JamesHardie™

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Technical Bulletin for

Applying Hardie® siding over non-nailable substrates

Technical Bulletin **19**

SCOPE: This technical bulletin provides options for attaching Hardie® siding when there are increased layers of non-nailable substrates (e.g., continuous insulation, exterior gypsum) between the siding and the structural members to which the product is attached.

- Method 1A - Install Hardie® siding directly over continuous insulation (c.i.) and other non-nailable substrates (e.g., gypsum sheathing) with a combined thickness of 1 in. or less.
- Method 1B - Install Hardie® siding directly over continuous insulation (c.i.) and other non-nailable substrates (e.g., gypsum sheathing) with a combined thickness of 1 in. to 1-5/8 in.
- Method 2 - Install Hardie® siding to furring strips that are attached through continuous insulation (c.i.) and other non-nailable substrates (e.g., gypsum sheathing) to the wall framing.

Building codes are evolving to address changing regional conditions around energy efficiency, wildfire occurrence, and other natural hazards. This bulletin presents methods to install Hardie® products over materials which may now be required on the outside of a building.

For more information about new energy code requirements or Wildland-Urban Interface requirements in your area, please consult the International Energy Conservation Code (IECC), International Wildland-Urban Interface Code (IWUIC), or the applicable codes for your area. This document includes solutions for greater design flexibility to comply with new code provisions for increased energy efficiency and resilience to natural hazards.

DESIGN CONSIDERATIONS: While longer fasteners can be used to penetrate non-nailable substrates (up to 1-5/8 in.), they may not always be ideal due to visible fastener heads, which can detract from the siding appearance, especially on smooth or ColorPlus® Technology finishes. Consult design professionals and your local James Hardie representative for guidance.

CONTENT

Method 1: Applying Hardie® siding directly through c.i. and non-nailable substrates up to 1-5/8 inch thick

When installing Hardie® siding over non-nailable substrates up to 1-5/8 in. thick (e.g., exterior continuous insulation, 5/8 in. gypsum), it's important to note that these materials lack nail-holding capacity. Method 1 extends the fastener length to account for the combined thickness of the non-nailable substrates. This ensures the fastener penetrates the wall framing adequately for meeting wind load requirements.

Exterior Wall Covering Assembly

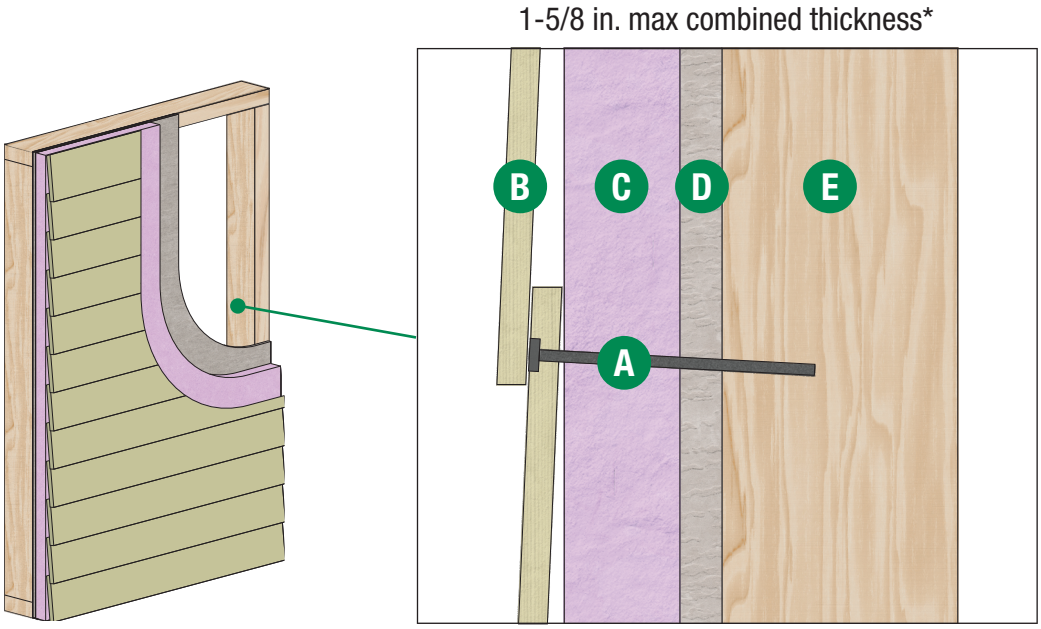

Figure 1: Exterior Wall Assembly for Siding applied directly over 1-5/8 in. non-nailable substrate

- **A** Siding fastener (nail or screw) (face or blind nail, see relevant installation instructions)
- **B** Hardie® siding
- **C** Thickness of exterior continuous insulation
- **D** Optional wall sheathing, as required by applicable building code (e.g., gypsum sheathing, WSP, or other)*
- **E** Wall framing per code (e.g., wood or steel studs)

Consult water-resistive barrier (WRB) manufacturer for placement of WRB.

***NOTE:** If layer D from Figure 1 is a non-nailable substrate (e.g. gypsum sheathing), the combined thickness of layers C and D must be 1-5/8 in. or less. If greater than 1-5/8 in., see Method 2.

Method 1 Guidance

Step 1: Determine the total thickness of non-nailable substrate specified for your project.

Step 2: Determine the wind load requirements for the project in compliance with the local building codes.

Step 3: Determine the wall frame spacing and stud type for the project.

Step 4: Determine the appropriate siding fastener for the project's wind load requirements. Wind pressure ratings can be found in the relevant ICC-ES product evaluation report or technical data sheet at jameshardie.com.

Step 5: Add the value from Step 1 to the fastener length from Step 4 to determine the correct fastener length.

Stud Material	Method 1A (combined thickness of 1 in. or less)	Method 1B (combined thickness between 1 in. and 1-5/8 in.)
Wood studs	Use fasteners of the length determined in Step 5 to fasten Hardie® siding.	Use fasteners of the length determined in Step 5 to fasten Hardie® siding. **NOTE:** Fasteners must have a minimum shank diameter of .120 in.
Metal studs (with screws)	Use #8 screws of the length determined in Step 5 to fasten Hardie® siding. **NOTE:** Ensure the screw penetrates through the stud by at least three (3) full threads.	
Metal studs (with knurled shank hardened pins)	Use pins of the length determined in Step 5 to fasten Hardie® siding. **NOTE:** Ensure the pin penetrates through the stud by at least 1/4 in. Refer to the pin fastener/toll manufacturer instructions for additional guidance.	No solution using pin fasteners. MUST USE SCREW FASTENERS.

Method 1 Guidance (Continued)

Step 6: Install the Hardie® siding following the installation instructions appropriate for your Hardie® siding product, available at jameshardie.com.

- Secure the siding to the framing members.
- Exercise caution as irregularities and unevenness in framing, sheathing, insulation, and other wall assembly components, including under-driven nails, can show through to the finished siding and trim. These irregularities should be corrected before installing the siding. When using continuous insulation, avoid over-driving fasteners to prevent dimpling of the siding due to the compressible nature of the insulation. Extra care is needed if using power-driven fasteners for attaching siding over foam sheathing; ensure gun pressures are set to prevent overdriving.

  NOTE: We recommend performing a small siding mock-up before installation to ensure the fastening practice and tools are properly adjusted. Fasteners must be installed to avoid overdriving, yet be snug enough to eliminate gaps between the connected parts.
- If using foam sheathing, it must have a minimum compressive strength of 15 pounds per square inch (psi) in accordance with ASTM C578 or ASTM C1289 (IRC R703.15 for wood framing, R703.16 for steel framing). If using other continuous insulation that does not meet this requirement (e.g., mineral wool or type 1 EPS foam), consult the insulation manufacturer for design solutions.
- Snap chalk lines of the frame layout and mark siding fastener locations on the outermost non-nailable substrate. **NOTE:** Some products may come with pre-marked fastener lines.
- Ensure adequate framing is present under non-nailable substrates at inside and outside corners and penetrations.

Method 2: Applying Hardie® siding to furring installed over non-nailable substrates 1-5/8 to 4 in. thick

When installing Hardie® siding on furring strips over non-nailable materials (e.g., exterior insulation or gypsum sheathing) up to 4 inches thick, it's important to note that these materials cannot hold nails. Therefore, the designer must create a new surface for the siding to be nailed into. In this method, the furring strips serve as the nail-holding surface for the siding. Method 2 establishes a nail base on top of the foam sheathing by using furring strips that are anchored to framing and thick enough to hold the fasteners.

NOTE: For other rainscreen solutions, pre-insulated nailbase, or Z-girts, refer to the manufacturer for engineering details.

Exterior Wall Covering Assembly

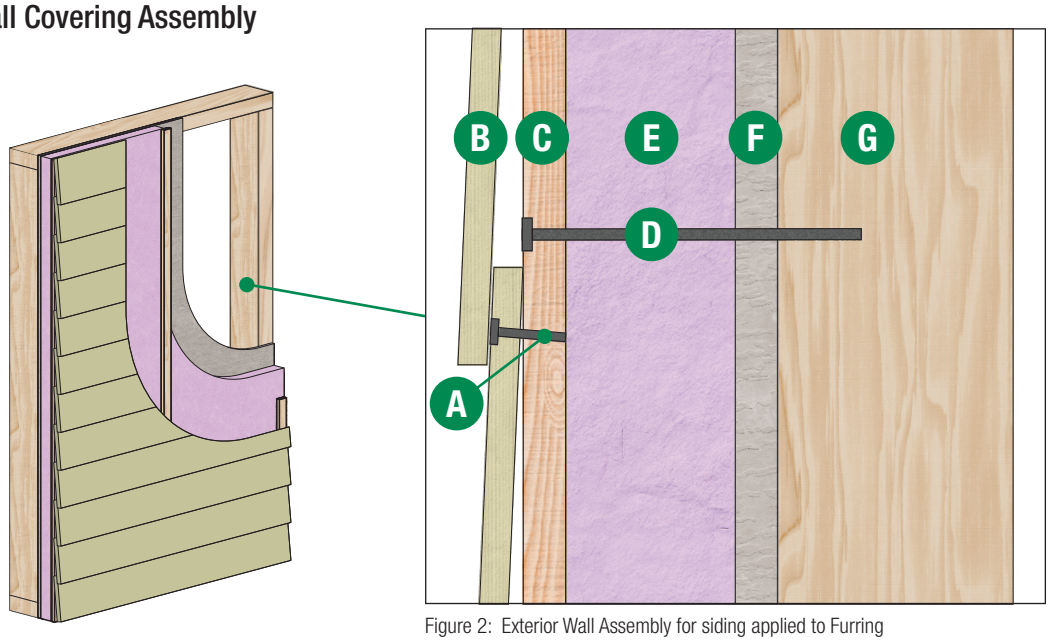

Figure 2: Exterior Wall Assembly for siding applied to Furring

- **A** Siding fastener (nail or screw) (face or blind nail, see relevant installation instructions)
- **B** Hardie® siding
- **C** Furring (e.g., lumber, WSP, steel, etc.)
- **D** Furring fastener
- **E** Thickness of rigid foam sheathing
- **F** Optional wall sheathing, as required by applicable building code (e.g., gypsum sheathing, WSP, or other)
- **G** Wall framing per code (e.g., wood or steel studs)

Consult water-resistive barrier (WRB) manufacturer for placement of WRB.

NOTE: If layer F from Figure 2 above is a non-nailable substrate (e.g. gypsum sheathing), the combined thickness of layers E + F must be less than 4 inches.

Method 2 Guidance

Step 1: Determine the total thickness of non-nailable substrates (in.) needed to achieve the specified r-value and/or fire-resistance rating.

Step 2: Determine the wind load requirements for the project as specified by the local building codes.

Step 3: Determine the wall frame spacing and stud type for the project.

Step 4: Determine the appropriate siding fastener based on the project's wind load requirements. Wind pressure ratings can be found in the relevant ICC-ES product evaluation report or technical data sheet, available at jameshardie.com. **NOTE:** The fastener length and stud type will dictate the furring thickness and furring type in Step 5 (IRC R703.15.2 for wood, R703.16.2 for steel).

Step 5: Select the appropriate furring material. **NOTE:** Local building codes may dictate furring requirements that supercede this bulletin.

- For metal furring: The metal furring must be between 20 gauge min. (33 mil) and 16 gauge (54 mil), ensuring it meets the installation requirements.
- For wood furring: The thickness of the wood furring will depend on the selected fastener, matching the net penetration of the fastener. As a best practice, use wood furring that is nominally 4 inches wide. The specific gravity of the wood furring should be equivalent to the reference wood stud specific gravity in the James Hardie installation literature or product evaluation report.
- For other rainscreen solutions, pre-insulated nailbase, or non-metallic Z-girts, refer to the manufacturer for engineering details.

Step 6: Calculate the combined weight of the siding and furring. Refer to Table 1 for Hardie® siding weights and Table 2 for softwood furring weights.

Step 7: Choose the appropriate furring strip fastener size and spacing based on wind loads and system weight (IRC R703.15.2 for wood, R703.16.2 for steel). Refer to Table 3 for details. Ensure the availability of furring fasteners in lengths that provide the necessary net penetration into the framing.

Step 8: Install the furring strips over the foam according to the installation guidance provided by the furring fastener manufacturer or the ACC Foam Sheathing Committee. For guidance on installation over mineral wool or other fibrous insulation, refer to North American Insulation Manufacturer's Association. **NOTE:** James Hardie recommends conducting a wall mock-up before installation to ensure that fastening practices and tools are properly adjusted. Fasteners should be installed to avoid overdriving while being snug enough to eliminate gaps between connected parts. Adjust driving tools and installation practices as necessary.

Step 9: Install the Hardie® siding onto the furring strips in accordance with relevant Hardie® product installation instructions, available at jameshardie.com.

APPENDIX A: REFERENCE MATERIAL

TABLE 1: Hardie® siding weight[1]

PRODUCT	THICKNESS (INCHES)	POUNDS PER SQUARE FOOT[1]
Hardie® Shingle	1/4	1.9
Hardie® Plank	5/16	2.5
Hardie® Panel	5/16	2.3
Cemplank®	5/16	2.5
Cempanel®	5/16	2.3
Hardie® Artisan® Lap	5/8	4.6
Hardie® Artisan® siding with Lock Joint System	5/8	4.6
Hardie® Artisan® Trim	1-1/2	8
4/4 Hardie® Trim	3/4	4.4
5/4 Hardie® Trim	1	7.1
Hardie® Architectural Panel	5/16	2.3

[1] Consult jameshardie.com for the most up to date information.

NOTE: It is the designer's responsibility to account for the weight of the installed condition (e.g., overlapped products).

TABLE 2: Softwood furring weight[1]

NOMINAL SIZE	ACTUAL SIZE			FURRING WEIGHT CONTRIBUTION AT SPACING	
(in x in)	(in x in)	(mm x mm)	Weight (lb/ft)1	16 in. OC (psf)	24 in. OC (psf)
1 x 1	3/4 x 3/4	19 x 19	0.14	0.11	0.07
1 x 2	3/4 x 1 1/2	19 x 38	0.27	0.20	0.14
1 x 3	3/4 x 2 1/2	19 x 64	0.47	0.35	0.24
1 x 4	3/4 x 3 1/2	19 x 89	0.64	0.48	0.32
1 x 6	3/4 x 5 1/2	19 x 140	1	0.75	0.50
1 x 8	3/4 x 7 1/4	19 x 184	1.32	0.99	0.66
2 x 2	1 1/2 x 1 1/2	38 x 38	0.55	0.41	0.28
2 x 3	1 1/2 x 2 1/2	38 x 64	0.94	0.71	0.47
2 x 4	1 1/2 x 3 1/2	38 x 89	1.28	0.96	0.64
2 x 6	1 1/2 x 5 1/2	38 x 140	2	1.50	1.00
2 x 8	1 1/2 x 7 1/4	38 x 184	2.64	1.98	1.32

[1] The Engineering ToolBox, 03/05/2012, http://www.engineeringtoolbox.com/softwood-lumber-dimensions-d_1452.html

Method 1 Example (any scenario where the total thickness of non-nailable substrates is 1 in. or less)

Consider the scenario where direct installation to foam sheathing is used, with the following project details:

Climate zone	5
Construction type	Residential wood frame
Required wall R-value (2021 IECC)	R-30, or R-20+5ci, or R-13+10ci, or R-0+20ci
Product type	5/16 in. thick Hardie® Plank
Product spacing	Lap siding at 8.25 in. width
Wall stud spacing	16 in. O.C. with SPF stud type
Design wind speed	100mph, for wind exposure category B, with a project mean roof height of 30 ft.

Solution

The designer chose the R-15+5ci option to comply with thermal envelope insulation requirements and followed these steps:

Step 1: To meet the R-5 requirement for continuous insulation, the foam insulation must consist of 1 inch polyisocyanurate or 1 in. extruded polystyrene (refer to the foam sheathing manufacturer's data). Also, verify the foam sheathing's wind pressure resistance by consulting with the foam sheathing manufacturer.

Step 2: Find an assembly that meets the wind load requirements (100 mph, Category B, with a 30 ft mean roof height), as listed in ESR-2290, to cover 16 inch on center framing and a building height of 30 feet. Note that the fastener length in the ESR is 2 inches long.

ESR-2290 ICC-ES Most Widely Accepted and Trusted

PRODUCT	PRODUCT DIMENSION (IN.)		FASTENER TYPE[4,16]	FASTENING METHOD[2]	FRAME TYPE[1,8]	STUD SPACING (IN.)	BUILDING HEIGHT (FT.)	EXPOSURE CATEGORY		
	THICK.	WIDTH						B	C	D
Hardie® Plank	5/16	8 1/4	6d-2 inch long X 0.092 inch shank X 0.222 inch head diameter siding nail	Blind Nailed Through top edge of plank	2 x 4 wood	16	0-15	107	97	88
							20	107	94	86
							40	102	88	-
							60	97	-	-

Step 3: For the installation of Hardie® Plank with wood studs, add the thickness of the non-nailable substrates (up to 1 in.) to the suggested fastener length. Therefore, a total length of 3 in. long x 0.092 inch shank x 0.222 inch head diameter siding nail is the appropriate fastener needed to apply Hardie® siding over foam sheathing in this example. Consult the fastener manufacturer to find the required fastener. **NOTE:** As described in Method 1B. when attaching siding to a non-nailable substrate with a width greater than 1 in. but less than 1-5/8 in., a fastener with minimum shank diameter of 0.120 in. must be used. In addition, the head bearing area and net penetration into the timber are equivalent to those specified in the relevant approvals section.

Step 4: Install Hardie® Plank siding following the relevant Hardie® product installation instructions.

Method 2 Example (any scenario where the total thickness of non-nailable substrates is between 1-5/8 - 4 in.)

Consider the scenario where furring on non-nailable substrates is used, with the following project details:

Climate zone	6
Construction type	Residential wood frame
Required wall R-value (2021 IECC)	R-30, or R-20+5ci, or R-13+10ci, or R-0+20ci
Product type	5/16 in. thick Hardie® Plank
Product spacing	Lap siding at 8.25 in. width
Wall stud spacing	16 in. O.C. with SPF stud type
Fire-resistance rating	1-hour
Design wind speed	110mph, for wind exposure category B, with a project mean roof height of 40 ft.

Solution

The designer chose R-13+10ci to comply with energy requirements and followed these steps:

Step 1: To meet the R-10 requirement for continuous insulation, the foam insulation must be 2 in. XPS or 1.55 in. polyisocyanurate. To meet the 1-hour fire-resistance rating requirement, an assembly using 5/8 in. type-x gypsum on the outside of the framing was chosen.

Step 2: Find an assembly that meets the wind load requirements, as listed in ESR-2290, to cover 16 in. on center SPF wood studs. Note that the fastener length in the ESR is 1.25 in. long.

ESR-2290 ICC-ES Most Widely Accepted and Trusted

PRODUCT	PRODUCT DIMENSION (IN.)		FASTENER TYPE[4,16]	FASTENING METHOD[2]	FRAME TYPE[1,8]	STUD SPACING (IN.)	BUILDING HEIGHT (FT.)	EXPOSURE CATEGORY		
	THICK.	WIDTH						B	C	D
Hardie® Plank	5/16	8 1/4	No. 11 gauge, 1.25" long roofing nail	Blind Nailed Through top edge of plank	2 x 4 wood	16	0-15	123	112	101
							20	123	108	99
							40	118	101	93
							60	112	97	90

Step 3: Select a furring material that meets ESR-2290's specific gravity requirements. Space it 16 inches on center, aligned with the wall framing. The thickness of the wood furring will depend on the selected fastener, matching the net penetration of the fastener. As a best practice, use wood furring that is nominally 4 inches wide. The specific gravity of the wood furring should be equivalent to the reference wood stud specific gravity in the James Hardie installation literature or product evaluation report.

Step 4: Calculate the assembly weight of the siding and furring using Table 1 and Table 2.

(continued on next page)

Method 2 Example (continued)

Step 5: Select the furring strip fastener size and system weight using Table 3.

For this design, nominal 1 in. x 4 in. wood furring is required. FastenMaster® HeadLok® fasteners were chosen to attach the furring through the foam and gypsum and into the wall studs. Table 3 in TER No. 1009-01 shows that 24-inch on-center spacing is sufficient for wind load, siding and furring weight, and furring spacing. Table 2 shows the fastener must penetrate 2 in. into the wood stud. Therefore, the required length is 4.75 in. (0.75 in. furring + 2 in. foam + 5/8 in. type-x gypsum + 2 in. penetration). Since 5-3/8 in. fasteners are unavailable, 5-1/2 in. FastenMaster® HeadLok® fasteners were used.

Step 6: Install furring strips over the non-nailable substrates following fastener manufacturer installation guidance.

Step 7: Install the Hardie® siding onto the furring strips in accordance with the product installation literature, available at jameshardie.com.

DISCLAIMER

The guidance and instructions provided in this technical bulletin are valid for and applicable to Hardie® products only. James Hardie Building Products Inc. makes no warranty or representation with respect to use of the information contained herein for any use other than with Hardie® products, including but not limited to use with fiber cement siding products made by others or siding products made of other materials.

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All national, state, and local building code requirements must be followed, and where they are more stringent than the Hardie® product installation instructions, state and local requirements will take precedence.

Current and detailed information on James Hardie product applications are found at jameshardie.com.

With regards to design advice: Any information or assistance provided by James Hardie in relation to specific projects must be approved by the relevant specialists engaged for the project, e.g., your builder, architect or engineer. James Hardie will not be responsible in connection with any such information or assistance. It is the responsibility of the licensed architect, designer, specifier or builder to ensure that the construction details are suitable for the intended application of the project. The responsible party shall also identify moisture related risks associated with any particular building design. The wall construction design must effectively manage moisture and provide consideration to wind driven rain, wall penetrations or artificially heated and cooled spaces.

NOTE: The design of the siding attachment system is the responsibility of the design professional. Any advice provided on constructing a nailable base (e.g., 1-inch nominal, 2-inch nominal wood furring, or minimum 20-gauge metal channels) over foam sheathing and other non-nailable substrates must be approved by the relevant specialists engaged for the project (e.g., builder, architect, or engineer). James Hardie shall not be held liable for any such information or assistance provided.