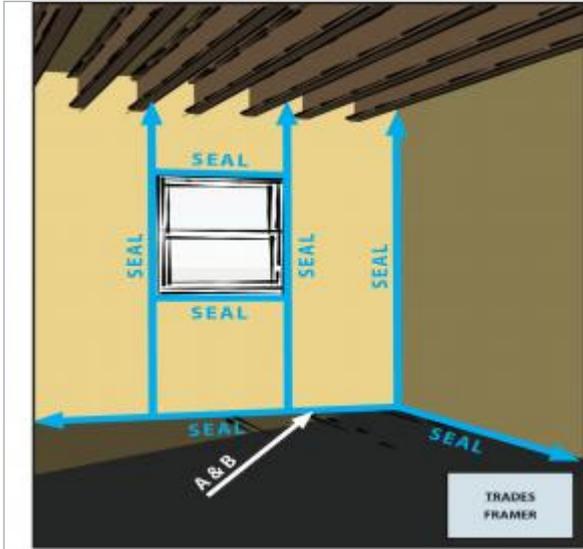


Air Sealing Structural Insulated Panel (SIP) Seams

Last Updated: 08/15/2013

Scope



All seams between structural insulated panels (SIPs) foamed and/or taped per manufacturer's instructions

Air Sealing

All seams between Structural Insulated Panels (SIPs) foamed and/or taped per manufacturer's instructions.

- A. Apply manufacturer-approved sealant inside the joints of all panels and at sub-floor or foundation connections.
- B. When applying tape to walls, center on joints and provide overlap of tape to meet manufacturer's specifications.
- C. When applying tape to roof panels, start from the lowest point of the panel and continue upward.

Description

SIPs consist of two layers of plywood or OSB that “sandwich” an inner core of insulating rigid foam. Panels are spliced together using splines, consisting of strips of OSB, SIPs, or 2x4 or 2x6 lumber. The seams where one panel joins another are susceptible to air leakage. To form an air tight bond, spray foam or caulk is applied to the seams before the panels are connected. Many SIP manufacturers will provide the caulk and instructions. The wall-floor, wall-wall, and wall-roof seams can each require as many as six beads of caulk, and the roof ridge seam can require up to 8 beads of caulk.

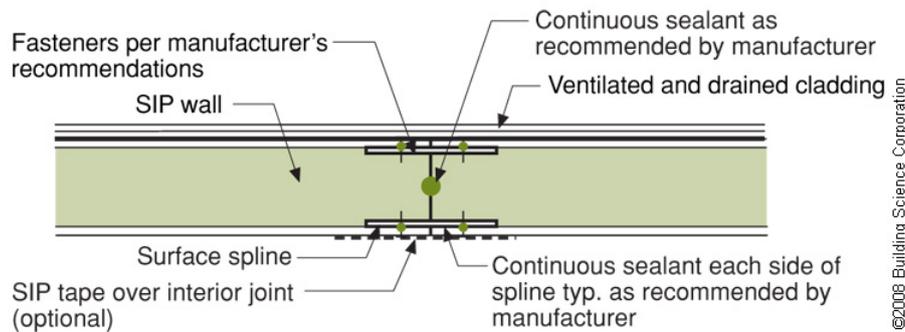
After caulking, the panels are fit together to assemble the structure. To ensure that joints lock tightly together, a belt winch can be used to pull wall assemblies together; this is especially helpful with larger panels. Before drywalling, the seams can be covered with peel and stick tape as a second layer of protection against air leakage. Before installing drywall is also an ideal time to test the air tightness of the seams with a blower door test and smoke pencil to visually identify the location of any leaks.

Air barrier effectiveness is measured at the whole-house level. High-performance branding programs and the 2009 International Energy Conservation Code (IECC) require that builders meet specified infiltration rates at the whole-house level. See the “compliance” tab for these specified infiltration rates.

For more information on SIP installation, see [Structural Insulated Panels](#).

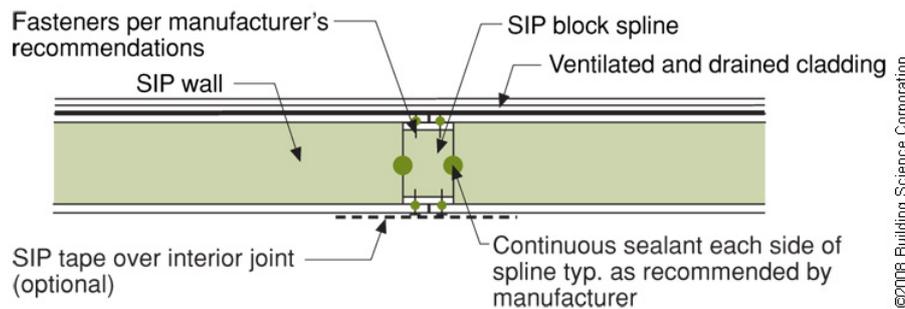
How to Seal SIP Seams

1. Connect the panels with splines. The three most common splines are surface splines, insulated splines, and structural splines (see Figures 1, 2, and 3). To minimize thermal bridging, only use structural splines when needed to carry the structural load. Splines can be installed on one side of the panel in the factory; this can save assembly time at the site.



Reference

Figure 1 - A surface spline reduces thermal bridging much more than a structural spline at SIP panel seams. [Image not found https://basc.pnnl.gov/sites/all](https://basc.pnnl.gov/sites/all)



Reference

Figure 2 - An insulated spline is another option for avoiding thermal bridging at SIP panel seams. [Image not found https://basc.pnnl.gov/sites/all/themes/pnnl](https://basc.pnnl.gov/sites/all/themes/pnnl)

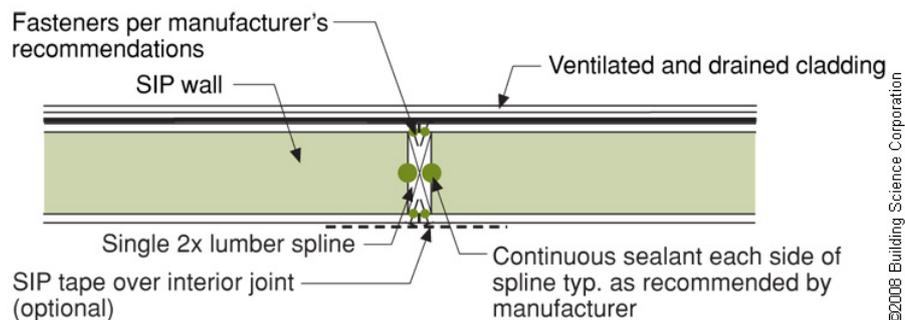


Figure 3 - A structural spline made of a solid 2x is used where needed to meet structural load requirements at SIP panel seams.
Reference

Image not found
https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_icon.png

2. Caulk on each side of the spline. Use caulk from the manufacturer, if provided. Follow the caulking schedule required by the SIP manufacturer for the number of beads of caulk to use at each type of seam. Make sure the beads are continuous. Consider using a power caulker; even in a small (1,200 sq. ft.) home, the amount of caulk required can total over 5,000 lineal feet of caulk.

3. Assemble the walls and roof. Use a fork lift and crane to place panels. Use lift plates and a belt winch (available from the manufacturer) to pull panels together tightly, if needed (Figure 4).



Reference

Figure 4 - Lifting plates attached to the wall provide good bracing to tighten up SIP panel seams. **Image not found**
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4. Install peel-and-stick tape at panel-to-panel seams and at the ridge and wall-roof interface (See Figure 5).



[Reference](#)

Figure 5 - Peel-and-stick panel tape provides added assurance that SIP panel seams will remain airtight. Image not found
<https://basc.pnnl.gov/sites/all/the>

5. Prior to drywalling, conduct a blower door test and use a smoke pencil to ensure that panel seams are tight (Figure 6).



[Reference](#)

Figure 6 - Use a smoke pencil to check for air leaks at SIP panel seams, especially along the ridge beam. Image not found
<https://basc.pnnl.gov/sites/all/the>

Ensuring Success

The air tightness of the envelope assembly of a home constructed with structural insulated panels can be easily tested by conducting a whole-house blower test prior to dry wall installation. While the house is depressurized, inspect all panel seams with a smoke stick. An infrared camera may also be helpful in spotting air leakage, if a sufficient temperature difference exists between the outside and the inside of the home.

Climate

No climate specific information applies.

Training

Right and Wrong Images



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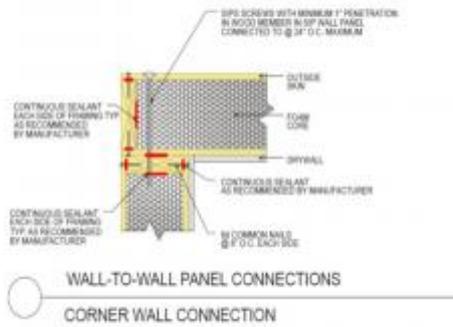
Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

CAD



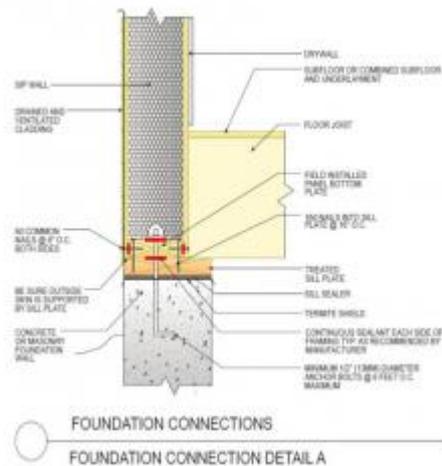
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



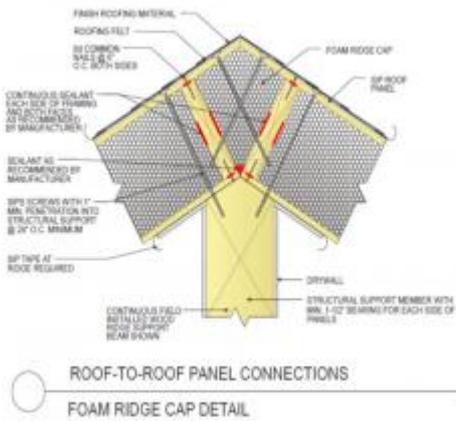
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

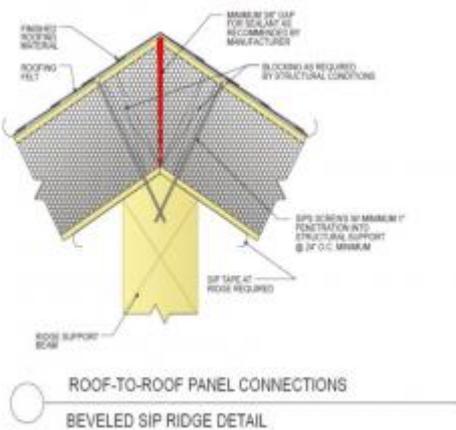
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Reference: [Structural Insulated Panel Connection Details](#)

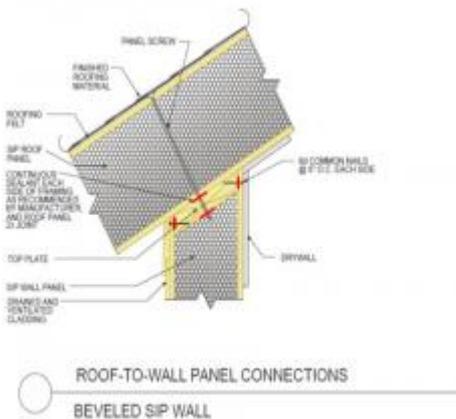
Author(s): Structural Insulated Panel Association
 Organization(s): Structural Insulated Panel Association



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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association
 Organization(s): Structural Insulated Panel Association

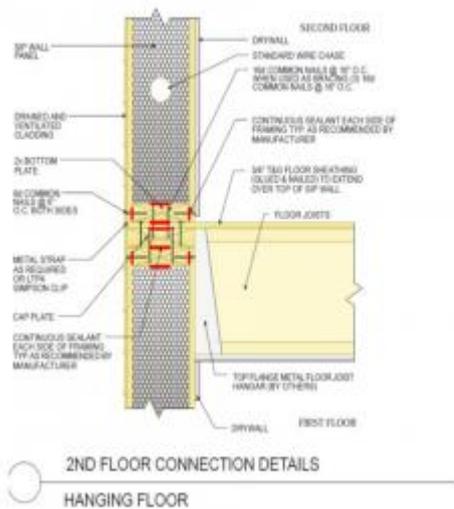


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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



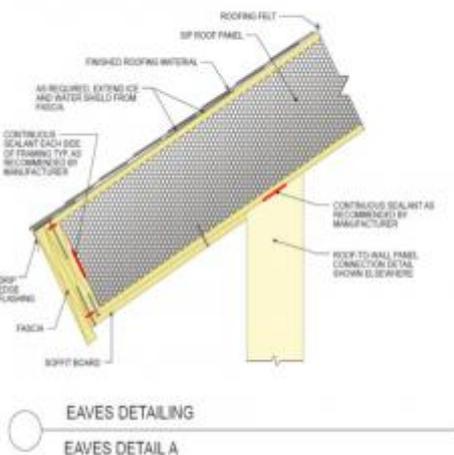
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Reference: [Structural Insulated Panel Connection Details](#)

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Organization(s): Structural Insulated Panel Association



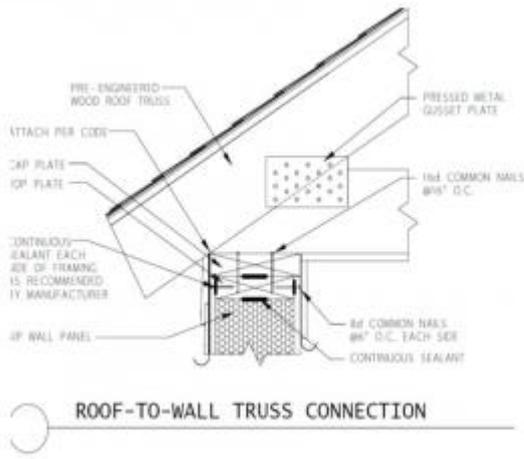
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

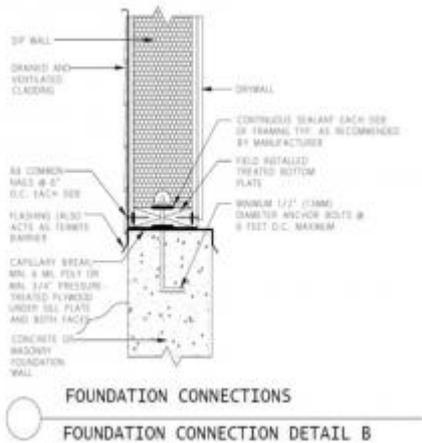
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Reference: [Structural Insulated Panel Connection Details](#)

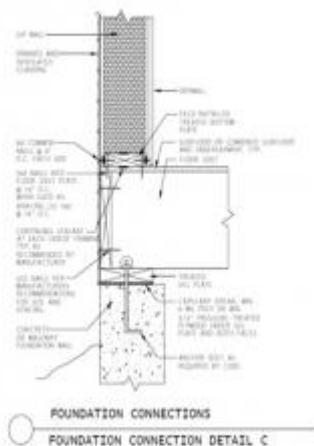
Author(s): Structural Insulated Panel Association
Organization(s): Structural Insulated Panel Association



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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association
Organization(s): Structural Insulated Panel Association

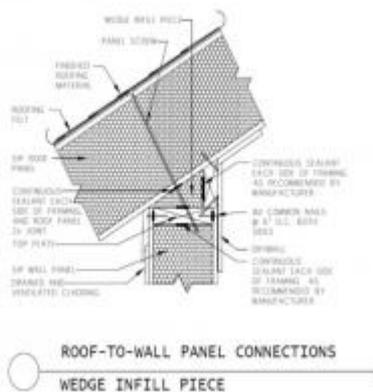


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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



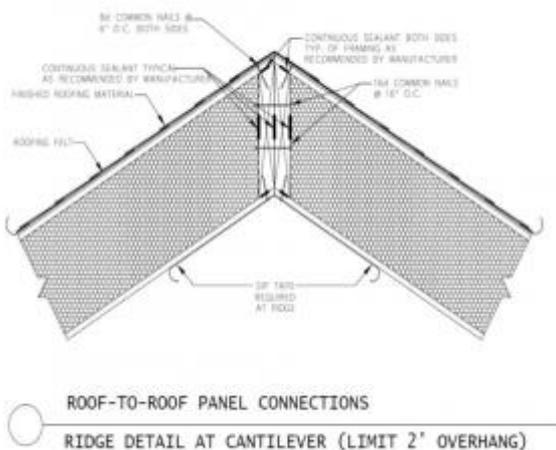
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Reference: [Structural Insulated Panel Connection Details](#)

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Organization(s): Structural Insulated Panel Association



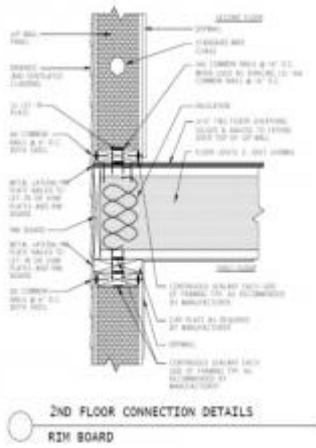
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

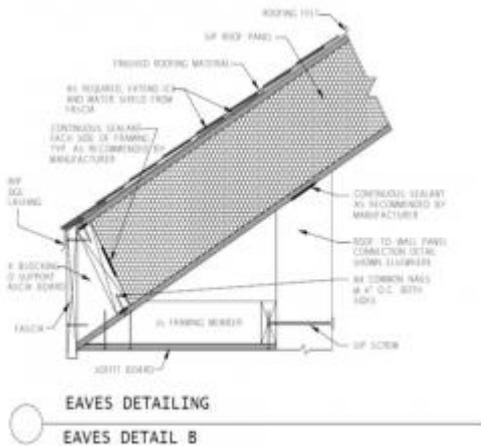
Organization(s): Structural Insulated Panel Association



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Reference: [Structural Insulated Panel Connection Details](#)

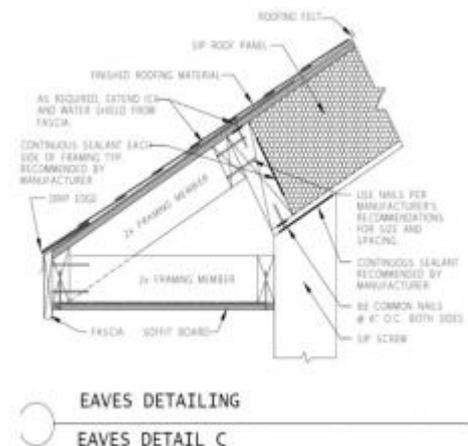
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 Organization(s): Structural Insulated Panel Association



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Author(s): Structural Insulated Panel Association
 Organization(s): Structural Insulated Panel Association

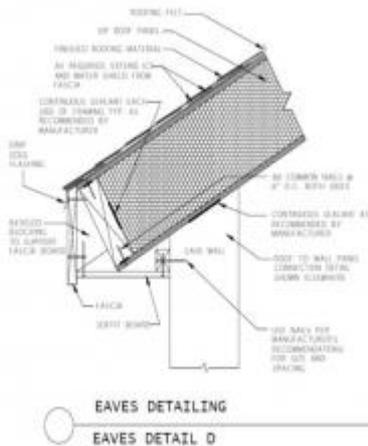


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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



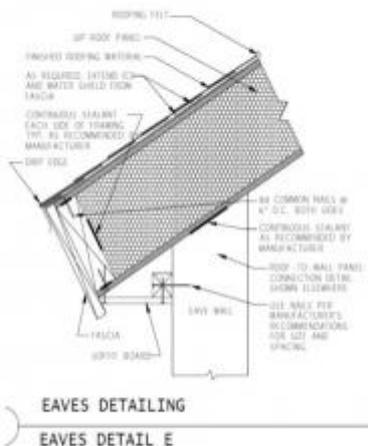
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



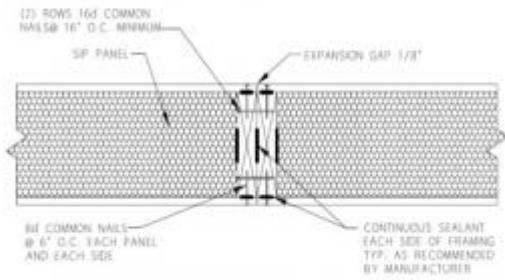
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



WALL-TO-WALL VERTICAL PANEL CONNECTIONS

DIMENSIONAL LUMBER SPLINE

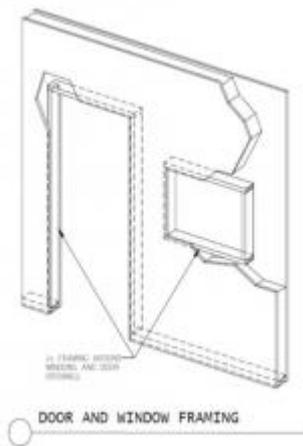
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Reference: [Structural Insulated Panel Connection Details](#)

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Organization(s): Structural Insulated Panel Association



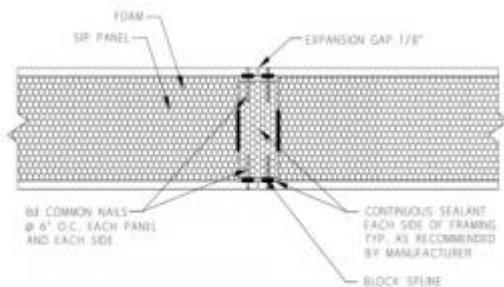
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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association



WALL-TO-WALL VERTICAL PANEL CONNECTIONS

BLOCK SPLINE

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Reference: [Structural Insulated Panel Connection Details](#)

Author(s): Structural Insulated Panel Association

Organization(s): Structural Insulated Panel Association

Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

[ENERGY STAR Certified Homes](#)

[Note: Guidance for ENERGY STAR Certified Homes Version 3.0, Revision 08 is coming soon.]
ENERGY STAR Certified Homes (Version 3.0, Revision 07), Thermal Enclosure Checklist, Air Sealing. Cracks in the building envelope fully sealed. All seams between Structural insulated Panels (SIPs) foamed and/or taped per manufacturer's instructions

[DOE Zero Energy Ready Home](#)

Exhibit 1: Mandatory Requirements. Certified under ENERGY STAR Qualified Homes Version 3

[2009 IECC](#)

The 2009 IECC does not specifically address sealing SIP seams. Table 402.4.2 Air Barrier and Insulation Inspection Component Criteria, Walls: Corners, headers, narrow framing cavities, and rim joists are insulated.*

[2009 IRC](#)

The 2009 IRC has several diagrams in Section R613 Structural Insulated Panel Wall Construction that illustrate the placement of continuous sealant.

[2012 IECC](#)

The 2012 IECC does not specifically address sealing SIP seams. Table R402.4.1.1 Air Barrier and Insulation Installation, Walls: Junction of foundation and wall sill plates, wall top plate and top of wall, sill plate and rim-band, and rim band and subfloor are sealed. Corners, headers, and rim joists making up the thermal envelope are insulated.*

[2012 IRC](#)

The 2012 IRC has several diagrams in Section R613 Structural Insulated Panel Wall Construction that illustrate continuous sealant. Table N11402.4.1.1 Air Barrier and Insulation Installation, Walls: Junction of foundation and wall sill plates, wall top plate and top of wall, sill plate and rim-band, and rim band and subfloor are sealed. Corners, headers, and rim joists making up the thermal envelope are insulated.*

*Due to copyright restrictions, exact code text is not provided. For specific code text, refer to the applicable code.

More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

Case Studies

None Available

References and Resources*

1. [Builder's Guide to Structural Insulated Panels \(SIPs\)](#)
Author(s): Lukachko
Organization(s): BSC
2. [Builders Guide to Structural Insulated Panels \(SIPs\) for all Climates](#)
Author(s): Lstiburek
Organization(s): BSC
3. [Building with Structural Insulated Panels](#)
Author(s): Morley
Organization(s):
4. [DOE Zero Energy Ready Home National Program Requirements](#)
Author(s): DOE
Organization(s): DOE
Publication Date: August, 2015
Standard requirements for DOE's Zero Energy Ready Home national program certification.
5. [ENERGY STAR Certified Homes, Version 3 \(Rev. 07\) Inspection Checklists for National Program Requirements](#)
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Organization(s): EPA
Publication Date: June, 2013
Standard document containing the rater checklists and national program requirements for ENERGY STAR Certified Homes, Version 3 (Rev. 7).
6. [How to Build a Zero Electric Utility Cost House](#)
Author(s): Christian
Organization(s): ORNL
Publication Date: January, 2006
Report presenting construction methods, building products, appliances and equipment of four single-family houses that achieve dramatic energy reductions and approach "net zero energy" use.
7. [Simple Affordable Near Zero Energy Habitats](#)
Author(s): Miller, Kosny, Shrestha, Christian, Karagozis, Kohler, Dinse
Organization(s): ORNL, LBNL
Publication Date: January, 2004
Report about four homes in the Tennessee Valley built to showcase 50% greater energy efficiency compared to homes built to local code.
8. [Structural Insulated Panel Connection Details](#)
Author(s): Structural Insulated Panel Association
Organization(s): Structural Insulated Panel Association
9. [Thermal Enclosure System Rater Checklist Guidebook](#)
Author(s): EPA
Organization(s): EPA
Publication Date: October, 2011
Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

None Available