

4.4 FPIS products are produced under proprietary manufacturing processes and are formed into rigid insulation panels.

4.5 FPIS products are typically available in the following sizes:

4.5.1 Thicknesses range from ½" to 6".

4.5.2 The standard product width is 48".

4.5.3 Standard lengths include 96", 108", and 120".

4.5.4 Consult the manufacturer for the availability of a given product with non-standard width or length.

4.6 The following FPIS products meet the requirements of Section 4.1 and 4.2:

4.6.1 Atlas Roofing Corporation – Energy Shield®, Energy Shield® Pro, Energy Shield® Pro2, Energy Shield® CGF, Energy Shield® CGF Pro, Stucco Shield®, ThermalStar® LWi, ThermalStar® One, ThermalStar® Insulation Board, ThermalStar® T&G

4.6.2 BASF Corporation – Neopor®

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4.6.3 DuPont de Nemours, Inc. – Styrofoam™, Tuff-R™, Super Tuff-R™, Thermax™, Thermax™ (ci) Exterior, Thermax™ Heavy Duty, Thermax™ Light Duty, Thermax™ White Finish, Thermax™ Metal Building Board, and Isocast™ R Thermal

4.6.4 Hunter Panels – Xci Foil (Class A), Xci CG (Class A), Xci 286, Xci Ply (Class A), Xci Foil, Xci CG, Xci Ply, and Xci NB

4.6.5 Kingspan Insulation, LLC – GreenGuard® Insulation Boards: CM, SL, SLX, and PGU

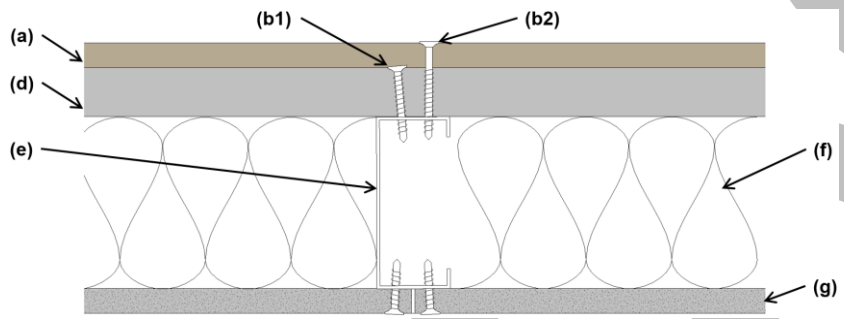
4.6.6 Rmax – R-Matte® Plus-3, Durasheath®, Thermasheath®, Thermasheath®-SI, Thermasheath®-XP, ECOMAXci® FR, ECOMAXci® FR White, TSX-8500, TSX-8510, ECOMAXci® Wall Solution, ECOMAXci® Ply, ECOMAXci® FR Ply, and THERMABASEci™

5 APPLICATIONS

5.1 *Design Procedure*

5.1.1 Determine an appropriate cladding attachment requirement in accordance with Section 5.2 through 5.6 and select one of the following methods.

5.1.2 *Direct attachment of cladding through FPIS to wall framing, Figure 1:*



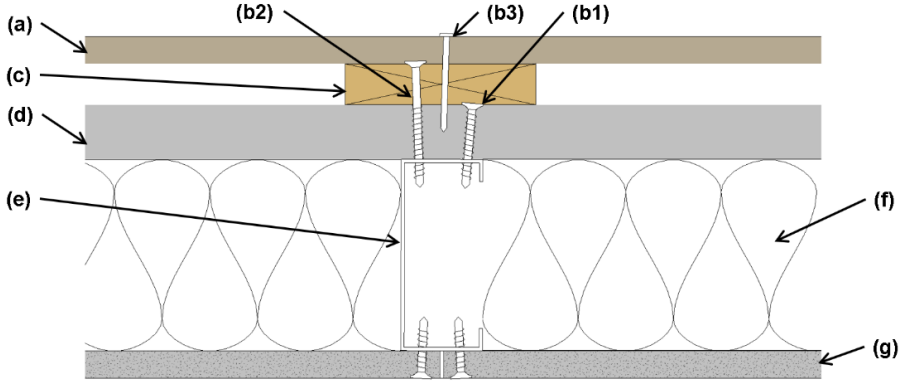
(a) Cladding
(b1) Fastener (Foam to Stud)
(b2) Fastener (Cladding to Stud)
(d) FPIS
(e) Framing
(f) Cavity Insulation
(g) Wall Finish

FIGURE 1. PLAN VIEW – DIRECT CLADDING ATTACHMENT THROUGH FPIS

5.1.3 *Furring attachment through FPIS to wall framing, Figure 2 and Figure 3:*

5.1.3.1 Cladding is attached to furring in accordance with the applicable building code and the cladding manufacturer's installation instructions.

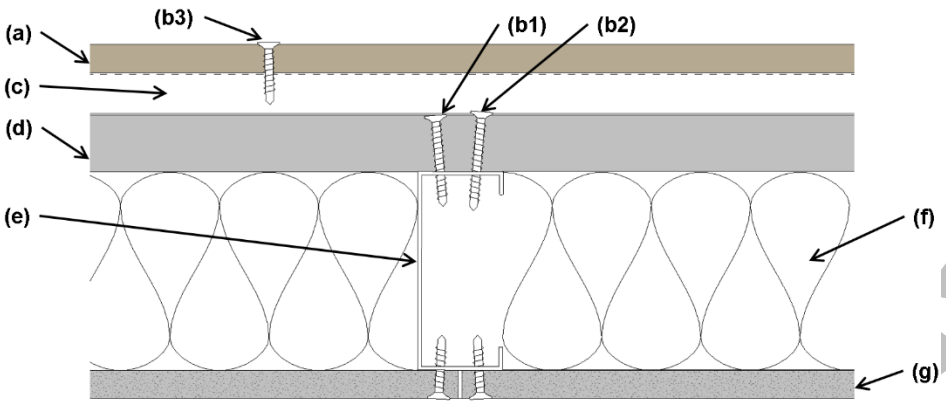
5.1.3.2 Minimum required furring thickness may increase where cladding fastening requirements dictate more penetration depth in framing; alternatively, a compatible siding fastener with adequate withdrawal resistance shall be specified.



(a) Cladding
(b1) Fastener (Foam to Stud)
(b2) Fastener (Furring to Stud)
(b3) Fastener (Cladding to Furring)
(c) Wood Furring
(d) FPIS
(e) Framing
(f) Cavity Insulation
(g) Wall Finish

FIGURE 2. CLADDING ATTACHMENT THROUGH WOOD FURRING ALIGNED PARALLEL TO STUDS

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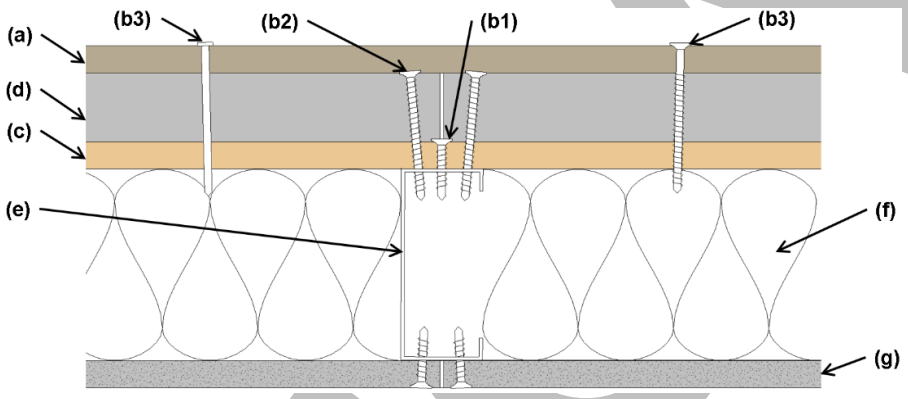


(a) Cladding
(b1) Fastener (Foam to Stud)
(b2) Fastener (Hat Channel to Stud – fasten alternate or both flanges at each stud location)
(b3) Fastener (Cladding to Hat Channel)
(c) Hat Channel Furring
(d) FPIS
(e) Framing
(f) Cavity Insulation
(g) Wall Finish

FIGURE 3. CLADDING ATTACHMENT THROUGH HAT CHANNEL FURRING ALIGNED PERPENDICULAR TO STUDS

5.1.4 *Direct attachment of cladding to qualifying wood structural panels, Figure 4:*

5.1.4.1 Exterior wall coverings weighing not more than 3 psf are permitted to be fastened through FPIS up to 2 inches in thickness into wood structural panel sheathing without penetrating into the framing. The attachment shall be in accordance with the manufacturer's instructions and supported by a testing report, or a product engineering report, or shall be fastened in accordance with IRC Section R703.3.3 and Table R703.3.3.



(a) Cladding
(b1) Fastener (WSP to Stud)
(b2) Fastener (Foam to Stud)
(b3) Fastener (Cladding to WSP - screw or nail permitted)
(c) WSP
(d) FPIS
(e) Framing
(f) Cavity Insulation
(g) Wall Finish

FIGURE 4. CLADDING ATTACHMENT DIRECT TO WOOD STRUCTURAL PANELS (WSP)

5.1.5 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.2 From Table 1 for "direct attachment" method or Table 2 for "furring attachment" method, determine the maximum allowable FPIS thickness based on a selected minimum fastener size, maximum fastener spacing, and the cladding system weight.

5.2.1 To determine cladding system weight, add the weight of all materials on the exterior side of the foam sheathing. This includes, but is not limited to, the cladding material, structural sheathing, furring, or other materials located exterior of the FPIS that are supported by the fastener extending through the FPIS and into the stud.

5.2.2 Use actual weights for the materials installed. Actual cladding weights of materials can be obtained from the cladding manufacturer's material specifications. Other typical weights of building materials can be found in the Commentary to *ASCE 7*.

5.2.2.1 Examples of cladding included in each weight category: 3 psf – vinyl siding, wood lap siding, most fiber cement siding; 11 psf – 3-coat stucco, 18 psf – medium weight adhered masonry veneer, 25 psf heavy

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adhered masonry veneer. Examples are not inclusive of all claddings. Refer to cladding manufacturer data for actual unit weight.

5.2.2.2 For reservoir claddings such as stone or masonry, the designer shall use the saturated weight of the cladding as defined in the manufacturer's product data as appropriate.

TABLE 1. SIDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT CLADDING ATTACHMENT OVER FPIS TO SUPPORT CLADDING SYSTEM WEIGHT

Cladding Fastener Through Foam Plastic Sheathing into:	Siding Fastener Type & Minimum Size	Siding Fastener Vertical Spacing (in)	Maximum Thickness of FPIS (in)							
			16" o.c. Fastener Horizontal Spacing				24" o.c. Fastener Horizontal Spacing			
			Max. Cladding Weight (psf)							
			3	11	18	25	3	11	18	25
Steel Framing (minimum penetration of steel thickness + 3 threads)	#8 screw into 33 mil steel or thicker	6	3.00	2.95	2.20	1.45	3.00	2.35	1.25	DR
		8	3.00	2.55	1.60	0.60	3.00	1.80	DR	DR
		12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
	#10 screw into 33 mil steel	6	4.00	3.50	2.70	1.95	4.00	2.90	1.70	0.55
		8	4.00	3.10	2.05	1.00	4.00	2.25	0.70	DR
		12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
	#10 screw into 43 mil steel or thicker	6	4.00	4.00	4.00	3.60	4.00	4.00	3.45	2.70
		8	4.00	4.00	3.70	3.00	4.00	3.85	2.80	1.80
		12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Tabulated requirements are based on minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
2. See ABTG Research Report 1503-02 for information on how the table values were derived.
3. Self-drilling tapping screw fasteners for connection of siding to cold-formed steel framing shall comply with the requirements of *AISI S240* and *ASTM C1513*. Other approved fasteners of equivalent or greater diameter and bending strength shall be permitted.
4. For cladding system weights exceeding 25 psf with any thickness of foam sheathing, a design professional should be consulted.
5. Table 1 solutions are limited to 4" maximum thickness of foam sheathing. Design is required for thicknesses of foam sheathing greater than 4".
6. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with *ASTM C578* or *ASTM C1289*.
7. Metal lath shall be minimum 2.5 lbs./yd.^{2} diamond mesh in accordance with *ASTM C847*. Metal lath lock washers on fasteners are highly recommended.
8. Vertical spacing of fasteners in metal lath shall not exceed 7" o.c., in accordance with *ASTM C1063* and the Masonry Veneer Manufacturer Association (MVMA) Installation Guide except where an approved design is provided.
9. Where adhered masonry is used, it shall be installed in accordance with the MVMA Installation Guide or an approved design.
10. Linear interpolation between cladding weight categories is permitted.
11. DR = Design Required

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TABLE 2. FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FPIS TO SUPPORT CLADDING SYSTEM WEIGHT

Furring Material	Framing Member	Fastener Type & Minimum Size	Minimum Penetration into Wall Framing (in)	Fastener Spacing in Furring (in)	Maximum Thickness of FPIS (in)							
					16" o.c. Furring				24" o.c. Furring			
					Siding Weight (psf)							
					3	11	18	25	3	11	18	25
Minimum 33mil Steel Hat Channel or Minimum 1x3 Wood Furring	33 mil Cold-formed Steel Stud	#8 screw (0.285" head)	Steel thickness +3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		#10 screw (0.333" head)	Steel thickness +3 threads	12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
				16	3.85	1.45	DR	DR	3.40	DR	DR	DR
				24	3.40	DR	DR	DR	2.70	DR	DR	DR
	43 mil or thicker Cold-formed Steel Stud	#8 screw (0.285" head)	Steel thickness +3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		#10 screw (0.333" head)	Steel thickness +3 threads	12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR
				16	4.00	3.30	1.95	0.60	4.00	2.25	DR	DR
				24	4.00	2.25	DR	DR	4.00	0.65	DR	DR

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m²

1. Table values are based on:
   a. Minimum ¾" (19.1 mm) thick wood furring of Spruce-Pine-Fir (SPF) or any softwood species with a specific gravity of 0.42 or greater per *NDS*.
   b. Minimum 33 mil steel hat channel furring of 33 ksi steel. Steel hat channel shall have a minimum $^{7}/_{8}$" (22.2 mm) depth.
   c. Cold-formed steel framing of indicated nominal steel thickness and minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
2. Self-drilling, self-tapping screw fasteners for connection of siding to cold-formed steel framing shall comply with the requirements of *AISI S240* and *ASTM C1513*. Other approved fasteners of equivalent or greater diameter and bending strength shall be permitted.
3. Furring shall be spaced a maximum of 24" o.c. in a vertical or horizontal orientation.
   a. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing.
   b. Where placed horizontally, wood furring shall be preservative treated wood in accordance with *IRC* Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance *IRC* Section R317.3. Steel furring shall have a minimum G60 galvanized coating.
   c. Furring strips installed in a horizontal direction shall be fastened at each stud with a number of fasteners equivalent to that required by the fastener spacing. If the required nail spacing is 12" o.c. and the studs are 24" o.c., then two (2) nails would be required at each stud (24/12=2). In no case shall fasteners be spaced more than 24" (0.6 m) apart.
4. For cladding system weights exceeding 25 psf with any thickness of foam sheathing, a design professional should be consulted.
5. Table 2 solutions are limited to 4" maximum thickness of foam sheathing. Design is required for thicknesses of foam sheathing greater than 4".
6. Foam sheathing shall have a minimum compressive strength of 15 psi, in accordance with *ASTM C578* or *ASTM C1289*.
7. Linear interpolation between cladding weight categories is permitted.
8. DR = Design Required

5.3 Verify that the selected fastener is capable of resisting the wind loads required for the project. (See Appendix A for guidance.)

5.4 The minimum fastening requirement shall be the more stringent of that required by:

5.4.1 Fastening schedule determined in accordance with Section 5.2.

5.4.2 Fastener type, head size, diameter, spacing, and penetration into framing required by the applicable building code for the specific cladding material and the cladding manufacturer's installation instructions.

5.4.2.1 For buildings within the scope of the *IRC* and where the seismic provisions of *IRC* Section R301.2.2 apply, the wall assembly shall not exceed the weight limits of Section R301.2.2.1, unless an engineered design is provided in accordance with Section R301.1.3.

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5.4.2.2 For buildings within the scope of the *IBC* and where the seismic load provisions of *IBC* Section 1613 apply, the cladding attachment shall be verified to provide resistance to meet or exceed minimum required earthquake loads.

5.5 Attachments using fasteners with different characteristics than prescribed in Sections 5.2 and 5.4 shall be designed to provide at least equivalent support of cladding weight, resistance to wind loading, and seismic loads as required by the applicable building code.

5.6 Allowable wind load resistance shall be verified to meet or exceed the minimum required allowable stress design wind load of the applicable code, or an approved design shall be required.

5.6.1 Refer to *IRC* Table R301.2(2) for components and cladding wind loads for the applicable wall wind zone and for an effective wind area of 10 square feet.

5.6.2 For *IBC* required wind loads, see *IBC* Section 1609.

5.6.3 For wind load resistance of steel hat channels and other metal furring shapes and attachments, refer to *AISI S100* or manufacturer design data (see also Appendix A).

5.6.4 For wind load resistance of wood furring and attachments, refer to *NDS*.

5.6.5 For wind load resistance of cladding materials and attachments, refer to the cladding manufacturer's data and installation instructions, or an approved design.

6 INSTALLATION

6.1 Installation shall comply with the manufacturer's installation instructions and this DRR. In the event of a conflict between the manufacturer's installation instructions and this DRR, the more restrictive shall govern.

6.2 Verify that materials comply with the following provisions of this research report:

6.2.1 FPIS materials shall comply with the requirements of Section 4, unless otherwise approved by the manufacturer evaluation report for the product and thickness intended.

6.3 Wall framing materials shall comply with Section 5, specifically the minimum cold-formed steel framing member requirements in the footnotes to Table 1 and Table 2, as applicable.

6.4 Cladding or furring fastener type and size, including fastener length to obtain required penetration into or through framing members, complies with the solution determined in accordance with Section 5.3 or Section 5.1.4 where attachment to qualified wood structural panel sheathing is used.

6.5 Fasteners shall be driven flush and snug such that gaps between layers are removed, except where a gap under the cladding fastener head is required for attachment of vinyl siding.

6.6 Fasteners shall be installed in a workmanlike manner and not over-driven, resulting in material damage or excessive distortion of cladding, furring or FPIS materials.

6.7 Ensure framing members or blocking are provided as required to allow for attachment of siding and trim materials at transitions such as corners and wall penetrations. Refer to DRR 1205-05 for construction detailing concepts.

6.8 Ensure that a code-compliant water-resistive barrier system and flashing is provided prior to or during the installation of cladding materials; refer to DRR 1205-05 for construction detailing concepts and DRR 1410-05 for applications of FPIS as a water-resistive barrier system.

6.9 Where required by contract documents, the project owner or owner's agent, or good practice, construct a mock-up assembly to demonstrate constructability and a proper integration of components.

7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

7.2 *AISI S100: North American Specification for the Design of Cold-formed Steel Structural Members*

7.3 Applied Building Technology Group Research Report 1503-02, *Attachment of Exterior Wall Coverings Through Foam Plastic Insulating Sheathing (FPIS) to Wood or Steel Wall Framing*, 2017.

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7.4 The product(s) evaluated by this research report falls within the scope of one or more of the model, state, or local building codes for building construction. The testing and/or substantiating data used in this research report is limited to buildings, structures, building elements, construction materials, and civil engineering related specifically to buildings.

7.5 The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineered alternative means of compliance. This research report assesses compliance with defined standards, generally accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

7.6 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC* Section 1703 and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.

7.7 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC, IRC, NDS®,* and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8 FINDINGS

8.1 This research report uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ's professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.

8.2 The prescriptive solutions, specifications, and installation requirements outlined in this research report may be used to attach exterior wall coverings through foam sheathing to wood or steel wall framing. For design of alternative solutions, refer to ABTG Research Report 1503-02 for the design methodology serving as the basis for prescriptive solutions included in this DRR and also in the *IBC* and *IRC*.

8.3 The *IBC* Section 2603.12 (Appendix C: Prescriptive Code Requirements) and *IRC* Section R703.3 and Section R703.16 include provisions for the attachment of cladding and/or furring over FPIS to steel framing to appropriately resist the required design wind loads.

8.4 *IBC* Section 104.11 (*IRC* Section R104.11 and *IFC* Section 104.9 are similar) states:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code…Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.

8.5 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.

8.5.1 No known variations

9 REFERENCES

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9.1 The Foam Sheathing Committee (FSC) of the American Chemistry Council sponsors research and tools to support the reliable, efficient, and economic design and installation of foam sheathing. This report is developed by DrJ from a grant provided by FSC. Learn more about foam sheathing at continuousinsulation.org.

10 Conditions of Use

10.1 The attachment of cladding materials through the FPIS described in this research report comply with the 2012, 2015, and 2018 versions of the *IBC* and *IRC* and are compliant with the intent of previous versions of the code as defined in the alternative means and methods section(s) subject to the following conditions:

10.1.1 Installation shall comply with the manufacturer's installation instructions and this research report. In the event of a conflict between the manufacturer's installation instructions and this research report, the more restrictive shall govern.

10.1.2 Installation shall be on exterior walls with code-compliant cold-formed steel framing meeting the minimum requirements as indicated in Table 1 and Table 2.

10.2 Where required by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this DRR and the installation instructions shall be submitted at the time of *permit* application.

10.3 Any generally accepted engineering calculations needed to show compliance with this DRR shall be submitted to the AHJ for review and approval.

10.4 Design loads shall be determined in accordance with the building code adopted by the *jurisdiction* in which the project is to be constructed and/or by the Building Designer (e.g., *owner* or *registered design professional*).

10.5 At a minimum, this product shall be installed per Section 6 of this DRR.

10.6 This product is manufactured under a third-party quality control program in accordance with *IBC* Section 104.4 and 110.4 and *IRC* Section R104.4 and R109.2.

10.7 The actual design, suitability, and use of this DRR, for any particular building, is the responsibility of the *owner* or the owner's authorized agent. Therefore, the DRR shall be reviewed for code compliance by the *building official* for acceptance.

11 Identification

11.1 The products listed in Section 4.6 in this research report are identified by a label on the board or packaging material bearing the manufacturer's name, product name, label of the third-party inspection agency, and other information to confirm code compliance.

11.2 Additional technical information can be found at the respective FSC member websites found at fsc.americanchemistry.com/Members.

12 Review Schedule

12.1 For the most recent version or current status of this DRR, visit drjengineering.org or contact DrJ Engineering.

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APPENDIX A: STEEL STUD WIND LOAD RESISTANCE SUPPLEMENT

The following table is provided as prescriptive supplement to facilitate verification of wind load resistance per Section 5.6.3. This table applies to a common metal hat channel size and connections as indicated; however, the wind load resistance of the actual metal hat channel and connections used should be verified by design or by consulting the manufacturer's design data. This table also assumes no eccentricity in the transfer of outward (negative pressure) wind load through the metal furring from the cladding attachment to the furring to the furring attachment to wall framing.

TABLE 3. FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FPIS TO RESIST ASD WIND PRESSURE

Furring Material	Framing Member	Fastener Type & Minimum Size	Minimum Penetration into Wall Framing (in)	Fastener Spacing in Furring (in)	Allowable Wind Pressure Resistance of Furring Attachment (psf)	
					16" o.c. Furring	24" o.c. Furring
Minimum 33mil Steel Hat Channel or Minimum 1x3 Wood Furring	33 mil Cold-formed Steel Stud	#8 screw (0.285" head)	Steel thickness +3 threads	12	52.9	35.3
				16	39.7	26.5
				24	26.5	17.6
		#10 screw (0.333" head)	Steel thickness +3 threads	12	62.9	41.9
				16	47.1	31.4
				24	31.4	21.0
	43 mil or thicker Cold-formed Steel Stud	#8 screw (0.285" head)	Steel thickness +3 threads	12	69.0	46.0
				16	51.8	34.5
				24	34.5	23.0
		#10 screw (0.333" head)	Steel thickness +3 threads	12	81.9	54.6
				16	61.5	41.0
				24	35.1	23.4

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m²

1. Table values are based on:
   a. Minimum ¾" (19.1 mm) thick wood furring of Spruce-Pine-Fir (SPF) or any softwood species with a specific gravity of 0.42 or greater per *NDS*.
   b. Minimum 33 mil steel hat channel furring of 33 ksi steel. Steel hat channel shall have a minimum $^{7}/_{8}$" (22.2 mm) depth.
   c. Steel framing of indicated nominal steel thickness and minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
2. Self-drilling, self-tapping screw fasteners for connection of siding to cold-formed steel framing shall comply with the requirements of *AISI S240* and *ASTM C1513*. Other approved fasteners of equivalent or greater withdrawal strength and head size shall be permitted.
3. Furring shall be spaced a maximum of 24" o.c. in a vertical or horizontal orientation.
   a. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing.
   b. Where placed horizontally, wood furring shall be preservative treated wood in accordance with *IRC* Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance *IRC* Section R317.3. Steel furring shall have a minimum G60 galvanized coating.
   c. Furring strips installed in a horizontal direction shall be fastened at each stud with a number of fasteners equivalent to that required by the fastener spacing. If the required fastener spacing is 12" o.c. and the studs are 24" o.c., then two (2) fasteners are required at each stud (24/12=2) and the wind load resistance of the furring installation shall be based on a 24" fastener spacing in furring. In no case shall fasteners be spaced more than 24" (0.6 m) apart.
4. For allowable stress design wind loads exceeding the allowable wind pressure resistance above, an approved design providing equivalent wind pressure resistance shall be permitted.
5. DR = Design Required

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APPENDIX B: WEIGHTS OF CLADDING MATERIALS AND DESIGN EXAMPLE

Cladding manufacturer's data should be consulted for the unit weight of specific cladding materials. For the cladding weight categories described in the *IBC* and *IRC* connection provisions based on this DRR, typical examples are as follows:

3 psf cladding weight category: wood lap siding, vinyl siding, fiber cement siding (most types), panel siding, etc.
11 psf: 3-coat Portland cement stucco (see calculation below)
18 psf: medium weight adhered masonry veneer
25 psf: heavy adhered masonry veneer

Weight of Portland Cement Plaster (Stucco)

On wood framing, three-coat plaster is typically installed over metal lath to a $^{7}/_{8}$" nominal thickness. A typical plaster mixture weighs about 142 lbs. per cubic foot, roughly the same as mortar, and this amount of material would cover about 13.7 sq. ft. at $^{7}/_{8}$" thick. The metal lath may add a small additional amount of weight, so the end result is that three-coat stucco weighs about 10.4 lbs. per sq. ft. (psf) installed.

(Source: Portland Cement Association [PCA] website: http://www.cement.org/for-concrete-books-learning/materials-applications/stucco/faqs)

For the weight of metal furring, refer to the metal furring manufacturer's data. Typical weight of softwood dimensional framing materials are as follows.[4,5]

Nominal Size *(in x in)*	Actual Size		Weight *(lb/ft)*
	(in x in)	*(mm x mm)*	
1 x 3	3/4 x 2 1/2	19 x 64	0.47
1 x 4	3/4 x 3 1/2	19 x 89	0.64
2 x 3	1 1/2 x 2 1/2	38 x 64	0.94
2 x 4	1 1/2 x 3 1/2	38 x 89	1.28

Design Example

Given

Foam Sheathing Thickness: 4"
Cladding Material: Fiber cement lap siding
Design Wind Speed/Exposure: 90/B
Seismic Design Category: B (exempt)
Steel Framing: 43 mil cold-formed steel stud at 24" o.c.

Solution

STEP 1: Use 1x3 (min) wood furring (vertical orientation over studs per Figure 1b). A metal hat channel (oriented horizontally per Figure 1b) or other metal furring shape could be used in a vertical or horizontal orientation provided eccentricities between the cladding connection to the furring and the furring connection to framing are minimized or properly accounted for by design. Direct siding attachment using Table 1 (without furring per Figure 1a) could also be considered in similar fashion, but direct cladding attachment is generally more feasible for foam sheathing thicknesses not in excess of about 2 inches.

STEP 2: Consult siding manufacturer data for siding weight (2.3 psf) and add 0.24 psf for furring.

[4] Weight is based on softwood lumber having a density of 35 pcf.

[5] Source: http://www.engineeringtoolbox.com/softwood-lumber-dimensions-d_1452.html

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Total = 2.54 psf (Use 3 psf).

Note: The material weight for the 1x3 furring in the table above is listed as 0.47 pounds per lineal foot. At 24" o.c., this equates to 0.24 pounds per square foot. A similar calculation is used for metal furring based on the weight per lineal foot of the metal furring.

STEP 3: Using Table 2 (and column for 3 psf siding weight), min 1x3 wood furring at 24" o.c. attached to studs can be attached with a #10 screw at 24" o.c. through furring and foam sheathing and penetrating framing a minimum of the steel thickness plus 3 threads . Other fastening solutions in Table 2 are also possible.

STEP 4: Check to ensure the selected furring and attachment schedule (Step 3) is capable of resisting the allowable stress design wind load required by the building code. Refer to Section 5.6. If wind load resistance must be increased, a stronger furring, a closer fastener spacing, or a stronger connection can be specified as required by design. For direct cladding attachments (or the cladding attachment to furring), the allowable wind load resistance of the specific cladding material is usually specified by the cladding manufacturer or the building code (if specifically addressed in the code).

STEP 5: The minimum length of fastener required is 0.75" (furring) + 4" (foam) + 0.428" + ¼" (thickness of stud+3 threads) = 5.428". Select a 6" self-drilling screw.

Note: Add length for thickness of additional sheathing material layer behind foam, if included. Verify furring provides adequate thickness for siding fastener per code or siding manufacturer's installation instructions. If needed, specify a thicker furring (i.e., 2x4) or an appropriate siding fastener for use in ¾"-thick furring.

STEP 6: Ensure installation follows the practices required in Section 6.

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APPENDIX C: PRESCRIPTIVE CODE REQUIREMENTS

The following code excerpts are from the 2018 editions of the *IBC* and *IRC* as justified by the test data and engineering analysis methodology presented in this DRR. In addition, a provision added by others to the 2015 edition of the *IRC* allows connection directly to wood structural panels with certain limitations and is included at the end of this appendix due to its relevance.

2018 IRC Section R703.16 Cladding attachment over foam sheathing to cold-formed steel framing. Cladding shall be specified and installed in accordance with Section R703, the cladding manufacturer's approved instructions, including any limitations for use over foam plastic sheathing, or an approved design. In addition, the cladding or furring attachments through foam sheathing to framing shall meet or exceed the minimum fastening requirements of Section R703.16.1, Section R703.16.2 or an approved design for support of cladding weight.

Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section R703.9.
3. For anchored masonry or stone veneer installed over foam sheathing, refer to Section R703.7.

R703.16.1 Direct attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table R703.16.1.

TABLE R703.16.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE[b]	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[c] (inches)							
			16" o.c. Fastener Horizontal Spacing				24" o.c. Fastener Horizontal Spacing			
			Cladding Weight:				Cladding Weight:			
			3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Steel Framing (minimum penetration of steel thickness + 3 threads)	No. 8 screw into 33 mil steel or thicker	6	3.00	2.95	2.20	1.45	3.00	2.35	1.25	DR
		8	3.00	2.55	1.60	0.60	3.00	1.80	DR	DR
		12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
	No. 10 screw into 33 mil steel	6	4.00	3.50	2.70	1.95	4.00	2.90	1.70	0.55
		8	4.00	3.10	2.05	1.00	4.00	2.25	0.70	DR
		12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
	No. 10 screw into 43 mil steel or thicker	6	4.00	4.00	4.00	3.60	4.00	4.00	3.45	2.70
		8	4.00	4.00	3.70	3.00	4.00	3.85	2.80	1.80
		12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.
DR = Design required.
o.c. = on center
a. Steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel, and 50 ksi steel f or 54 mil steel or thicker.
b. Screws shall comply with the requirements of ASTM C 1513.
c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C 578 or ASTM C 1289.

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R703.16.2 Furred cladding attachment. Where steel or wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table R703.16.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance with Section R317.3. Steel furring shall have a minimum G60 galvanized coating.

TABLE R703.16.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE[b]	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d](inches)							
					16" o.c. Furring[e]				24" o.c.Furring[e]			
					Cladding Weight:				Cladding Weight:			
					3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Minimum 33 mil Steel Furring or Minimum 1 × Wood Furring[c]	33 mil Steel Stud	No. 8 screw	Steel thickness + 3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		No. 10 screw	Steel thickness + 3 threads	12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
				16	3.85	1.45	DR	DR	3.40	DR	DR	DR
				24	3.40	DR	DR	DR	2.70	DR	DR	DR
	43 mil or thicker Steel Stud	No. 8 screw	Steel thickness + 3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		No. 10 screw	Steel thickness + 3 threads	12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR
				16	4.00	3.30	1.95	0.60	4.00	2.25	DR	DR
				24	4.00	2.25	DR	DR	4.00	0.65	DR	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.
DR = Design required.
o.c. = on center
a. Wood furring shall be Spruce-pine-fir or any softwood species with a specific gravity of 0.42 or greater. Steel furring shall be minimum 33 ksi steel. Steel studs shall be minimum 33 ksi steel for 33mil and 43 mil thickness, and 50 ksi steel for 54 mil steel or thicker.
b. Screws shall comply with the requirements of ASTM C 1513.
c. Where the required cladding fastener penetration into wood material exceeds 3 / 4 inch and is not more than 1-1/ 2 inches, a minimum 2-inch nominal wood furring or an approved design shall be used.
d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C 578 or ASTM C 1289.
e. Furring shall be spaced not more than 24 inches (610 mm) on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

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2018 IBC Section 2603.12 Cladding attachment over foam sheathing to cold-formed steel framing. Cladding shall be specified and installed in accordance with Chapter 14 and the cladding manufacturer's approved installation instructions, including any limitations for use over foam plastic sheathing, or an approved design. Where used, furring and furring attachments shall be designed to resist design loads determined in accordance with Chapter 16. In addition, the cladding or furring attachments through foam sheathing to cold-formed steel framing shall meet or exceed the minimum fastening requirements of Sections 2603.12.1 and 2603.12.2, or an approved design for support of cladding weight.

Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section 1408.
3. For anchored masonry or stone veneer installed over foam sheathing, refer to Section 1405.

2603.12.1 Direct attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table 2603.12.1.

TABLE 2603.12.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE[b]	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[c](inches)							
			16" o.c. Fastener Horizontal Spacing				24" o.c. Fastener Horizontal Spacing			
			Cladding Weight:				Cladding Weight:			
			3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Cold-formed steel framing (minimum penetration of steel thickness plus 3 threads)	#8 screw into 33 mil steel or thicker	6	3.00	2.95	2.20	1.45	3.00	2.35	1.25	DR
		8	3.00	2.55	1.60	0.60	3.00	1.80	DR	DR
		12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
	#10 screw into 33 mil steel	6	4.00	3.5	2.70	1.95	4.00	2.90	1.70	0.55
		8	4.00	3.10	2.05	1.00	4.00	2.25	0.70	DR
		12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
	#10 screw into 43 mil steel or thicker	6	4.00	4.00	4.00	3.60	4.00	4.00	3.45	2.70
		8	4.00	4.00	3.70	3.00	4.00	3.85	2.80	1.80
		12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa, 1 pound per square inch = 0.00689 MPa.
DR = design required; o.c. = on center.
a. Cold-formed steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
b. Screws shall comply with the requirements of AISI S240.
c. Foam sheathing shall have a minimum compressive strength of 15 pounds per square inch in accordance with ASTM C 578 or ASTM C 1289.

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2603.12.2 Furred cladding attachment. Where steel or wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table 2603.12.2. Where placed horizontally, wood furring shall be preservative-treated wood in accordance with Section 2303.1.9 or naturally durable wood and fasteners shall be corrosion resistant in accordance Section 2304.10.5. Steel furring shall have a minimum G60 galvanized coating.

TABLE 2603.12.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE[b]	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d](inches)							
					16" o.c. Furring[e]				24" o.c.Furring[e]			
					Cladding Weight:				Cladding Weight:			
					3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Minimum 33 mil Steel Furring or Minimum 1 × Wood Furring[c]	33 mil cold-formed Steel Stud	#8 screw	Steel thickness + 3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		#10 screw	Steel thickness + 3 threads	12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
				16	3.85	1.45	DR	DR	3.40	DR	DR	DR
				24	3.40	DR	DR	DR	2.70	DR	DR	DR
	43 mil or thicker cold-formed Steel Stud	#8 screw	Steel thickness + 3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		#10 screw	Steel thickness + 3 threads	12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR
				16	4.00	3.30	1.95	0.60	4.00	2.25	DR	DR
				24	4.00	2.25	DR	DR	4.00	0.65	DR	DR

For SI: 1 inch = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa, 1 pound per square inch = 0.00689 MPa.
DR = design required: o.c. = on center.
a. Wood furring shall be Spruce-Pine fir or any softwood species with a specific gravity of 0.42 or greater. Steel furring shall be minimum 33 ksi steel. Cold-formed steel studs shall be minimum 33 ksi steel for 33 mil and 43 mil thickness and 50 ksi steel for 54 mil steel or thicker.
b. Screws shall comply with the requirements of AISI S240.
c. Where the required cladding fastener penetration into wood material exceeds 3 / 4 inch and is not more than 1 1 / 2 inches, a minimum 2-inch nominal wood furring shall be used or an approved design.
d. Foam sheathing shall have a minimum compressive strength of 15 pounds per square inch in accordance with ASTM C 578 or ASTM C 1289.
e. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

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In addition to the above model code provisions based on engineering methods and data as documented in this research report, the following additional provision for cladding attachments through foam sheathing to wood structural panels is included in the 2015 and 2018 editions of the *IRC*:

R703.3.2 Fasteners.

Exterior wall coverings shall be securely fastened with aluminum, galvanized, stainless steel or rust-preventative coated nails or staples in accordance with Table R703.3(1) or with other approved corrosion-resistant fasteners in accordance with the wall covering manufacturer's installation instructions. Nails and staples shall comply with ASTM F 1667. Nails shall be T-head, modified round head, or round head with smooth or deformed shanks. Staples shall have a minimum crown width of $^{7}/_{16}$ inch (11.1 mm) outside diameter and be manufactured of minimum 16-gage wire. Where fiber-board, gypsum, or foam plastic sheathing backing is used, nails or staples shall be driven into the studs. Where wood or wood structural panel sheathing is used, fasteners shall be driven into studs unless otherwise permitted to be driven into sheathing in accordance with either the siding manufacturer's installation instructions or Table R703.3.2.

TABLE R703.3.2
OPTIONAL SIDING ATTACHMENT SCHEDULE FOR FASTENERS WHERE NO STUD PENETRATION NECESSARY

APPLICATION	NUMBER AND TYPE OF FASTENER	SPACING OF FASTENERS[b]
Exterior wall covering (weighing 3 psf or less) attachment to wood structural panel sheathing, either direct or over foam sheathing a maximum of 2 inches thick.[a] Note: Does not apply to vertical siding.	Ring shank roofing nail (0.120" min. dia.)	12" o.c.
	Ring shank nail (0.148" min. dia.)	15" o.c.
	No. 6 screw (0.138" min. dia.)	12" o.c.
	No. 8 screw (0.164" min. dia.)	16" o.c.

For SI: 1 inch = 25.4 mm.

a. Fastener length shall be sufficient to penetrate back side of the wood structural panel sheathing by at least $^{1}/_{4}$ inch. The wood structural panel sheathing shall be not less than $^{7}/_{16}$ inch in thickness.

b. Spacing of fasteners is per 12 inches of siding width. For other siding widths, multiply "Spacing of Fasteners" above by a factor of 12/s, where "s" is the siding width in inches. Fastener spacing shall never be greater than the manufacturer's minimum recommendations.

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