

Applying James Hardie® Siding over Continuous Insulation and Non-Nailable Substrates

SEPTEMBER 2014

TECHNICAL BULLETIN #19



The guidance and instructions provided in this technical bulletin are valid for and applicable to James 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 James Hardie® products, including but not limited to use with fiber cement siding products made by others or siding products made of other materials.*

You bear all risk associated with using any of the information contained herein in any way other than with James Hardie products, *including in the design or construction of structures with fiber cement siding products made by others or siding products made from other materials.*

Rainscreen application for panels - James Hardie requires a 3/8 in. air gap (Rainscreens, Furring, Etc.), when installing HardiePanel on a Multi-Family/Commercial project. Reference Rainscreen guidelines here: <http://www.jameshardiecommercial.com/hardiepanel-install-requirements.shtml>

SCOPE

This bulletin summarizes the application of Hardie® Siding by two methods that align with the goal to improve the building's thermal envelope:

- **Method 1** - James Hardie® Siding installed directly over continuous insulation (c.i.) and other non-nailable substrates (e.g. gypsum sheathing) with combined thickness of 1 inch or less
- **Method 2** - James Hardie® Siding installed to furring strips that are attached through the c.i. and other non-nailable substrates (e.g. gypsum sheathing) and to wall framing

Building codes are evolving and require improved building energy efficiency. The Department of Energy (DOE) is working from the code development goals below; these goals directly relate to the building's thermal envelope requirements.

- US Code development goal is 30% energy efficiency improvement in 2012 IECC (relative to 2006)¹
- US Code development goal is 50% energy efficiency improvement in 2015 IECC (relative to 2006)¹
- National Energy Code for Housing, in Canada, is to have approximately 25% more efficiency and is to be included as an update to the NBC Part 9 in late 2012.²

CONTENT

| | |
|--|---------|
| Method 1 , Applying Hardie® Siding Directly through Non-Nailable Substrates 1 inches thick and less | Page 2 |
| Method 2 , Applying Hardie® Siding to Furring Installed Over Non-Nailable Substrates up to 4 inches thick | Page 4 |
| DISCLAIMER | Page 6 |
| Appendix A Reference Material | Page 7 |
| Table 1, James Hardie Product Installation Literature | Page 7 |
| Table 2, Siding Weight | Page 7 |
| Table 3, Softwood Furring Weight | Page 7 |
| Table 4, Design Guidance on Furring Attachment | Page 8 |
| Appendix B Worked Examples | Page 9 |
| Appendix C Background Code Requirements | Page 13 |

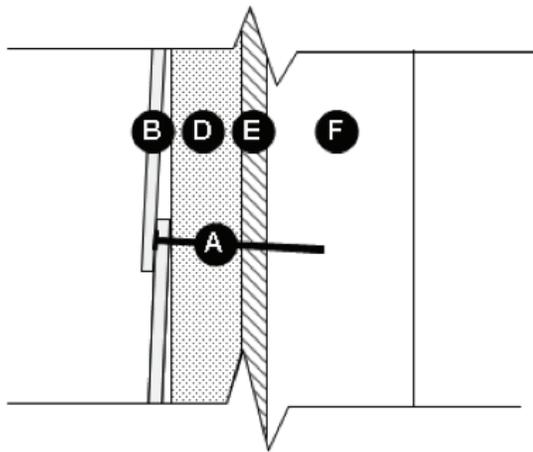
¹ U.S. Department of Energy, Building Technologies Program, 03/05/2012.

http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/ns/webinar_residential_energycodes_20110222.pdf

² National Research Council Canada, 03/05/2012. <http://www.nrc-cnrc.gc.ca/eng/ci/v16n3/1.html>

Method 1: Applying Hardie® Siding Directly through C.I. and Non-Nailable Substrates 1 inches thick and less:

When applying James Hardie® Siding directly over the combined thickness of foam sheathing (continuous insulation) and other non-nailable substrates (e.g. gypsum sheathing), up to 1 inch thick, the foam sheathing and other non-nailable substrates do not have nail holding capacity. The basic premise of Method 1 is to extend the fastener length by the combined thickness of the non-nailable substrates being used. The fastener length accommodates the thickness of all the non-nailable substrates between the product and the wall framing and maintains the requisite net penetration of the fastener into the framing.

**EXTERIOR WALL COVERING ASSEMBLY**

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

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

Figure 1: Exterior Wall Assembly for Siding applied directly over foam

NOTE: If layer E from Figure 1 above is a non-nailable substrate (e.g. gypsum sheathing), the combined thickness of layers D + E must be 1 inch or less. If greater than 1 inch see Method 2.

METHOD 1 GUIDANCE

- Step 1:** Determine the foam sheathing thickness, in inches, needed to meet the code required R-value and wall sheathing wind pressure performance requirements if not used as oversheathing.
- Step 2:** Determine the wind load requirements for the project in accordance with the local building codes.
- Step 3:** Determine the project's wall frame spacing and stud type
- Step 4:** Identify relevant James Hardie Product Literature (see Table 1, page 7).
- Step 5:** Determine the appropriate James Hardie Siding fastener for the project's wind load requirements. Wind pressure ratings information is available in the relevant ICC-ES product evaluation report or technical data sheet and can be found in the "Code Approvals" section of Table 1, page 7.
- Step 6:** Ensure the Fasteners selected are available in the necessary length
- i. For wood studs:**
Add the combined non-nailable substrate thickness to the selected fastener length, in Step 5, and determine the appropriate fastener length needed to apply James Hardie siding directly over max 1 inch non-nailable substrates.
 - ii. For metal studs (with screws):**
The length of the minimum #8 screw shall be increased as necessary to ensure it will penetrate through the minimum 20 gauge metal studs by 3 full threads when applying James Hardie siding directly over max 1 inch thick non-nailable substrates; screw head diameter shall be as required from Step 5.
 - iii. For metal studs (with knurled shank hardened pins):**
The length of the pin shall be increased as necessary to ensure it will penetrate through the minimum 20 gauge metal studs by at least ¼ inch when applying James Hardie siding directly over max 1 inch thick non-nailable substrates (pin head diameter shall be as required by Step 5). Refer to fastener/tool manufacturer for fastener installation guidance for use with James Hardie® Siding.

METHOD 1 GUIDANCE (CONTINUED)

Step 7: Install the James Hardie Siding in accordance with the Product Installation Literature (see Table 1).

- Attach the siding to the framing members.
- Caution should be taken as irregularities and unevenness in framing, sheathing, foam and other wall assembly components, including under driven nails, can telegraph through to the finished siding and trim. These irregularities should be corrected before the siding is installed. When using continuous insulation (foam sheathing), avoid over-driving fasteners, which can result in dimpling of the siding due to the compressible nature of the foam sheathing. Extra caution is necessary if power driven fasteners are used for attaching siding over foam sheathing, make sure gun pressures are adequate to prevent overdriving fasteners.

Note: *We recommend performing a small siding mockup prior to installation to ensure the fastening practice and/or fastening tools are properly adjusted. Fasteners must be installed in a manner to avoid overdriving, yet snug enough to remove gaps between the connected parts.*

- Foam sheathing shall be minimum Type II (EPS) or Type X (XPS) per ASTM C578, or Type 1 (Polyiso) per ASTM C1289.
- Transfer the frame layout directly from wall framing to each attachment of the outermost non-nailable substrate or
- Snap vertical chalk lines onto the outermost non-nailable substrate at each stud location after it has been installed (some foam products may be available with pre-marked fastener lines).
- When installing trim on inside corners, outside corners, and around wall penetrations (e.g. windows, doors, vents), extra attention is needed to install the trim and accommodate the wall framing offset that the foam thickness creates.
- If you have questions on trim layout contact James Hardie Technical Services - 1-800-942-7343.

Method 2: Applying Hardie® Siding to Furring Installed Over Non-Nailable Substrates up to 4 inches thick:

When applying James Hardie Siding to furring strips, which is applied on foam sheathing or other non-nailable substrates (e.g. gypsum sheathing) with a combined thickness up to 4 inches thick, the foam sheathing and other non-nailable substrates do not have nail holding capacity. For that reason, the designer needs to reestablish the siding's nail holding surface. When applying by this method, the nail holding substrate for the cladding is the furring strips. The basic premise of Method 2 is to reestablish the nail base overtop the foam sheathing by installing a furring that has sufficient thickness to accommodate the James Hardie® Siding fastener.

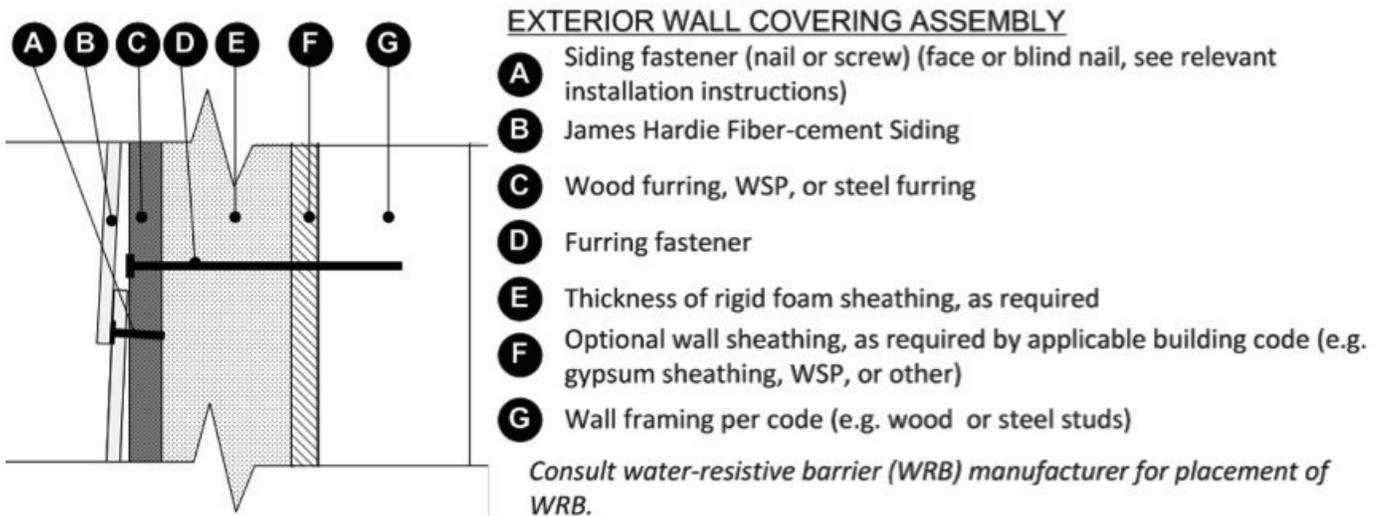


Figure 2: Exterior Wall Assembly for Siding applied to Furring

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 foam sheathing thickness, in inches, needed to meet the code required R-value.

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

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

Step 4: Identify relevant James Hardie Product Literature (see Table 1).

Step 5: Determine the appropriate James Hardie Siding fastener for the project's wind load requirements. Wind pressure ratings information is available in the relevant ICC-ES product evaluation report or technical data sheet and can be found in the "Code Approvals" section of (Table 1).

NOTE: The fastener length and stud type will determine the furring thickness and furring type in Step 6.

Step 6: Select the appropriate furring material

NOTE: the National Building Code (NBC) in Canada may contain furring (strapping) requirements that will take precedence over the guidance below.

- **For metal furring,** The metal furring must be 20 gauge min (33 mil) to 16 gauge max (54 mil), with a dimension that satisfies the installation requirements.

NOTE: When installing steel Z-girts, be sure to fasten close to the Z-girt spine when applying panel fasteners.

This helps prevent deflection which can result in incomplete fastening and gaps between the panel and the furring.

- **For wood furring,** the wood furring thickness will be dependent on the fastener selected. The wood furring thickness is equal to the net penetration of the fastener. As a best practice use wood furring that is nominally 4 inches wide. The wood furring specific gravity shall be equivalent to the reference wood stud specific gravity in the James Hardie Installation Literature or Product Evaluation Report.

METHOD 2 GUIDANCE (CONTINUED)

Step 7: Determine the (siding + furring) weight. James Hardie siding weights are found in Table 2, and softwood furring weights are found in Table 3.

Step 8: Select the furring strip fastener size and furring strip fastener spacing necessary for wind loads and the system weight. (See Table 4).

Step 9: Verify the furring's fastener availability, for the lengths that provide the required net penetration into framing.

Step 10: Install the furring strips over the foam following the furring fastener manufacturer (or Foam Sheathing Coalition) installation guidance (from Step 7 above).

- The fastener must fully engage the framing or stud.
- To help the furring installer know where the framing members are so as to attach the furring to the framing,
 - o Transfer the frame layout directly from wall framing to each attachment of rigid foam insulation or
 - o Snap vertical chalk lines onto the foam insulation at each stud location after foam has been installed (some foam products may be available with pre-marked fastener lines).
- Install fasteners prior to utilities to avoid potential damage.
- Caution should be taken as irregularities and unevenness in framing, sheathing, foam and other wall assembly components, including under driven nails, can telegraph through to the finished siding and trim. These irregularities should be corrected before the siding is installed.

NOTE: *James Hardie recommends performing a siding mockup prior to installation, to ensure the fastening practice and/or fastening tools are properly adjusted. Fasteners must be installed in a manner to avoid overdriving, yet snug enough to remove gaps between the connected parts. Adjust driving tools and installation practice accordingly.*

- Fasteners must be installed in a manner to avoid overdriving, yet snug enough to remove gaps between the connected parts. Adjust driving tools and installation practice accordingly.
- Foam sheathing shall be minimum Type II (EPS) or Type X (XPS) per ASTM C578, Type 1 (Polyiso) per ASTM C1289, or Type IVB mineral fiber board thermal insulation per ASTM C 612.
- When installing trim on inside corners, outside corners, and around wall penetrations (e.g. windows, doors, vents), a wider furring strip may be needed to accommodate the trim width and accommodate the wall framing offset that the foam thickness creates. If you have questions on trim layout contact James Hardie Technical Services - 1-800-942-7343.

Step 11: Install the James Hardie Siding to furring strips and in accordance with the Product Installation Literature (see Table 1).

NOTE: *the siding attachment system design is the responsibility of the design professional. The advice given, on how to build a nailable base (e.g. 1 inch nominal, 2 inch nominal wood furring, or minimum 20 gauge metal channels) over foam sheathing and any other non-nailable substrates must be approved by the relevant specialists engaged for the project (e.g., builder, architect or engineer). James Hardie will not be responsible in connection with any such information or assistance.*

DISCLAIMER

The guidance and instructions provided in this technical bulletin are valid for and applicable to James 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 James Hardie® products, including but not limited to use with fiber cement siding products made by others or siding products made of other materials.

You bear all risk associated with using any of the information contained herein in any way other than with James Hardie products, including in the design or construction of structures with fiber cement siding products made by others or siding products made from other materials.

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

Current and detailed information on James Hardie product applications are found at <http://www.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.

For further clarification, please contact your local sales representative, or, the James Hardie Technical Desk at 1-800-942-7343.

TABLE A.1: JAMES HARDIE PRODUCT LITERATURE

| PRODUCT | SUBJECT MATTER | LINK |
|---|--|---|
| HardiePlank® Lap Siding, HardiePanel® Siding, HardieShingle® Siding | Install Instructions | http://www.jameshardie.com/developer/helpSupport_productInstructions.shtml |
| | Best Practice Guides | http://www.jameshardie.com/developer/bestPractices.shtml |
| | Code Approvals | http://www.jameshardie.com/developer/designBuildCenter_technicalDocuments.shtml |
| Cemplank® Siding, Cempanel® Siding | Install Instructions | http://www.cemplank.com/installation.shtml |
| | Code Approvals | http://www.jameshardie.com/developer/designBuildCenter_technicalDocuments.shtml |
| Prevail™ Lap Siding, Prevail™ Panel Siding | Install Instructions | http://www.prevailsiding.com/ |
| | Code Approvals | http://www.jameshardie.com/developer/designBuildCenter_technicalDocuments.shtml |
| Artisan® Lap Siding | Install Instructions | http://www.artisanluxury.com/installation.shtml |
| | Code Approvals | http://www.jameshardie.com/developer/designBuildCenter_technicalDocuments.shtml |
| For questions contact: | James Hardie Technical Services - 1-800-942-7343 | |

TABLE A.2: JAMES HARDIE SIDING WEIGHT

| PRODUCT | THICKNESS (INCHES) | POUNDS PER SQUARE FOOT ¹ |
|-----------------------|--------------------|-------------------------------------|
| HardieShingle® Siding | 1/4 | 1.9 |
| HardiePlank® Siding | 5/16 | 2.5 |
| HardiePanel® Siding | 5/16 | 2.3 |
| Cemplank® Siding | 5/16 | 2.5 |
| Cempanel® Siding | 5/16 | 2.3 |
| Prevail™ Lap Siding | 5/16 | 2.5 |
| Prevail™ Panel Siding | 5/16 | 2.3 |
| Artisan® Lap Siding | 5/8 | 4.6 |
| HardieTrim® Boards | 3/4 | 4.4 |
| HardieTrim® Boards | 1 | 7.1 |
| Artisan® Accent Trim | 1-1/2 | 8 |

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

TABLE A.3: SOFTWOOD FURRING WEIGHT¹

| NOMINAL SIZE (in x in) | ACTUAL SIZE | | Weight (lb/ft) ¹ | FURRING WEIGHT CONTRIBUTION AT SPACING | |
|---------------------------|---------------|-----------|--------------------------------|---|--------------------|
| | (in x in) | (mm x mm) | | 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

TABLE A.4: DESIGN GUIDANCE ON FURRING ATTACHMENT FOR JAMES HARDIE® SIDING

| FURRING TYPE | FURRING THICKNESS (INCHES) | FRAMING MEMBER | FURRING FASTENER TYPE | COMPANY / PHONE | EMAIL | TECHNICAL REPORTS ¹ |
|--------------|--------------------------------------|--------------------------------------|--|--------------------------------------|---|---|
| Wood | Minimum 3/8 | Minimum 2X wood | HeadLok™ Heavy Duty Flathead Fastener ² | FastenMaster / 1-800-518-3569 | info@fastenmaster.com | TER No. 1009-01 "Use of FastenMaster Headlok™ Fasteners to Attach Cladding and/or Furring to Wood Framing Through Foam Sheathing" |
| | Minimum 3/4 | | Nails, wood screws, lag screws | | | |
| | | Minimum 20 gauge (33 mil) Steel Stud | Screws | Foam Sheathing Coalition | http://www.foamsheathing.org/contactus.php | "Guide to Attaching Exterior Wall Coverings through Foam Sheathing to Wood or Steel Wall Framing" |
| | Minimum 18 gauge (43 mil) steel stud | Screws | | | | |
| Metal | Minimum 20 gauge (33 mil) steel hat | Minimum 20 gauge (33 mil) steel stud | Screws | Foam Sheathing Coalition | http://www.foamsheathing.org/contactus.php | "Guide to Attaching Exterior Wall Coverings through Foam Sheathing to Wood or Steel Wall Framing" |
| | | Minimum 18 gauge (43 mil) steel stud | | | | |
| | 18 gauge GALVALUME | see manufacturer | Various | Knight Wall Systems / 1-855-597-9255 | info@knightwallsystems.com | "Installation Instructions" |

¹ Consult manufacturer for most recent literature and design guidance.

² HeadLok™ is a trademark of OMG, Inc. Copyright ©2011 OMG, Inc. All rights reserved.

APPENDIX B – WORKED EXAMPLES

B.1 Worked Example by Method 1 – (This would apply to any scenario where the combined thickness of non-nailable substrates added together is 1-inch or less.)

Consider the case where installing direct to foam sheathing is used, and the project details are listed as follows:

- Climate Zone: 5
- Residential Wood Frame Construction
- Required Wall R-value (2009 IECC) at R-19 or R-13+5ci
- 5/16 in. thick HardiePlank® Lap Siding at 8.25 in. width
- Wall stud spacing at 16 in. on center with SPF stud type
- Design wind speed at 100mph, for wind exposure category B, project mean roof height at 30ft.

Solution

The designer shall choose R-15+5ci to comply with code thermal envelope and follow the steps,

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

Step 2: wind load is 100mph, Category B, 30 ft mean roof height,

Step 3: refer to James Hardie Literature (Table 1)

Step 4: find assembly that meets wind load requirements, as listed in ESR-2290, to cover 24 inch on center framing and building height 30 feet. Note that the fastener length in ESR is 2 inches long,

ESR- 2290 | Most Widely Accepted and Trusted

Page 13 of 16

TABLE 4—MAXIMUM WIND SPEED (mph)³ (Continued)

| PRODUCT | PRODUCT (IN.) | | FASTENER TYPE ⁴ | FASTENING METHOD ² | FRAME TYPE ¹ | STUD SPACING (IN.) | BUILDING HEIGHT (FT.) | EXPOSURE CATEGORY | | |
|--------------|---------------|-------|--|--|-------------------------|--------------------|-----------------------|-------------------|----|----|
| | THICK. | WIDTH | | | | | | B | C | D |
| HardiePlank® | 5/16 | 8.25 | 6d-2 inch long X 0.093 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 5: for installation of HardiePlank® with wood studs, add the foam thickness of 1 inch to the suggested fastener length. Therefore a total length of 3 inch long x 0.093 inch shank x 0.222 inch head diameter siding nail is the appropriate fastener needed to apply James Hardie siding over foam sheathing, in this example. Consult with fastener manufacturer to find the fastener in needed. For example, the above referenced fastener information is available at <http://www.mazenails.com>

| Stock Numbers PLAIN Shank | Length | Gauge | Head | Nails/Ctn. | Price Per Carton |
|------------------------------|--------|-------|------|------------|---------------------|
| CLCEM115 | 2" | .095 | .235 | 3200/CTN | \$125.38 |
| CLCEM116 | 2 1/4" | .095 | .235 | 3200/CTN | \$144.96 |
| CLCEM117 | 2 1/2" | .095 | .235 | 3200/CTN | \$147.15 |
| CLCEM119 * | 3" | .095 | .235 | 2400/CTN | \$138.65 |

NOTE: a longer fastener is acceptable, as long as the head bearing area, shank diameter, and net penetration in to timber are at least the same as the fastener listed in the relevant approvals section.

Step 6: install HardiePlank® siding in accordance with Installation Instructions and other supporting literature.

- To help the siding installer know where the framing members are so as to attach the siding to the framing,
 - Transfer the frame layout directly from wall framing to each attachment of rigid foam insulation or
 - Snap vertical chalk lines at each stud location after foam has been installed.
- Foam sheathing shall be minimum Type II (EPS) or Type X (XPS) per ASTM C578, or Type 1 (Polyiso) per ASTM C1289.
- When installing trim on inside corners, outside corners, and around wall penetrations (e.g. windows, doors, vents), extra attention is needed to install the trim and accommodate the wall framing offset that the foam thickness creates

B.2 Worked Example by Method 2 – (This would apply to any scenario where the combined thickness of non-nailable substrates added together is greater than 1-inch but equal to or less than 4-inches.)

Consider the case where furring on foam sheathing is used, and the project details are listed as follows:

- Climate Zone: 6
- Residential Wood Frame Construction
- Required Wall R-value (2009 IECC) at R-20+5ci or R-13+10ci
- 5/16 in. thick HardiePlank Lap Siding at 8.25 in. width
- 2x4 wall stud spacing at 16 in. on center with SPF stud type
- Design wind speed at 110mph, for wind exposure category B, project mean roof height at 40ft.

Solution

The designer shall choose R-13+10ci to comply with code thermal envelope in 2x4 construction and follow the steps,

- Step 1:** to meet R-10 requirement for continuous insulation the foam insulation shall consist of 2 inch extruded polystyrene or 1.55 inch polyisocyanurate or 2.5 expanded polystyrene (refer to foam sheathing manufacturer’s data),
- Step 2:** wind load is 110mph, Category B, 40 ft mean roof height,
- Step 3:** project requires 16 inch on center SPF wood studs
- Step 4:** refer to James Hardie Literature (Table 1),
- Step 5:** find assembly that meets wind load requirements, as listed in ESR-2290, to cover 16 inch on center framing and building height 40 feet. Normally, the shortest fastener is preferred since the fastener length will control the furring thickness.

TABLE 4—MAXIMUM WIND SPEED (mph)³ (Continued)

| PRODUCT | PRODUCT (IN.) | | FASTENER TYPE ⁴ | FASTENING METHOD ² | FRAME TYPE ¹ | STUD SPACING (IN.) | BUILDING HEIGHT (FT.) | EXPOSURE CATEGORY | | |
|--------------|---------------|-------|---|--|-------------------------|--------------------|-----------------------|-------------------|-----|-----|
| | THICK. | WIDTH | | | | | | B | C | D |
| HardiePlank® | 5/16 | 8.25 | No. 11 gauge 1.25 inch roofing Nail | Blind Nailed Through top edge of plank | 2 x 4 wood | 16 | 0-15 | 127 | 115 | 105 |
| | | | | | | | 20 | 127 | 112 | 102 |
| | | | | | | | 40 | 122 | 104 | 96 |
| | | | | | | | 60 | 115 | 100 | 93 |
| | | | | | | | 100 | 95 | - | - |

Step 6: select furring material, with specific gravity in accordance with ESR-2290, spaced at 16 in. on center, aligned with wall framing.

- The fastener is 1.25 inches long, no. 11 ga roofing nail, blind nailed,
- Fastener achieves 0.75 inches of net penetration into wood stud
 - o Nail length=1.25 in., Plank thickness=0.313 in..
 - o Paper thickness=0.063 in., Stud/plank gap=0.125 in..
 - o Net Penetration = 1.25-0.313-0.063-0.125.
- Furring must be a minimum of 0.75 in. thick to achieve the same values as listed in ESR-2290. Furring is therefore 1x4 nominal (3/4 x 3.5 actual).

NOTE: The National Building Code (NBC) in Canada may contain furring (strapping) requirements that will take precedence over the guidance above.

Step 7: determine assembly weight of siding and furring from Table 2 and Table 3,

- HardiePlank Lap Siding = 2.5 lb/sqft,
- ¾ in. furring x 3.5 in. wide = 0.48 lb/ft
- Total weight is 2.98 lb/sqft

Step 8: select furring strip fastener size and the system weight (see Table 4),

- In this design example nominal 1 inch by 4 inch wood furring is required. This example uses the FastenMaster HeadLok™ Fastener to attach the furring through the foam and into the wall studs. Review TER No. 1009-01 (Table 4, page 8), it shows that 24 inch on center fastener spacing is adequate for this example project's wind load, (siding + furring) weight and furring spacing.,

Step 9: TER No. 1009-01 Table 2 requires the HeadLok Fastener penetrate 2 inches into the wood stud Therefore the length of HeadLok Fastener needed is (0.75 in.furring + 2 in.foam + 2 in.net penetration) = 4.75 inches. HeadLok Fasteners are not offered in 4.75 inch lengths so default to the next size up, in this case a 5 inch HeadLok Fastener

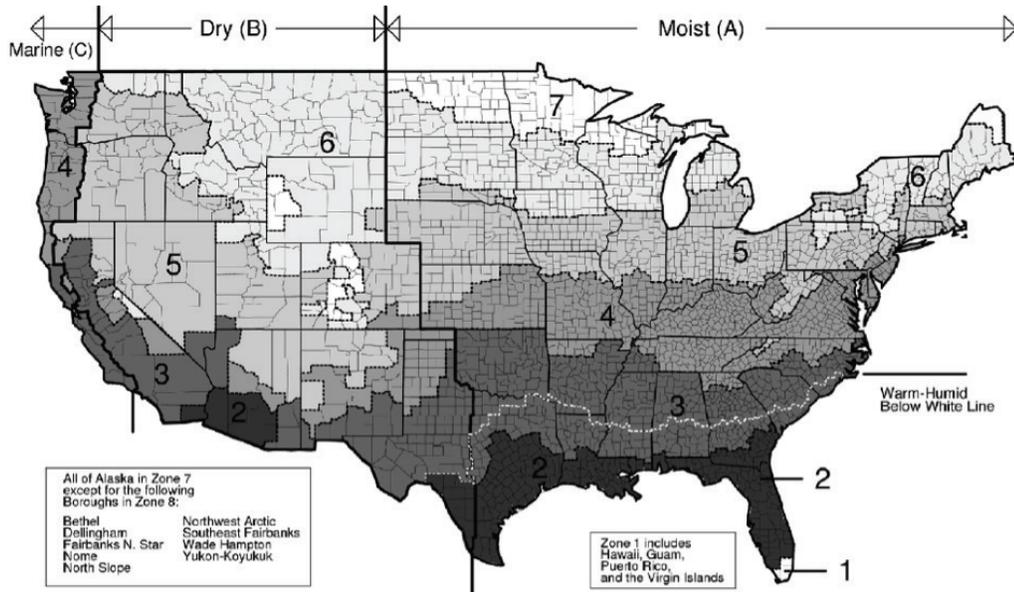
Step 10: install furring strips over the foam following FastenMaster installation guidance.

- The fastener must fully engage the framing or stud,
- Furring must attach to framing,
 - o Transfer the frame layout directly from wall framing to each attachment of rigid foam insulation or,
 - o Snap vertical chalk lines at each stud location after foam installation
- Fasteners must be installed in a manner to avoid overdriving, yet snug enough to remove gaps between the connected parts and maintain a planar (non-wavy) surface for connection.
- Foam sheathing shall be minimum Type II (EPS) or Type X (XPS) per ASTM C578, Type 1 (Polyiso) per ASTM C1289, or Type IVB mineral fiber board thermal insulation per ASTM C 612.
- When installing trim on inside corners, outside corners, and around wall penetrations (e.g. windows, doors, vents), a wider furring strip may be needed to accommodate the trim width and accommodate the wall framing offset that the foam thickness creates. If you have questions on trim layout contact James Hardie Technical Services 1-800-942-7343

Step 11: install HardiePlank siding in accordance with Installation Instructions and other supporting literature.

APPENDIX C – BACKGROUND CODE REQUIREMENTS

Figure 1, IECC Climate Zones,



| | CLIMATE ZONE | 2006 IECC | 2009 IECC | 2012 IECC |
|---|-----------------|----------------|-----------------|----------------------------------|
| Residential, Wood Frame Wall R-value | 1 | R-13 | R-13 | R-13 + R-3.8ci or R-20 |
| | 2 | R-13 | R-13 | R-13 + R-3.8ci or R-20 |
| | 3 | R-13 | R-13 | R-13 + R-3.8ci or R-20 |
| | 4 except marine | R-13 | R-13 | R-13 + R-3.8ci or R-20 |
| | 5 and marine 4 | R-19 or 13+5 | R-19 or 13+5 | R-13 + R-7.5ci or R-20 + R-3.8ci |
| | 6 | R-19 or 13+5 | R-19 or 13+5 | R-13 + R-7.5ci or R-20 + R-3.8ci |
| | 7 | R-21 | R-21 | R-13 + R-7.5ci or R-20 + R-3.8ci |
| | 8 | R-21 | R-21 | R-13 + R-15.6ci or R-20 + R10c |
| Non-Residential, Metal Frame Wall R-value | 1 | R-13 | R-13 | R-13 + R-5ci |
| | 2 | R-13 | R-13 | R-13 + R-5ci |
| | 3 | R-13 | R-13 | R-13 + R-7.5ci |
| | 4 except marine | R-13 | R-13 + R-7.5 ci | R-13 + R-7.5ci |
| | 5 and marine 4 | R-13 + R-3.8ci | R-13 + R-7.5 ci | R-13 + R-7.5ci |
| | 6 | R-13 + R-3.8ci | R-13 + R-7.5 ci | R-13 + R-7.5ci |
| | 7 | R-13 + R-7.5ci | R-13 + R-7.5 ci | R-13 + R-7.5ci |
| | 8 | R-13 + R-7.5ci | R-13 + R-7.5 ci | R-13 + R-7.5ci |

Table D.1: Summary of IECC Wall R-values (refer to IECC for actual wall R-values)

NOTE: : other R-value combinations are possible by way of the u-value performance procedure in the IECC.

IMPORTANT: Failure to install and finish this product in accordance with applicable building codes and James Hardie written application instructions may affect system performance, violate local building codes, void the product-only warranty and lead to personal injury.

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 eg. builder, architect or engineer. James Hardie will not be responsible in connection with any such information or assistance.

Additional Installation Information, Warranties, and Warning are available at JamesHardie.com



1.866.442.7343 | www.jameshardie.com

© 2014 James Hardie Building Products, Inc. All rights reserved. TM, SM, and ® denote trademarks or registered trademarks of James Hardie Technology Limited. The is a registered trademark of James Hardie Technology Limited. TB1201 08/14