

COMPREHENSIVE GUIDES

PDF SERIES

Structural Insulated Panels:

BUILDING WITH SIPS



Structural Insulated Panels:

BUILDING WITH SIPS: **SIP INSTALLATION**



SIP BUILDER-BP 7: SIP Installation

This document is created specifically for builders by the manufacturing members of the Structural Insulated Panel Association (SIPA). It dives deeper and provides more background into each of the summarized topics presented in the [Building with SIPs: NEED TO KNOW](#) overview which highlights important considerations during the construction phase of a Structural Insulated Panel (SIP) structure. Decades of in-field project experience will help reduce the learning curve and leverage SIPs' exceptional qualities to achieve the high-performance results owners expect when building with SIPs. The considerations of how and why the best practices were developed as the common industry platform for SIP construction are explored here.

The index below outlines eleven topical areas, listed in sequence to match the order of building considerations and construction. The details in each chapter provide a deeper understanding of the subject matter to facilitate successful SIP construction. The current chapter is highlighted in blue.

1. High-Performance SIP Building Envelope
2. HVAC Systems with SIPs
3. SIP Structural Capabilities
4. SIP Sizes
5. SIP Shop Drawings
6. SIP Fabrication/Manufacturing

7. SIP Installation

7.0. Introductory Installation Overview

- 7.1. Assure there is a capillary break between the SIPs and concrete floors, foundations and walls.
- 7.2. Typically, it is best to start installation of wall SIPs at a corner.
- 7.3. The use of ratchet straps to pull SIPs together can be very helpful during installation.

- 7.4. During installation, it is important to drill plates and connectors (i.e., splines) to allow access to electrical chases.
 - 7.5. Brace SIPs appropriately during construction to withstand wind-related issues.
 - 7.6. When installing roof SIPs, install splines and "chicken sticks" on the ground, to make the process easier.
 - 7.7. Due to the "stack effect," the ridge joint is the most important joint in the house. Follow Premier's ridge sealing detail to the letter!
 - 7.8. A Premier representative is recommended during the initial stages of installation for a first-time SIP user, to help expedite the SIP installation, ensuring the system is installed as required and meets performance targets.
 - 7.9. After the project has been erected, review all SIP joints to ensure properly nailed/fastened and sealed/taped.
 - 7.10. Training programs are available to installers, ensuring that an educated installer understands the importance of proper installing and sealing of the SIP package. Programs include:
 - 7.10.1. SIPA online training course
 - 7.10.2. SIPA Registered Master Builder & Designer Program
 - 7.10.3. SIPschool hands-on field training
 - 7.10.4. Carpenters International Training Fund (CITF) for SIPs
 - 7.10.5. SIP manufacturer in-house training programs
8. SIP Roof and Wall Assemblies
 9. SIP Electrical
 10. SIP Plumbing
 11. SIP Field Modifications

SIP BUILDER-BP 7: SIP Installation

SIP BUILDER-BP 7.0: Introductory Installation Overview:

1. The standard carpentry skills required for successful layout, leveling and squaring of framing elements apply to a SIP install as they would to any other building project. Confirm that you are using a properly calibrated level.
2. Confirm that you are building on a square and level surface (i.e., floor or foundation). If you identify variations, square and level the surface to provide required bearing conditions for both facers of SIP walls.

3. Measure and re-measure as you go to make sure you are staying on track in critical areas such as pockets for support beam placement or window locations, especially kitchens where cabinets might be installed to each side.
4. As SIPs are installed, SIP sealant should be applied at all SIP joints for wall, floor and roof SIPs. Refer to Premier's shop drawing details. See Images 7.1 through 7.7.

IMAGE 7.1

SIP ROOF SEALANT APPLICATION



IMAGE 7.2
EXPANDING FOAM INSULATION AT SIP
ROOF RIDGE JOINT



IMAGE 7.3
AUTOMATED SEALANT APPLICATOR



IMAGE 7.4
SIP WALL SEALANT APPLICATION



IMAGE 7.5
SIP WALL SEALANT WITH MANUAL APPLICATOR



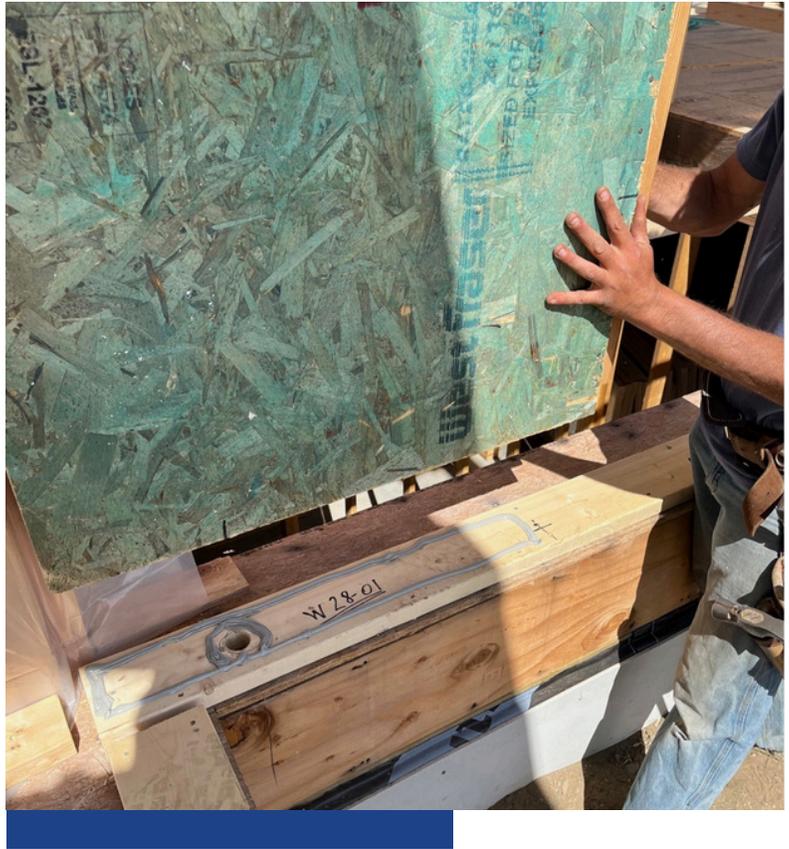
IMAGE 7.6

TALL SIP WALL SEALANT APPLICATION



IMAGE 7.7

SEALANT ON SILL PLATE



Checklist of Tools

- Auger bit (1-1/2" x 12)
- Bits for panel screws/fasteners (e.g., Torx or star drive)
- Caulking guns
- Chain saw or Prazi saw with 14" - 21" bar and chain saw guide for site fabrication
- Chalk line
- Circular saws
- Come-along with 2" ratchet straps for pulling SIPs together
- Drill motor (1/2") for 1-1/2" diameter electrical chase holes
- Drill motors (3/8")
- Dunnage for supporting panels
- Expanding foam
- Fall arrest gear for roofs (if applicable)
- Foam scoop and/or Wind-lock hot knife
- Framing square
- Hand saw
- J roller for SIP tape application
- Ladders - step and extension
- Levels (4' or longer)
- Lifting plates/pins
- Mineral spirits to clean caulking/sealants from tools
- Miter saw
- Nail gun
- Power planer
- Pry bars
- Reciprocating saw
- Sledge hammers
- String line
- Wrench and socket for tightening anchor bolts

SIP Installation Tips

1. Project must meet local code.
2. Confirm your installation date at least two weeks prior to requesting on-site assistance.
3. Schedule a preconstruction meeting with your installation crew (concrete, plumbing, electrical, siding, roofing, etc.).
4. Review SIP shop drawings for hold-downs locations if applicable.
5. Inventory materials when you receive them.
6. Check all SIPs for proper cuts and recesses.
7. Double check SIPs sizes and compare to shop drawings before installation.
8. Project-specific SIP shop drawings take precedence over SIP manufacturer's standard/typical details. Always confirm with SIP manufacturer if there are questions or concerns.
9. Follow SIP details regarding sealant and SIP tape installation as described in [Builder Best Practices 8: SIP Roof and Wall Assemblies](#) or [Design Best Practices 8: SIP Roof and Wall Assemblies](#).
10. Fabricate and pre-install box spline, dimensional lumber or I-joist spline material as specified.
11. Any changes to the SIPs required at the job site should be double-checked with the SIP manufacturer.
12. Make sure to pre-drill for electrical chases:
 - a) For vertical electrical chases, drill the bottom/sill plates, top and cap plates
 - b) For horizontal electrical chases, drill the vertical splines (i.e., 2x's or block splines)
13. Plumbing is not recommended inside exterior SIP walls. Refer to [Builder Best Practices 10: SIP Plumbing for more information](#).
14. Do not cut the SIP facers (OSB) for extra electrical chases or plumbing. Refer to [Builder Best Practices 9: SIP Electrical](#) or [Builder Best Practices 10: SIP Plumbing](#) for more information.
15. Do not pick up the SIPs by the edge of the top facer.
16. Remove debris from sill plate before you place the SIP wall on it.
17. Use sealant on all connections as shown in the SIP shop drawing details.
18. Make sure that both of the wall SIP facers are fully supported on the subfloor or sill plate.
19. Follow proper nailing requirements according to SIP shop drawing details.
20. Plumb/level each SIP in each direction, then secure with fasteners.
21. Temporarily brace walls adequately to stabilize during installation.
22. Only apply interior or exterior finish materials over dry SIPs.
23. Fill all voids with expanding foam.

SIP BUILDER-BP 7.1: Assure there is a capillary break between the SIPs and concrete floors, foundations and walls.

A capillary break in construction is the use of a hydrophobic/water-repelling material (non-porous) that acts as a barrier between two layers of material that can stop capillary action. Various types of materials may be used as the capillary break, including but not limited to sill seal, waterproofing membrane, or other non-permeable materials.

In many parts of the country, a treated sill (aka sole plate) is considered a capillary break with traditional stick framing. Other parts of the country traditionally place a capillary separation layer between the concrete foundation and the sill/sole plate. The treated sill plate separates the concrete from the untreated outer SIP facers.

The treated sill plate allows for minor imperfections in concrete surfaces and provides adequate bearing surface for both facers of the SIP. Note that foundations out of square might not fully support the entire sill plate and cause a cantilever situation which would require a structurally designed sill plate, as seen in Image 7.10. Contact your SIP manufacturer for an engineered solution.

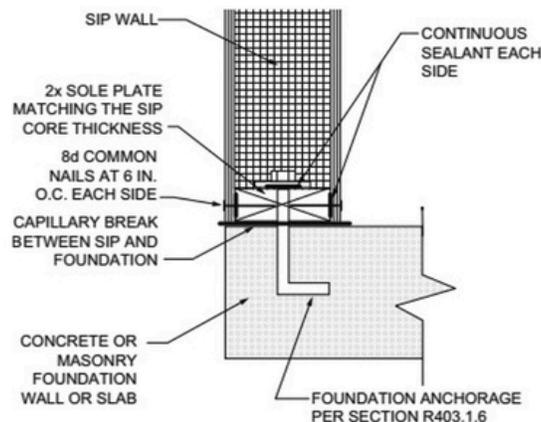
IRC 2021, section R610.5.2 (see Image 7.8) requires that a capillary break be installed between the SIP wall and the concrete or masonry foundation wall or slab.

While the IRC does not illustrate a treated sill plate, SIPA best practices do recommend it. See Image 7.9: Figure 4 from SIPA's SIP Basic Connection Details showing a SIP wall to a foundation.

IMAGE 7.8 FROM IRC (INTERNATIONAL RESIDENTIAL CODE) 2021

R6 10.5.2 Bottom (sole) plate connection.

Where SIP walls are supported directly on continuous foundations, the wall wood sill plate shall be anchored to the foundation in accordance with Figure R6 10.5.2 and Section R403.1

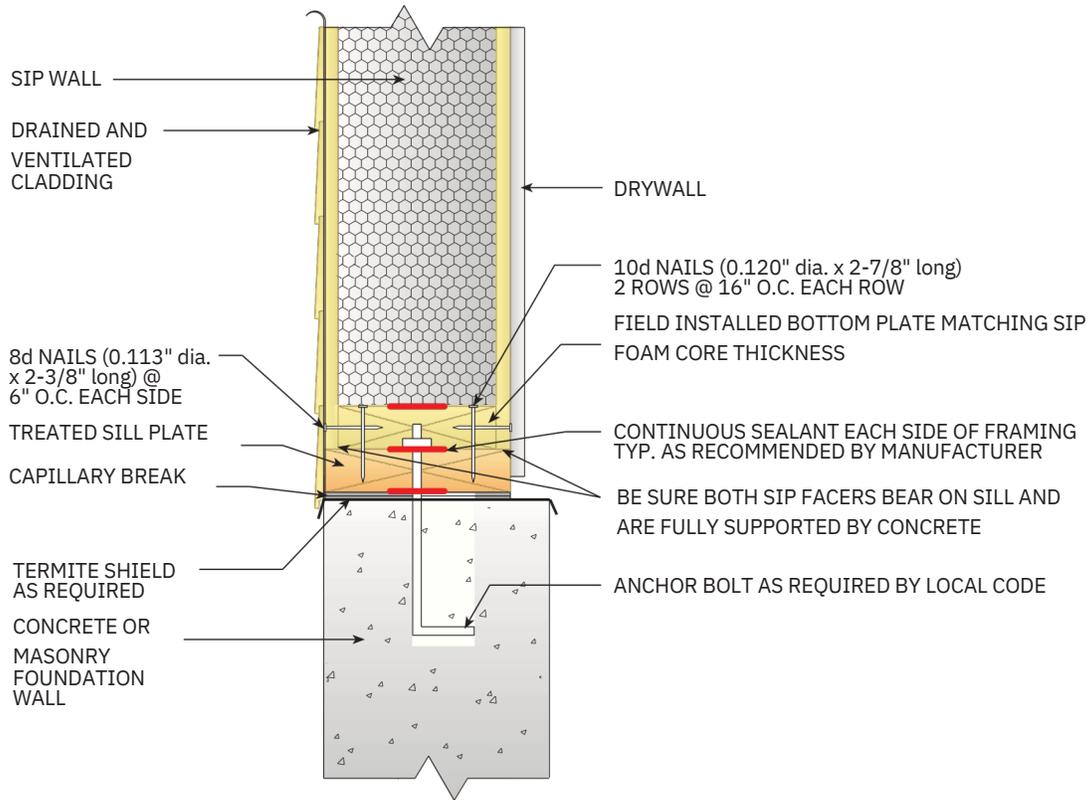


For SI: 1 inch = 25.4 mm.

FIGURE R610.5.2
SIP WALL TO CONCRETE SLAB FOR FOUNDATION WALL ATTACHMENT

Note that sill seal also reduces air leakage between the concrete surface and the bottom of the SIP wall. Sill seal is used in both SIP and wood framed construction.

IMAGE 7.9
FROM SIPS BASIC CONNECTION DETAILS



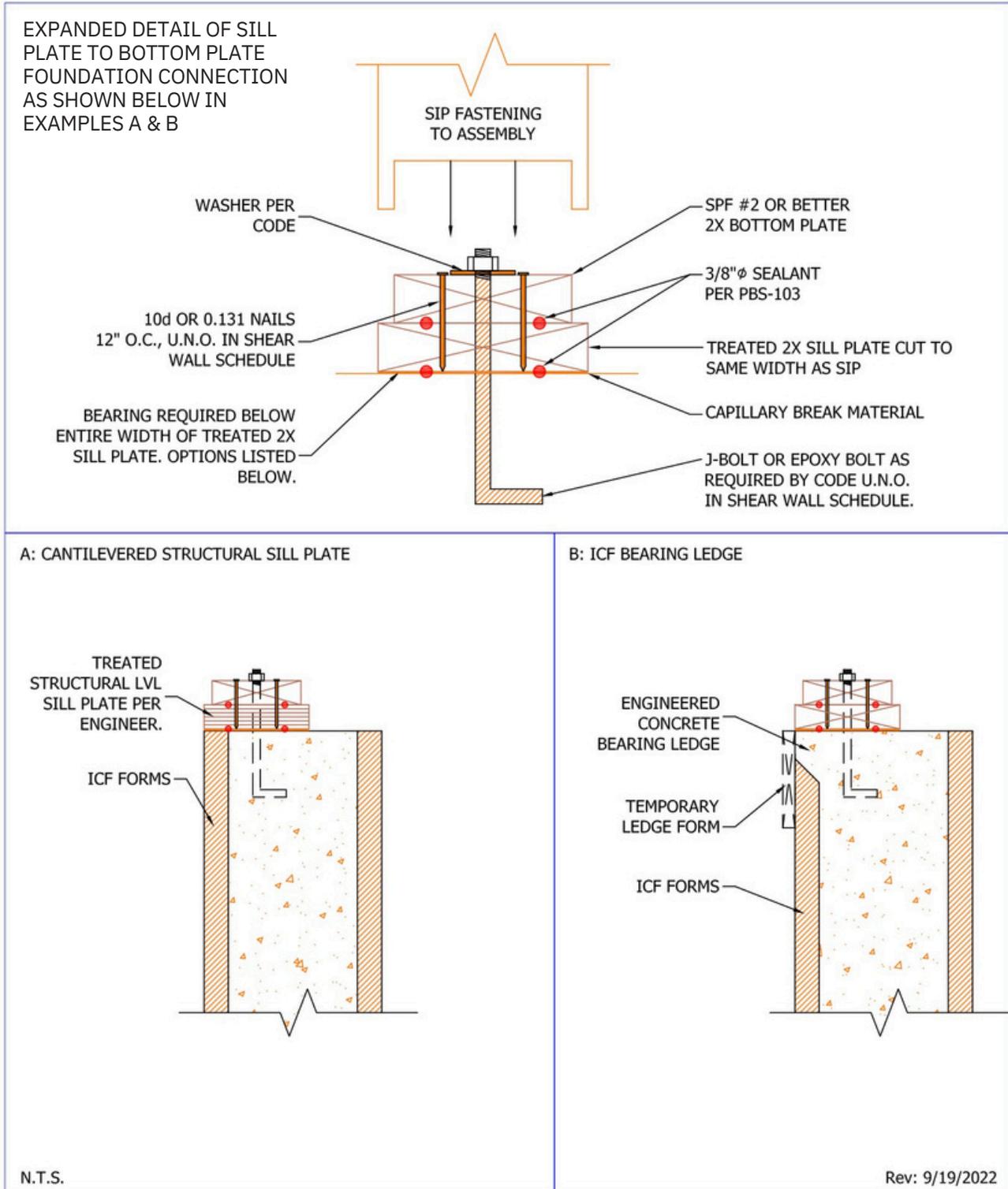
ALL SIP JOINTS SHALL BE AIR SEALED WITH SEALANT AND/OR SIP TAPE. FOLLOW SIP MANUFACTURER'S RECOMMENDATIONS FOR SIP TAPE WIDTHS AND SEALANT PATTERN AND THICKNESSES. VERIFY NAIL SPACING PER MANUFACTURER SPECS/CODE LISTING

FOUNDATION CONNECTIONS SIP WALL ON FOUNDATION

Note the red lines representing continuous sealant for air leakage control. Sill seal also reduces air leakage between the concrete surface and the bottom of the SIP wall. Sill seal is used in both SIP and wood framed construction.

IMAGE 7.10

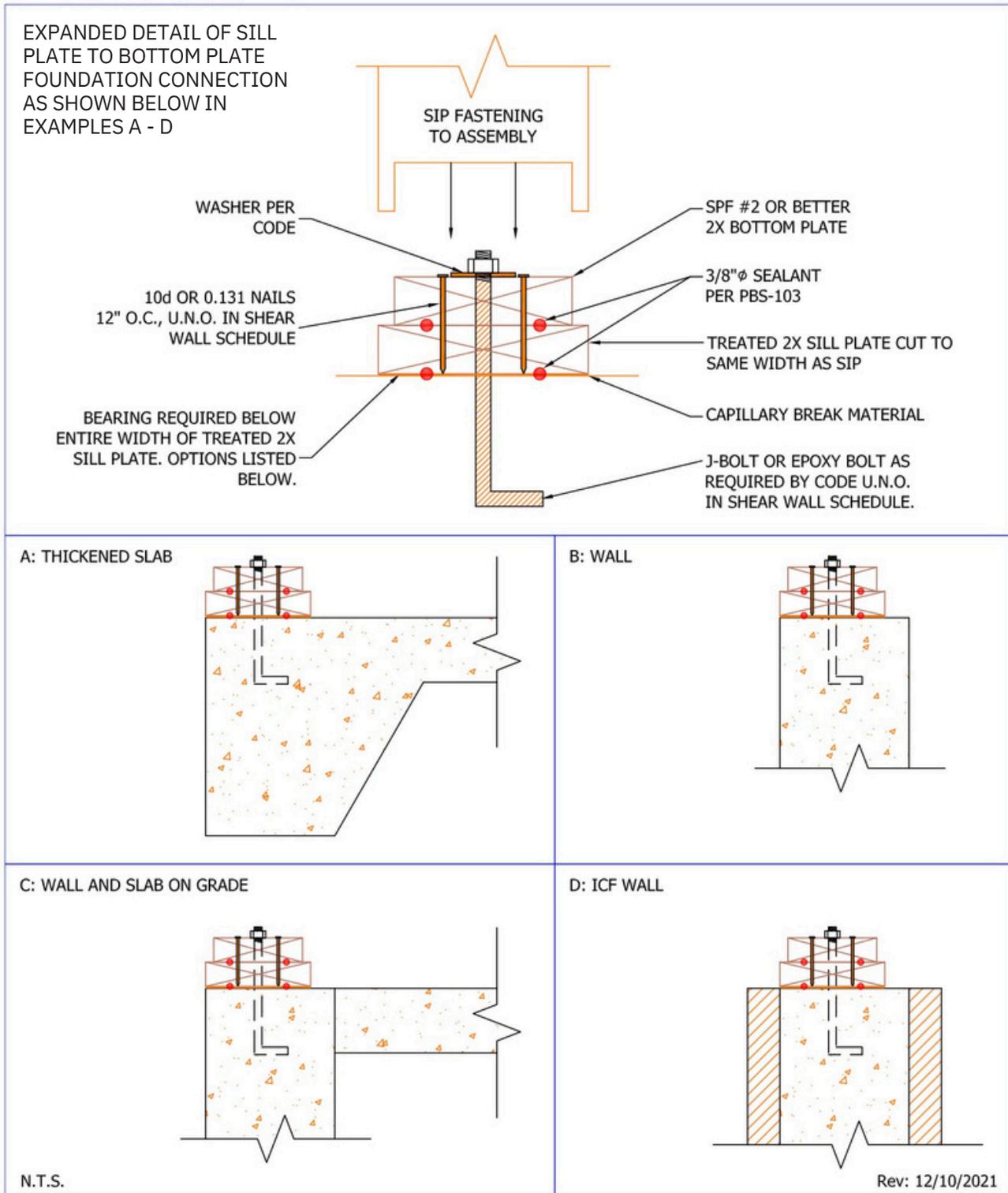
TYPICAL CANTILEVERED SILL PLATE/FOUNDATION CONNECTION DETAILS



Note that sill seal also reduces air leakage between the concrete surface and the bottom of the SIP wall. Sill seal is used in both SIP and wood framed construction.

IMAGE 7.11

TYPICAL CAPILLARY 2X SILL PLATE/FOUNDATION CONNECTION DETAILS



Note that sill seal also reduces air leakage between the concrete surface and the bottom of the SIP wall. Sill seal is used in both SIP and wood framed construction.

IMAGE 7.12

TREATED SILL PLATE AND CAPILLARY BREAK



IMAGE 7.13

WATERPROOFING MEMBRANE FUNCTIONING AS CAPILLARY BREAK ON TOP OF ICF (INSULATED CONCRETE FORMS) WALL



IMAGE 7.14

WATERPROOFING MEMBRANE FUNCTIONING AS CAPILLARY BREAK ON TOP OF ICF WALL (ALTERNATE VIEW)



IMAGE 7.15

TREATED SILL PLATE AND SILL SEAL (CAPILLARY BREAK)



SIP BUILDER-BP 7.2:

Typically, it is best to start installation of wall SIPs at a corner.

It is typically best to start installing wall SIPs in the corner to ensure that the adjacent SIPs are plumb and square. Starting to install the wall SIPs in the corner also allows you to work in two directions. If you have a large enough crew along with equipment, this will speed up the installation of SIPs. See Images 7.16A and 7.16B.

IMAGE 7.16A

SETTING CORNER PANELS



IMAGE 7.16B

SETTING CORNER PANELS (ALTERNATE VIEW)



There are, however, times when you would want to start in the middle of the wall and work to the corners. This methodology should be considered if you have a gable wall supporting ridge beams. Image 7.17 shows a pocket in the SIP gable wall for the ridge beam. Working from the middle of the gable wall to the eave walls helps ensure proper alignment of the ridge beam.

IMAGE 7.17

GABLE WALL WITH RIDGE BEAM POCKET



Images 7.18 and 7.19 show starting in the middle of a gable wall and installing temporary bracing to ensure wall SIPs stay plumb and withstand wind-related forces. Temporary bracing will be discussed more in Section 7.5 of this document.

IMAGE 7.18
SIP GABLE WALL INSTALLATION
STARTING AT CENTER OF WALL



IMAGE 7.19
SIP GABLE WALL INSTALLATION
OF ADJACENT SIP



The APA recommends a 1/8" gap to help mitigate issues that would otherwise require trimming of the SIP. Gaps can be installed large or small as required to align with SIP layout per shop drawings. If gable ends need to be trimmed, this should occur at the downslope ends (eave end of the gable wall). Otherwise, trimming gable wall SIPs as they are set could cause stair-stepping of the gable slope.

When installing SIP walls, it is important to consider point load locations, supporting posts of structural members, and locations of doors, windows and sinks. Make sure to measure and mark on the plate/deck these locations and trim the wall SIPs if they are growing in length (overall wall length of combined SIP sections). Trimming a SIP is much easier before it is set in place. Referring to SIP shop drawings beforehand will help identify these critical locations.

Consult with your Premier Rep if you have any questions or concerns about where to start installing wall SIPs.

SIP BUILDER-BP 7.3:
The use of ratchet straps to pull SIPs together can be very helpful during installation.

Several types of splines (e.g., box/block, surface, etc. – reference images 7.20 and 7.21) are used to connect SIPs together. Before the SIPs are drawn together, ensure the sealant is applied according to the SIP shop drawing details. To make the spline connection, it is important to pull the SIPs snugly

together (i.e., not too much pressure to damage the SIP) to fully engage the EPS foam core with the connecting spline in the recesses of the two SIPs. This may or may not cause the OSB facers to touch. The priority is that the inner foam core surfaces should be in contact. If the OSB facers are touching, validate that the EPS foam cores are touching by observing from the top of the wall looking downward or at the end of roof SIPs. In the event that the foam surfaces are not touching, contact your SIP manufacturer to determine how best to accomplish this.

IMAGE 7.20
FROM *SIPS BASIC CONNECTION DETAILS (SURFACE SPLINE EXAMPLE)*

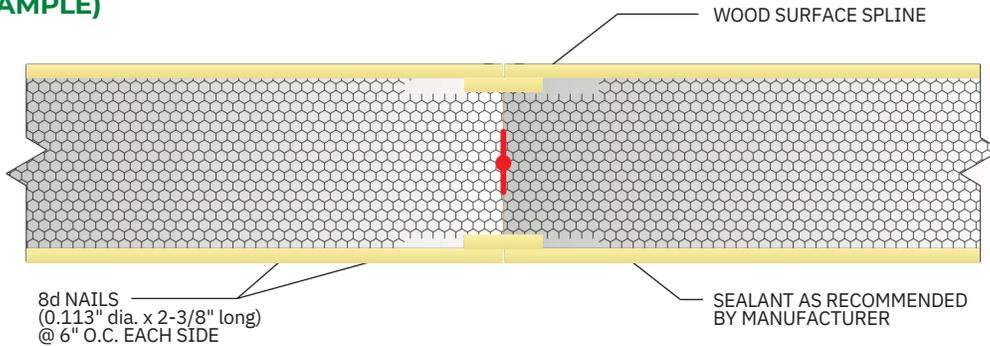
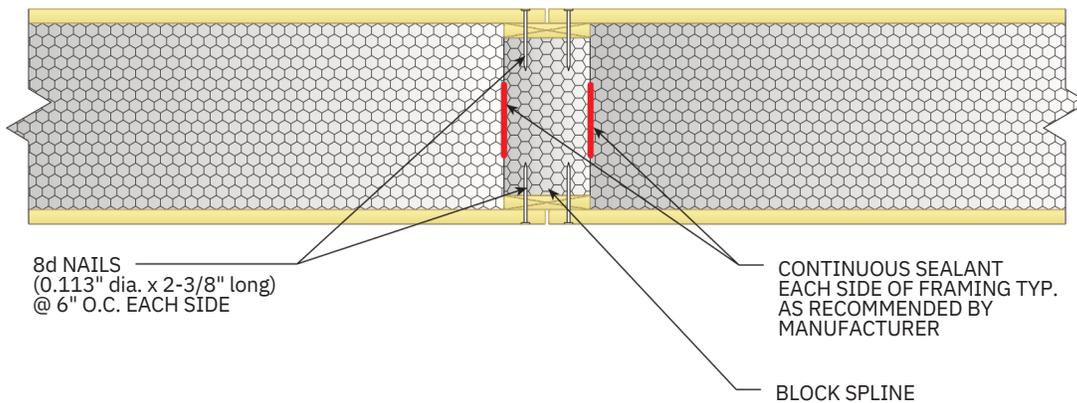


IMAGE 7.21
FROM *SIPS BASIC CONNECTION DETAILS (BOX/BLOCK SPLINE EXAMPLE)*



ALL SIP JOINTS SHALL BE AIR SEALED WITH SEALANT AND/OR SIP TAPE. FOLLOW SIP MANUFACTURER'S RECOMMENDATIONS FOR SIP TAPE WIDTHS AND SEALANT PATTERN AND THICKNESSES. VERIFY NAIL SPACING PER MANUFACTURER SPECS/CODE LISTING

The assembly process can be made easier with the use of a ratchet strap type (i.e., “Come-Along”). Adding a beveled edge on the spline can also aid in joining the SIPs together. Once the installer has the SIPs pulled together, the SIPs should be nailed off on both the interior and exterior sides of the bottom plate along with the vertical spline joint before the ratchet is released. Reference the SIP shop drawings for the appropriate OSB “Gap” at SIP joints. This Gap can also mitigate “popping” complaints due to thermal expansion and contraction. Follow the SIP shop drawings for nail size and spacing.

Note that ratchet straps are not typically supplied by Premier SIPS. There are different types, and it is up to the installers to purchase the equipment that works best for them.

Images 7.22A, 7.22B and 7.22C show some examples of installers using ratchet straps to pull panels together.

IMAGE 7.22A
USING RATCHET STRAPS TO PULL SIPs TOGETHER



NOTE: Hook on end of wall to pull a SIP into place with a ratchet

IMAGE 7.22B
USING RATCHET STRAPS TO PULL SIPs TOGETHER



NOTE: Suspended header SIP being pulled tight (making sure to align beam pockets with opposite wall)

IMAGE 7.22C
USING RATCHET STRAPS TO PULL SIPs TOGETHER



NOTE: Plate screwed to SIPs and ratchet strap used to pull them together.

There are two types of hooks at the end of ratchet straps: flat hooks and wire hooks. There is typically a preference to use the flat hook when pulling from the edge of a SIP to prevent damage to the OSB, and the wire hook when using lifting plates screwed to the SIPs. See Images 7.23A, 7.23B and 7.23C.

IMAGE 7.23A
VARIOUS RATCHET STRAP HOOKS



FLAT HOOK RATCHET STRAPS

WIRE HOOK RATCHET STRAPS

IMAGE 7.23B
VARIOUS RATCHET STRAP HOOKS



IMAGE 7.23C
COME-ALONG STYLE ASSEMBLY WITH HOOKS AND LIFTING PLATES



SIP BUILDER-BP 7.4:
During installation, it is important to drill plates and connectors (i.e., splines) to allow access to electrical chases.

SIP manufacturers may provide electrical wiring chases in wall SIPs. The chases are approximately 1-1/4" in diameter and are located in the EPS foam core of the SIP. Horizontal chases in the wall SIPs are located at switch and outlet heights, approximately 14" and 48" from the bottom of the SIP. Vertical chases are located approximately 4' on center in the wall SIP. Additional chases may be added if required; consult with the SIP manufacturer.

The sill plates, bottom and top plates, cap plates and connection splines need to be drilled with an approximate 1-1/2" diameter drill bit at the vertical and horizontal chase locations when the SIPs are being

IMAGE 7.24
DRILLED TOP PLATE AND CAP PLATE FOR VERTICAL ELECTRICAL CHASE



installed. These holes facilitate the installation of the electrical wires during the wiring process. As shown in Image 7.24, when drilling the sill plate one might have to angle the drill bit to facilitate electrical wire placement through the floor system depending on the RIM board material. When drilling top and cap plates, the hole will be vertical matching the electrical chase in the SIP wall. Consult with your Premier SIP Rep with any questions. The SIP installer should double check that all splines used to connect the vertical SIP joints have the holes drilled to match the horizontal electrical chases.

IMAGE 7.25
SILL PLATE CHASE CUT OUT TO PASS FROM SIP WALL TO BELOW FLOOR



IMAGE 7.26
DRILLING SILL PLATE



NOTE: One might have to angle the drill bit to facilitate electrical wire placement through the floor system depending on the RIM board material.

SIP BUILDER-BP 7.5:
Brace SIPs appropriately during construction to withstand wind-related issues.

SIPs are designed to withstand loading conditions over the course of the life of the structure under normal use conditions. However, during construction, the lack of temporary bracing may lead to instability and even collapse under certain conditions such as high-wind events. During SIP installation, the purpose of temporary bracing is to provide stability and stiffness to the framing against unintended movement or loading prior to the installation of the entire structural system. Temporary bracing may also be used to plumb the wall prior to installing floor/roof systems.

Dimensional lumber is often used as temporary bracing of wall and roof elements. Refer to images 7.27, 7.28, 7.29 and 7.30.

IMAGE 7.27
GABLE WALL BRACING



IMAGE 7.28
EXTERIOR SIP WALL BRACING FROM THE EXTERIOR OF THE BUILDING



IMAGE 7.29

EXTERIOR SIP WALL BRACING FROM THE INTERIOR OF THE BUILDING



IMAGE 7.30

ROOF RAFTER BRACING PRIOR TO SIP ROOF INSTALLATION



SIP BUILDER-BP 7.6:
When installing roof SIPs, install splines and “chicken sticks” on the ground, to make the process easier.

Toe boards, also known as “chicken sticks,” can be used to help installers move around on the sloped roof SIP. Often the toe boards are 2x4s that are fastened to the exterior side of the roof SIPs. They need to be securely fastened so that they support the weight of the workers without shifting or loosening.

IMAGE 7.31A
ROOF SIPs WITH TOE BOARDS



IMAGE 7.31B
ROOF SIPs WITH TOE BOARDS



IMAGE 7.31C
ROOF SIPs WITH TOE BOARDS



IMAGE 7.31D
ROOF SIPs WITH TOE BOARDS



IMAGE 7.31E
ROOF SIPs WITH TOE BOARDS

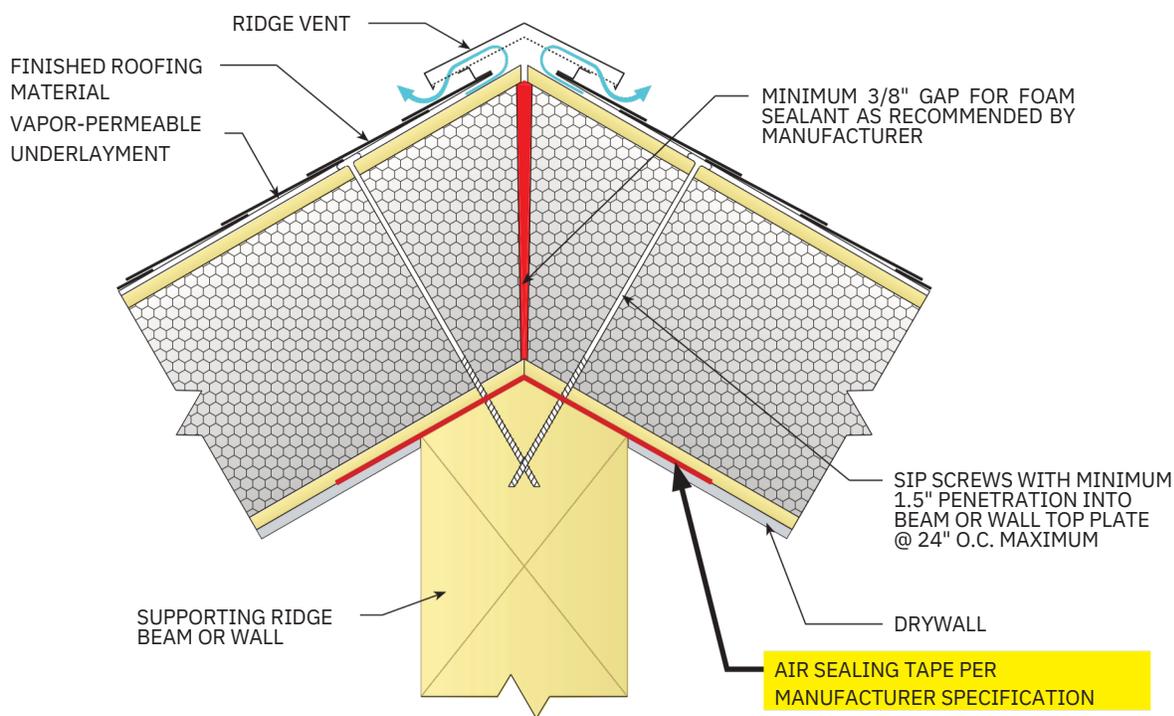


SIP BUILDER-BP 7.7:
Due to the “stack effect,” the ridge joint is the most important joint in the house. Follow manufacturer’s ridge sealing detail to the letter!

The stack effect or chimney effect is the rising of warm air and movement out of buildings through unsealed

openings at ridge beams, chimneys, stack vents, etc., resulting from warm air rising (buoyancy). SIP tape is an important part of your SIP installation to minimize movement of warm, moist air through panel joints due to stack effect (see Image 7.32 and 7.33). Refer to Section 8.8 of *SIP BUILDER-BP 8: Roof and Wall Assemblies* for taping recommendations.

IMAGE 7.32
SIP TAPE AT RIDGE BEAM DETAIL FROM SIPS BASIC CONNECTION DETAILS



ALL SIP JOINTS SHALL BE AIR SEALED WITH SEALANT AND/OR SIP TAPE. FOLLOW SIP MANUFACTURER’S RECOMMENDATIONS FOR SIP TAPE WIDTHS AND SEALANT PATTERN AND THICKNESSES. VERIFY NAIL SPACING PER MANUFACTURER SPECS/CODE LISTING

ROOF-TO-ROOF PANEL CONNECTIONS
 SIP WITH RIDGE VENT

IMAGE 7.33

EXPANDING FOAM INSULATION AT SIP ROOF RIDGE JOINT



At roof supports (beams/walls), SIP tape (typically a wide width with 2 inches of attachment to each side of the roof support; check with your SIP manufacturer) should be centered and attached with the release paper side up over all roof supports with panel joints before roof SIPs are set (see Image 7.34). Overlap the SIP tape segments at least three inches at the tape- end joints. SIP tape is best attached in place using staples or a hammer tacker prior to setting roof SIPs. Do not remove the paper backing until the roof SIPs are in place and fastened to the beam or supporting walls. SIP tape should be installed in the temperature range from 0°F to 120°F. Refer to [SIP DESIGN-BP 1: High-Performance SIP Building Envelope](#) for climates in which you may need SIP tape.

IMAGE 7.34

WIDE-WIDTH SIP TAPE DRAPED/STAPLED OVER ROOF SUPPORT BEAMS PRIOR TO SETTING ROOF SIPS



SIP surfaces should be clean, dry, free of dirt and debris, and free of damage, sharp protrusions, or voids. On the SIP tape, peel back a few inches of one side of the split paper release liner to facilitate the SIP tape sticking to the underside of the SIP above. Remove the release paper applying firm pressure to the SIP tape surface as it comes in contact with the SIP surface. Repeat this procedure with the remaining side of the paper release liner. Using a spatula or roller (rubber, wood or a steel J roller; see Images 7.35 and 7.36), apply sufficient pressure along the entire tape surface to ensure a continuous wrinkle-free seal and to eliminate trapping air between the OSB and the tape.

IMAGE 7.35
SPATULA/FLAT BLADE APPLICATOR



IMAGE 7.36
ROLLER APPLICATOR



Other interior roof SIP joints not occurring at roof supports also need to have SIP tape applied. See images 7.37 and 7.38. Refer to SIP BUILDER-BP 8: Roof and Wall Assemblies for additional recommendations.

IMAGE 7.37
SIP TAPE APPLIED TO INTERIOR SIP ROOF AND SIP WALL JOINTS



IMAGE 7.38
SIP TAPE APPLIED TO INTERIOR SIP ROOF AND SIP WALL JOINTS



SIP BUILDER-BP 7.8:

A factory representative is recommended during the initial stages of installation for a first-time SIP user, to help expedite the SIP installation, ensuring the system is installed as required and meets performance targets.

SIP manufacturers may have representatives that can provide advice on site, assist with installation, and help teach a building crew how to install SIPs. Check with the manufacturer you are working with to determine what types of installation training options are available and the fees associated with these services.

SIP BUILDER-BP 7.9:

After the project has been erected, review all SIP joints to ensure they are properly nailed/fastened and sealed/taped.

Once the SIP installation is completed, prior to installation of the SIP tape if required, inspect all

SIP joints and connections to ensure proper nailing and installation of sealant. Nailing of SIP joints and connections should be according to the SIP manufacturer shop drawings, listing reports, or other pertinent technical documents.

If SIP tape is required, apply SIP tape over the SIP joints. Ensure that the SIP tape over the roof supports has been properly attached to the underside of the SIP roof panels.

Proper sealing of the SIP joints with sealant and SIP tape mitigates air leakage through the SIP joints helping to ensure a high-performance assembly.

Refer to Images 7.37 and 7.38 for proper SIP tape installation examples.

Refer to Images 7.39 through 7.44 for proper sealant installation examples.

All of these air sealing and taping steps will help to pass the air leakage checks (i.e., blower door tests mandated by building codes)

IMAGE 7.39

SIP ROOF SEALANT APPLICATION



IMAGE 7.40
AUTOMATED SEALANT APPLICATOR



IMAGE 7.41
SIP WALL SEALANT APPLICATION



IMAGE 7.42
SIP WALL SEALANT WITH MANUAL APPLICATOR



IMAGE 7.43

TALL SIP WALL SEALANT APPLICATION



IMAGE 7.44

SEALANT ON SILL PLATE



SIP BUILDER-BP 7.10: **Training programs are available to installers, ensuring that an educated installer understands the importance of proper installing and sealing of the SIP package.**

SIPA has numerous programs in place to train installers to make sure SIPs are installed according to their architectural plans and the manufacturers' subsequent shop drawings.

7.10.1: **SIPA online training courses**

A variety of online training resources for both commercial and residential applications are available for both designers (<https://www.sips.org/resources/architect-education>) and builders (<https://www.sips.org/resources/builder-education>). Many of these are officially credentialed and approved for continuing education credits from American Institute of Architects (AIA) and other organizations. The on-demand video sessions can be watched, and separate ten-question tests taken online, after which certificates will be automatically emailed immediately after passing.

7.10.2: **SIPA Registered Master Builder & Designer programs**

A guided curriculum of ten courses called *Building Education with SIPs Training* or the *BEST* program has been developed to orient those new to SIPs. The self-standing educational units each have a narrated video, study guide, and an optional accompanying quiz to test comprehension. An overview is available at:

<https://www.sips.org/resources/bestprogram>



- Lesson 1 - [Introduction to SIPs](#)
- Lesson 2 - [Basic SIP Design & Engineering](#)
- Lesson 3 - [SIP Order Process](#)
- Lesson 4 - [SIP Building Science](#)
- Lesson 5 - [SIP Layout Drawings](#)
- Lesson 6 - [SIP Site Planning & Coordination](#)
- Lesson 7 - [SIP Layout & Panel Installation](#)
- Lesson 8 - [Integrating Mechanical Systems with SIPs](#)
- Lesson 9 - [SIP Finish Materials & Detailing](#)
- Lesson 10 - [Common Objections for SIP Designs](#)

Once completing the set of ten courses, individuals interested can receive a \$50 discount for first-year membership to join SIPA as a builder or design professional member. SIPA members are eligible to enter a two-step program. The first step is to become a *Registered SIP Builder* or *Registered SIP Designer*. Individuals desiring to take the second step toward the prestigious *Master SIP Builder* or *Master SIP Designer* credential must then fulfill the further requirements illustrating mastery of SIPs by:

Master SIP Builder Program Requirements

- Completing at least ten (10) SIP structures or having worked with SIPs for a minimum of five (5) years and
- Passing the Registered SIP Builder/Designer test of 100 questions with a score of 80% or better and
- Submitting a blower door test result conducted by a RESNET-certified energy rater from a recently completed SIP project with a result not to exceed 2.0 ACH50 and
- Completing the SIPA Master Builder Checklist on the blower door tested project

Master SIP Designer Program Requirements

- Completing at least ten (10) SIP structures or having worked with SIPs for a minimum of five (5) years and
- Passing the Registered SIP Builder/Designer test of 100 questions with a score of 80% or better

Master SIP Builders and Master SIP Designers are distinguished by unique profiles on the SIPA website (<https://www.sips.org/sip-experts/master-builder-profiles>) and also receive special designations and filtering included as part of the SIPA member directory. Special promotional mentions in SIPA newsletters and social media channels are additional benefits of achieving the *Master SIP* designation. Members holding this highest SIP designation enjoy elevated business traffic.

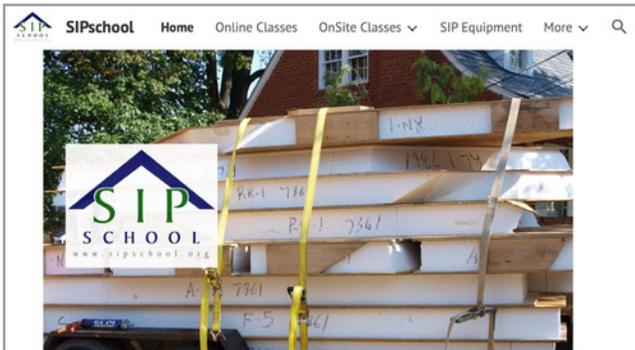
IMAGE 7.45
SIPA BADGES



7.10.3: SIPschool hands-on field training

SIPschool (www.sipschool.org) was established in 2006 by industry veteran Al Cobb to provide training and consulting in SIP manufacturing, design and construction for a fee. For those considering building with and/or installing SIPs in a hands-on or supervisory role, in-person SIPschool training can give you the knowledge to help ensure your successful SIP installation. Instructors address the details used within the SIP industry, across all SIP manufacturers. Regardless of which structural insulated panel system you're using, the building science to SIP installation is universal. Find out more at: <https://www.sipschool.org/OnSiteClasses>

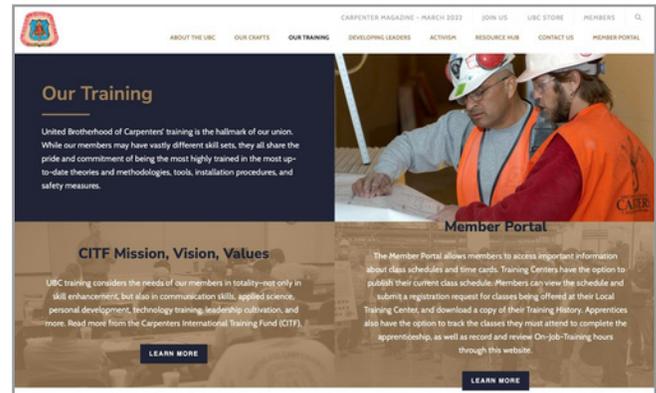
IMAGE 7.46 SIPSCHOOL HOME PAGE



7.10.4: Carpenters International Training Fund (CITF) for SIPs

SIPA collaborated with the United Brotherhood of Carpenters (UBC) trade union, which focuses primarily on commercial construction, in the creation of a detailed 'train the trainer' program curriculum. Contact the national training headquarters in Las Vegas, Nevada or the local union to conduct this training. More information can be found at: <https://www.carpenters.org/citf-training/>.

IMAGE 7.47 CITF WEBSITE



7.10.5: SIP manufacturer in-house training programs

SIP manufacturers offer a variety of training programs to help designers, builders and owners become familiar with the design, use and installation of SIPs. These training programs may consist of the following, to name a few:

- On-site training
- Training at the manufacturer's facility
- AIA accredited training sessions
- Live webinars
- Recorded training sessions
- YouTube videos
- Construction/installation guides

Check with the various SIP manufacturers you are working with for the training programs that are offered. Visit online at <https://www.sips.org/resources/architect-education> for help in scheduling face-to-face educational presentations.

Glossary of Terms

ACH50: the abbreviation for air changes per hour at 50 pascals (Pa) pressure differential and one of the most important metrics used to determine the energy efficiency of a house. It is the measurement of the rate of air leakage: the number of times the air volume in a building exchanges per hour at 50 Pa of pressure from a blower door test. It is considered equal to wind of approximately 25 miles per hour blowing on the outside of a building.

Bottom Plate (SIP wall): the horizontal pieces of wood that are recessed between the OSB facers, in contact with the EPS foam core, at the bottom of a SIP wall.

Capillary break: a non-porous material membrane or coating to prevent moisture migration from the concrete foundation into wood wall assemblies. This prevents wicking of moisture from the foundation.

Chicken boards (chicken sticks, toe kicks, toe boards): non-slip foot holds temporarily nailed onto a roof panel for workers to walk on while doing the install of steep SIP roof panels.

Come-Along: a ratchet system used to pull things (e.g., SIPs) together.

Dimensional lumber: lumber that is cut to pre-defined, standard sizes (e.g., 1-inch x 4-inch, 2-inch x 4-inch, etc.).

Framing factor: the ratio of the area of all wood structural members in contact with both the interior and exterior facers of the panels (e.g., studs and top and bottom plates) to the total surface area of the panel being considered.

HERS: Home Energy Rating System. The HERS index measures energy consumption from heating, cooling, water heating, lights, and some appliances. The lower the index, the less energy a building is consuming. A HERS rating of zero signifies a net-zero energy building.

HVAC: heating, ventilation and air conditioning.

R-value (thermal resistance): the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \cdot ft^2 \cdot OF / Btu$).

Sill plate (SIP wall) (also known as sole plate): the horizontal pieces of treated wood on a concrete or block foundation on which the OSB facers bear.

Sill seal (foam gasket): provides a seal against air leakage and moisture intrusion between concrete foundation and sill plate.

SIPA: Structural Insulated Panel Association (www.sips.org), a non-profit trade association representing manufacturers, suppliers, dealer/distributors, design professionals and builders committed to providing quality structural insulated panels for all segments of the construction industry.

SIPs: Structural Insulated Panels, a high-performance building component for residential and light commercial construction.

SIPschool: SIPschool (www.sipschool.org) was established in 2006 by industry veteran Al Cobb to provide training and consulting in SIP manufacturing, design and construction for a fee.

Stack effect (chimney effect): the rising of warm air and movement out of buildings through unsealed openings at ridge beams, chimneys, stack vents, etc., resulting from warm air rising (buoyancy).

Thermal bridging: the movement of heat across an object that is more conductive than the materials around it. The conductive material creates a path of least resistance for heat. Thermal bridging can be a major source of energy loss in homes and buildings.



LET'S CONNECT

Premier is ready to help you convert from your current building practices to SIPs. In the office or in the field, our construction support is why our clients come back to us year after year. Find your Regional Premier contact at www.premiersips.com.

Structural Insulated Panels:

BUILDING WITH SIPS: SIP ELECTRICAL



SIP BUILDER-BP 9: SIP Electrical

This document is created specifically for builders by the manufacturing members of the Structural Insulated Panel Association (SIPA). It dives deeper and provides more background into each of the summarized topics presented in the [Building with SIPs: NEED TO KNOW](#) overview which highlights important considerations during the construction phase of a Structural Insulated Panel (SIP) structure. Decades of in-field project experience will help reduce the learning curve and leverage SIPs' exceptional qualities to achieve the high-performance results owners expect when building with SIPs. The considerations of how and why the best practices were developed as the common industry platform for SIP construction are explored here.

The index below outlines eleven topical areas, listed in sequence to match the order of building considerations and construction. The details in each chapter provide a deeper understanding of the subject matter to facilitate successful SIP construction. The current chapter is highlighted in blue.

1. High-Performance SIP Building Envelope
2. HVAC Systems with SIPs
3. SIP Structural Capabilities
4. SIP Sizes
5. SIP Shop Drawings
6. SIP Fabrication/Manufacturing
7. SIP Installation
8. SIP Roof and Wall Assemblies
- 9. SIP Electrical**
 - 9.1. Vertical and horizontal chases are provided in SIP walls assisting with wiring at outlet and switch heights.
 - 9.2. Wall and roof chases can be added or removed, prior to SIP manufacture.
 - 9.3. Shop drawings will confirm all chase locations to avoid cutting SIPs in the field unnecessarily. Pre-planning for installation and special chase locations
 - 9.4. Electrical chases should be sealed after electrical rough-in inspection to maximize airtightness.
 - 9.5. An experienced SIP installer helps your electrical rough-in go smoothly.
 - 9.6. Recessed lights are not recommended for installation in SIP roofs. Use of surface mounted LED lighting is recommended.
10. SIP Plumbing
11. SIP Field Modifications

SIP BUILDER-BP 9: SIP Electrical

SIP BUILDER-BP 9.1: Vertical and horizontal chases are provided in SIP walls assisting with wiring at outlet and switch heights.

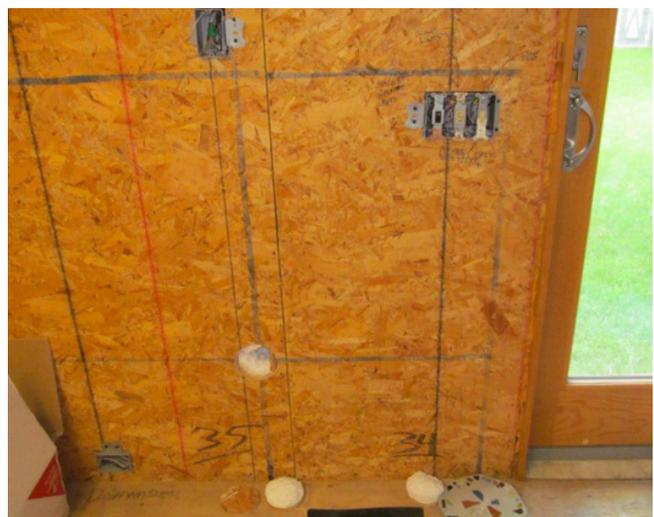
Premier may provide electrical wiring chases in wall panels. The chases are approximately 1-1/4" in diameter and are located in the foam insulation core of the SIP. Horizontal chases in the wall panels are located at switch and outlet heights, approximately 14" and 48" from the bottom of the panel. Vertical chases are located approximately 4' on center in the wall panels. Additional chases may be added. Consult the Premier Rep that you are working with.

The sill plates, top plates, cap plates and lumber splines need to be drilled with an approximate 1-1/2" diameter drill bit when the panels are being installed by the installation crew at the vertical or horizontal chase locations. These holes facilitate the installation of the electrical wires during the electrical wiring process.

To gain access to chase intersections, use a 4" hole saw. Alternatively, jigs can be used to cut/router the rectangle box. Use a flat blade screwdriver to pry out the plug. Save the plug for reinstallation. After pulling your wires, reinsert the plug using panel sealant or expanding foam. See Images 9.1, 9.2 and 9.3.

Refer to Premier's SIP shop drawings (also known as layout drawings) for electrical chase placement.

IMAGE 9.1
INSTALLED LIGHT SWITCHES AND OUTLET BOXES WITH ACCESS PLUGS ON FLOOR.



Note: sealant/expanding foam not shown. See section *SIP BUILDER-BP 9.4* on page 7 for details regarding sealant/expanding foam.

IMAGE 9.2
VARIOUS ELECTRICAL BOX INSTALLATIONS IN SIP WALLS



Note: sealant/expanding foam not shown. See section *SIP BUILDER-BP 9.4* on page 7 for details regarding sealant/expanding foam.

IMAGE 9.3

DIAGRAMMATIC REPRESENTATION OF ELECTRICAL CHASES

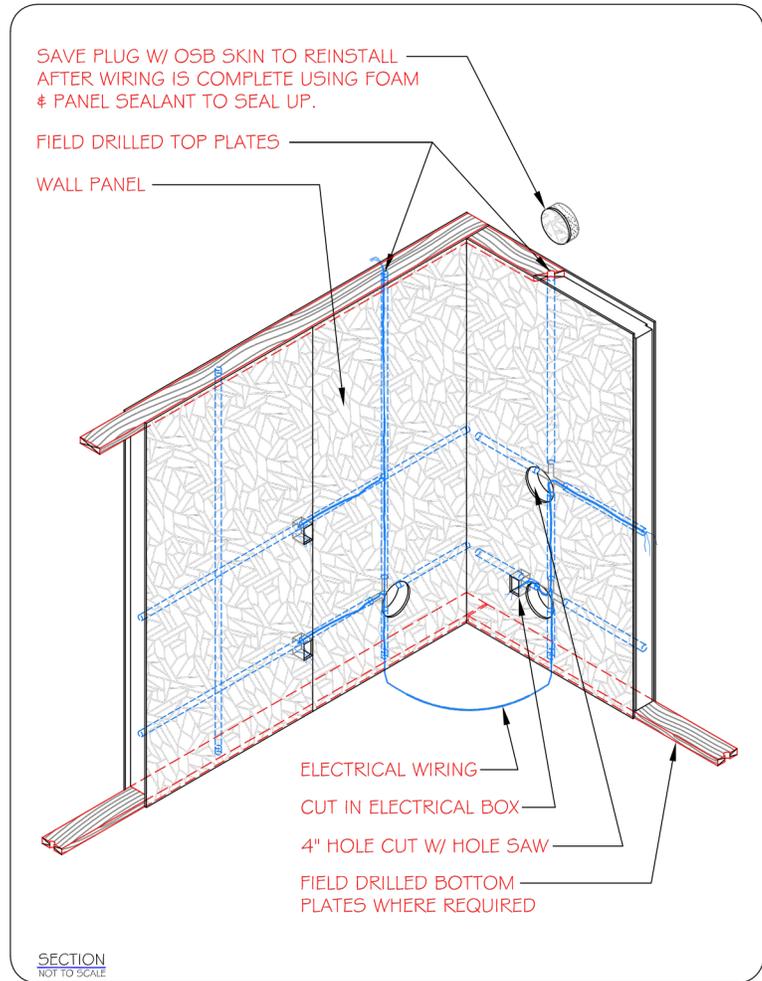


IMAGE 9.4A AND 9.4B

STACKED SIP WALLS WITH ELECTRICAL WIRING CHASES

Vertical chases

Horizontal chases at switch height

Horizontal chases at outlet height



IMAGE 9.5
SILL PLATE DRILLED FOR ELECTRICAL CHASE



IMAGE 9.6
CEILING BOX INSTALLATION IN SIP ROOF



Note: shows installation in process, prior to addition of fasteners and sealant/ expanding foam.

IMAGE 9.7
WALL FRAMED OUT TO ACCOMMODATE ELECTRICAL BOX AND WIRING



Note: sealant/expanding foam not shown. See section *SIP BUILDER-BP 9.4* on page 7 for details regarding sealant/expanding foam.

**SIP BUILDER-BP 9.2 and 9.3:
Wall and roof chases can be added or removed, prior to SIP manufacture. Shop drawings confirm all chase locations to avoid unnecessary cutting of SIPs in the field. Pre-planning for installation and special chase locations is critical.**

Electrical chases are cut prior to adhering facers to the SIP's core. Therefore, it is important that proper chase locations be confirmed prior to project entering production.

Aside from "standard" chases, referenced in section *SIP BUILDER-BP 9.1* on page 3, it is possible to add additional chases. Consideration must be given to the number and location of chases. It is important to remember that a SIP functions as a composite, with each material acting together to create a structural

component far greater than any of the materials tested component far greater than any of the materials tested independently. Should electrical chases need to be added at a later date, consult the manufacturer for guidance.

Typically, the standard factory electrical chases are sufficient to provide adequate access for electrical runs; however, it would be best for the builder and electrician to review the SIP shop drawings. Let your Premier Rep know if you would like to add any additional electrical chases within the SIPs.

While field modifications are possible, images 9.8 and 9.9 illustrate what should NEVER be done. Never cut grooves/channels in the facer of a panel. Grooves or channels in the facer can seriously compromise the structural integrity of your panels. Consult your Premier Rep with any questions.

**IMAGE 9.8
WHAT NEVER TO DO: CUT GROOVES/
CHANNELS IN THE SIP FACER FOR ELECTRICAL
OR PLUMBING**



**IMAGE 9.9
WHAT NEVER TO DO: CUT GROOVES/
CHANNELS IN THE SIP FACER FOR ELECTRICAL
OR PLUMBING**



¹ See [SIP Design-BP 5: SIP Shop Drawings](#)

SIP BUILDER-BP 9.4: Electrical chases should be sealed after electrical rough-in inspection to maximize airtightness.

All penetrations made in the SIP facers need to be sealed with expanding foam to minimize air flow through the chases. This is important to do after the electrical rough-in and inspection is complete around all electrical box locations. It is important that both the general and electrical contractors decide who is responsible for the sealing process to avoid handoff confusion.

The process can be done simply by using expanding foam similar to what is used around windows and doors. Placing a small amount of expanding foam behind the box, where it intersects with the horizontal or vertical electrical chases in the foam insulation core, will minimize air movement.

It is important to use this same process to seal off holes that were drilled through sill and top plate locations in SIP walls and in SIP roof overhang locations.

SIP BUILDER-BP 9.5: An experienced SIP installer helps your electrical rough-in go smoothly.

The SIP installer should drill approximately 1-1/2" diameter holes in the vertical splines, top plate, cap plate of the walls, as well as the sill plate in multilevel construction for the vertical chases, and in the splines connecting the panels for horizontal chases. See Image 9.5.

If these holes are not drilled at these locations in the wall SIPs, the electrical rough-in will be very difficult. An experienced SIP installer helps ensure this necessary step.

RSMeans studies have shown that electrical installation with SIPs is equivalent to standard stick-frame construction and does not require extra time.

Videos about Electrical & SIPs can be found on Premier's YouTube channel at <https://www.youtube.com/@premiersips>

SIP BUILDER-BP 9.6:
Recessed lights (e.g., cans) are not recommended for installation in SIP roofs. Use of surface mounted LED lighting is recommended.

There are limitations on the type of lighting that can be used in SIP roof or ceiling applications. Recessed or can lights that are intended to be recessed into a finished ceiling are not recommended for application in SIP roofs.

There are two primary considerations with using recessed lighting in SIP roofs. First, the OSB facers of the SIPs are a key component of the structural integrity of the panel. Secondly, the heat created by the lighting and the reduction of the insulation in the SIP can lead to hot spots on the roof and possible condensation issues. The heat generated from the recessed light fixture may damage the SIP core.

The lighting choices can be resolved in the design stage. Some of the options include the use of track lighting or surface mounted LED lighting. Furring down below the interior roof SIP facer is an alternative for installing recessed lighting. See Images 9.10 and 9.11.

IMAGE 9.10
FURRING AT RIDGE BEAM OF VAULTED SPACE TO ACCOMMODATE CAN LIGHTING



IMAGE 9.11
ALTERNATIVE FURRED-DOWN CEILING FOR WIRING AND THIN PROFILE LIGHTING



IMAGE 9.12
THIN PROFILE LED LIGHT



Glossary of Terms

Cap plate: lumber ripped to the width of the SIP wall that bears on the top of both facers of the SIP below. For illustration, refer to Details 3.1 and 3.2 in *SIP Design Best Practices 3: SIP Structural Capabilities*.

Channel: a cut into the OSB facer of a SIP. See Images 9.8 and 9.9.

Electrical Chase: a channel in a wall to allow electricians to run their cables in.

Electrical Cut-out: an opening in the facer to recess an electrical box. Expanding foam: any number of expansion foams or spray foams that are canned based polyurethane thermal insulation also used for air sealing.

Groove: a cut into the OSB facer of a SIP. See Images 9.8 and 9.9.

Layout Drawings: see SIP shop drawings.

Sealant: a substance used to block the passage of fluid (including air) through materials; a type of mechanical seal. Sometimes called caulk or mastic.

Sill Plate (SIP wall) (also known as sole plate): the horizontal pieces of treated wood on a concrete or block foundation on which the OSB facers bear. SIP shop drawings: drawings showing more detail than the architectural/construction documents regarding the SIPs. The SIP shop drawing explains the fabrication and/or installation of the SIPs to the SIP manufacturer's production crew and the contractor installation crews. Refer to *SIP Design Best Practices 5: SIP Shop Drawings*.

SIP tape: an all-weather vapor-tight joint sealing tape developed for SIPs and other high-performance building envelopes.

SIPA: Structural Insulated Panel Association (www.sips.org), a non-profit trade association representing manufacturers, suppliers, dealer/distributors, design professionals and builders committed to providing quality structural insulated panels for all segments of the construction industry.

SIPs: Structural Insulated Panels, a high-performance building component for residential and light commercial construction.

Spline: connection system used to connect two panels together at vertical, in-plane joints. Many different spline systems are available including box/block, surface, I-joint, dimensional lumber and engineered lumber.

Top plate: a horizontal member positioned between the SIP facers above the foam. Sits under the cap plate. For illustration, refer to Details 3.1 and 3.2 in *SIP Design Best Practices 3: SIP Structural Capabilities*.



LET'S CONNECT

Premier is ready to help you convert from your current building practices to SIPs. In the office or in the field, our construction support is why our clients come back to us year after year. Find your Regional Premier contact at www.premiersips.com.

Structural Insulated Panels:

BUILDING WITH SIPS: SIP PLUMBLING



SIP BUILDER-BP 10:

SIP Plumbing

This document is created specifically for builders by the manufacturing members of the Structural Insulated Panel Association (SIPA). It dives deeper and provides more background into each of the summarized topics presented in the [Building with SIPs: NEED TO KNOW](#) overview which highlights important considerations during the construction phase of a Structural Insulated Panel (SIP) structure. Decades of in-field project experience will help reduce the learning curve and leverage SIPs' exceptional qualities to achieve the high-performance results owners expect when building with SIPs. The considerations of how and why the best practices were developed as the common industry platform for SIP construction are explored here.

The index below outlines eleven topical areas, listed in sequence to match the order of building considerations and construction. The details in each chapter provide a deeper understanding of the subject matter to facilitate successful SIP construction. The current chapter is highlighted in blue.

1. High-Performance SIP Building Envelope
2. HVAC Systems with SIPs
3. SIP Structural Capabilities
4. SIP Sizes
5. SIP Shop Drawings
6. SIP Fabrication/Manufacturing
7. SIP Installation
8. SIP Roof and Wall Assemblies
9. SIP Electrical

10. SIP Plumbing

- 10.1. Plumbing is recommended to be placed in interior walls to provide for an optimal exterior building envelope.
 - 10.2. Minimize roof penetrations and consider consolidating all vents away from south facing roof planes for potential solar array.
11. SIP Field Modifications

SIP BUILDER-BP 10: SIP Plumbing

SIP BUILDER-BP 10.1: Plumbing is recommended to be placed in interior walls to provide for an optimal exterior building envelope.

Plumbing lines should be pre-planned during the SIP design stage of the project. Plumbing supply lines should be kept out of SIP exterior walls. Placement of any piping in the exterior SIP wall reduces the thermal insulation of the EPS core and in cold climates could be at risk of freezing and maybe bursting. Faucet, spigot or hose bibs that are of the frost-free protected design (used in cold climates) are acceptable because they don't retain water in the pipe as it penetrates the exterior wall, thus decreasing the chance of freezing water damaging pipes.

Even though plumbing vent lines don't risk freezing/bursting, where possible it is discouraged to place them in exterior SIP walls and care must be taken NOT to jeopardize the structural capacity of a wall (see Images 10.1A, B and C, 10.2, and 10.3A and B). Consult with your Premier Rep.

Do not make any cuts to the SIP facers without coordinating with the SIP manufacturer or design professional to verify structural capacities are not compromised.

IMAGE 10.1A
HOSE BIB



A few options to consider are:

1. Furr out the exterior wall (see Images 10.4 and 10.5).
2. Preplan with your Premier Rep to build into the SIP panel a dedicated void space for the vent pipe (see Image 10.6).
3. Use an island vent option (see Images 10.7, 10.8, 10.9 and 10.10).

Facers of the SIP walls should *never* be field cut to accommodate plumbing runs unless Premier or design professional is consulted. If piping must be placed along an exterior wall, furring out the interior is recommended (see Images 10.4 and 10.5), or place the piping in a cabinet (e.g., kitchen sink or bathroom, see Image 10.11).

Some jurisdictions allow for a mechanical vent or air admittance valve to be used. The use of an "island or loop" style vent also works well to allow multiple fixtures to be brought to a more central vertical vent pipe location in interior walls, which also minimizes the penetrations through the roof system (see Images 10.7, 10.8, 10.9 and 10.10).

IMAGE 10.1B

PLUMBING VENT PIPE GOING INTO SIP WALL (NOTE: DO NOT DO THIS WITHOUT CONSULTING THE SIP MANUFACTURER)



IMAGE 10.1C

PLUMBING VENT PIPE GOING INTO SIP WALL (NOTE: DO NOT DO THIS WITHOUT CONSULTING THE SIP MANUFACTURER)



IMAGE 10.2

**DIRECTING VENTING INTO NON-SIP INTERIOR WALL
(PREFERRED ALTERNATIVE TO IMAGES 10.1A AND B)**

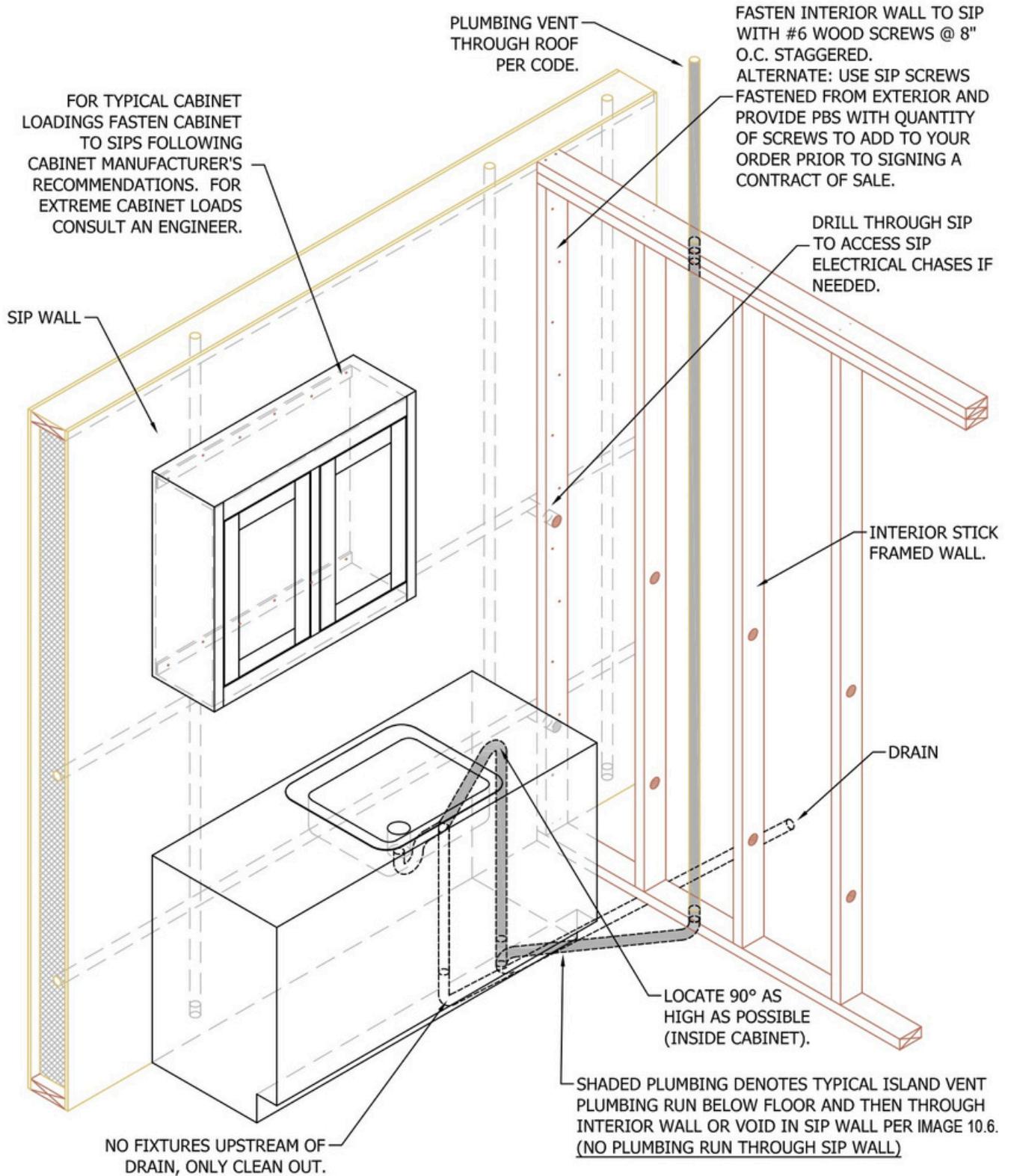


IMAGE 10.3A

WALL AND ROOF FURRING OUT OPTION (PREFERRED ALTERNATIVE TO IMAGES 10.1A AND B)

NOTE:

FASTENER / ADHESIVE ATTACHMENT OF 2X'S AND SPRINKLER SYSTEM TO BE SPECIFIED BY AN ENGINEER.

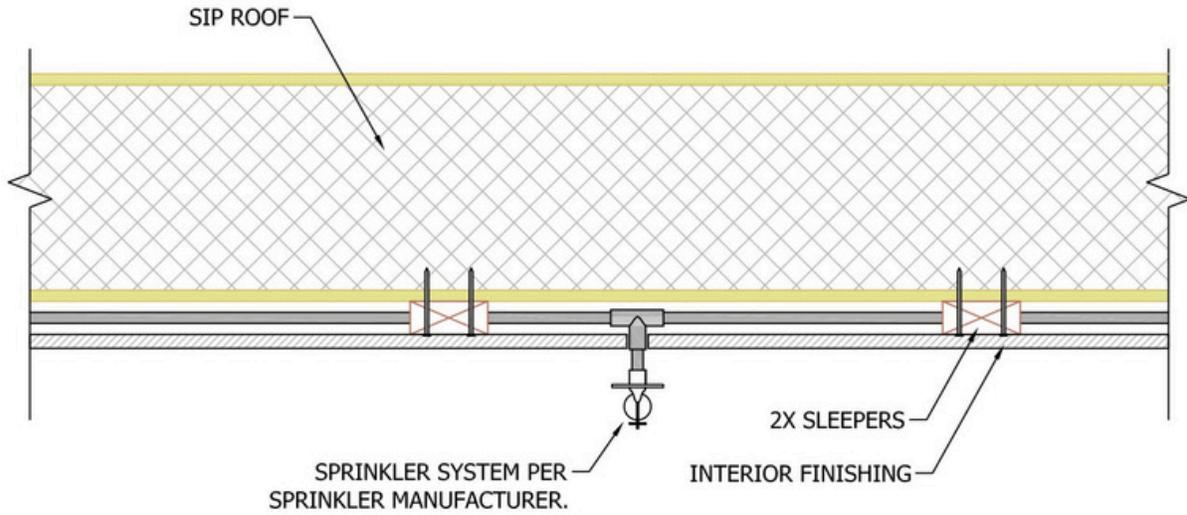


IMAGE 10.3B

WALL AND ROOF FURRING OUT OPTION (PREFERRED ALTERNATIVE TO IMAGES 10.1A AND B)

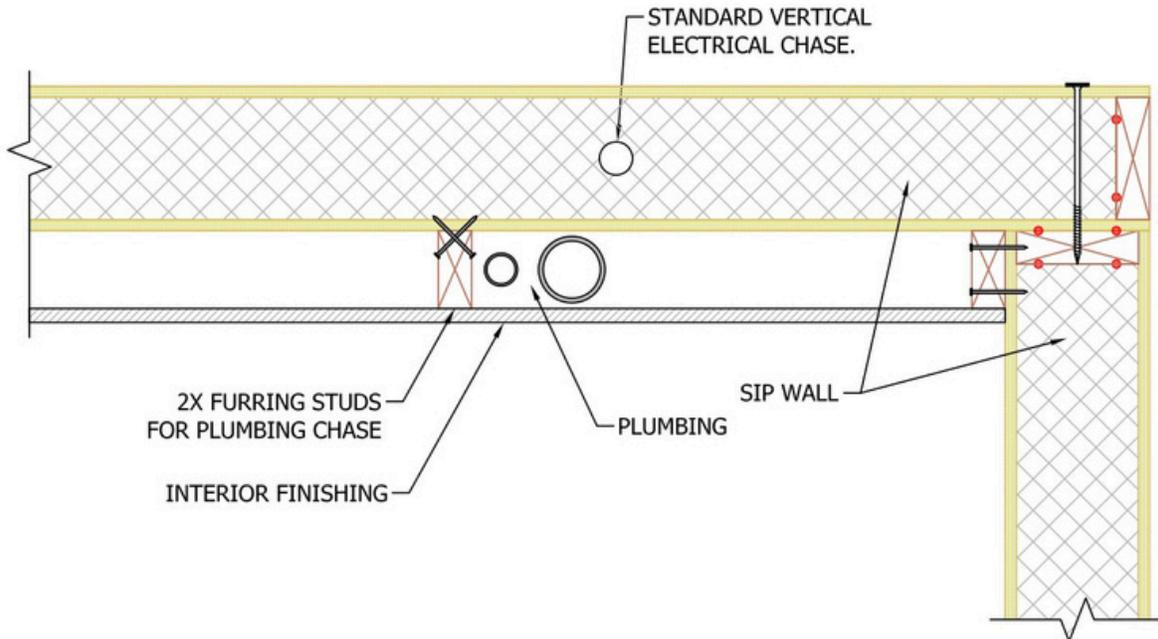


IMAGE 10.4

EXTERIOR SIP WALL WITH FURRED OUT STUD WALL ON INSIDE FACER FOR UTILITIES (PHOTO ILLUSTRATION OF IMAGE 10.3B)



IMAGE 10.5

INTERIOR FURRED OUT STUD WALL FOR UTILITIES WITH DRY WALL (PHOTO ILLUSTRATION OF IMAGE 10.3B)

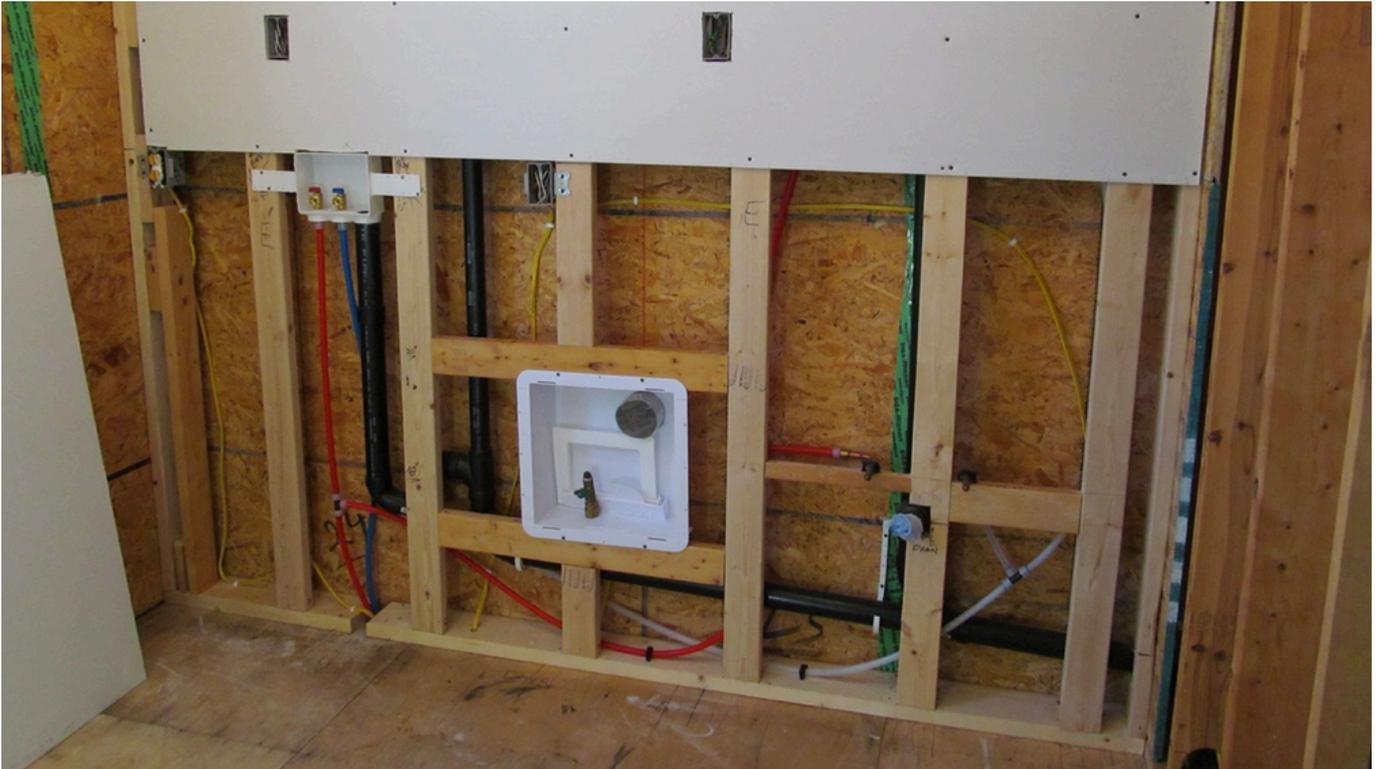


IMAGE 10.6
VOID IN SIP WALL

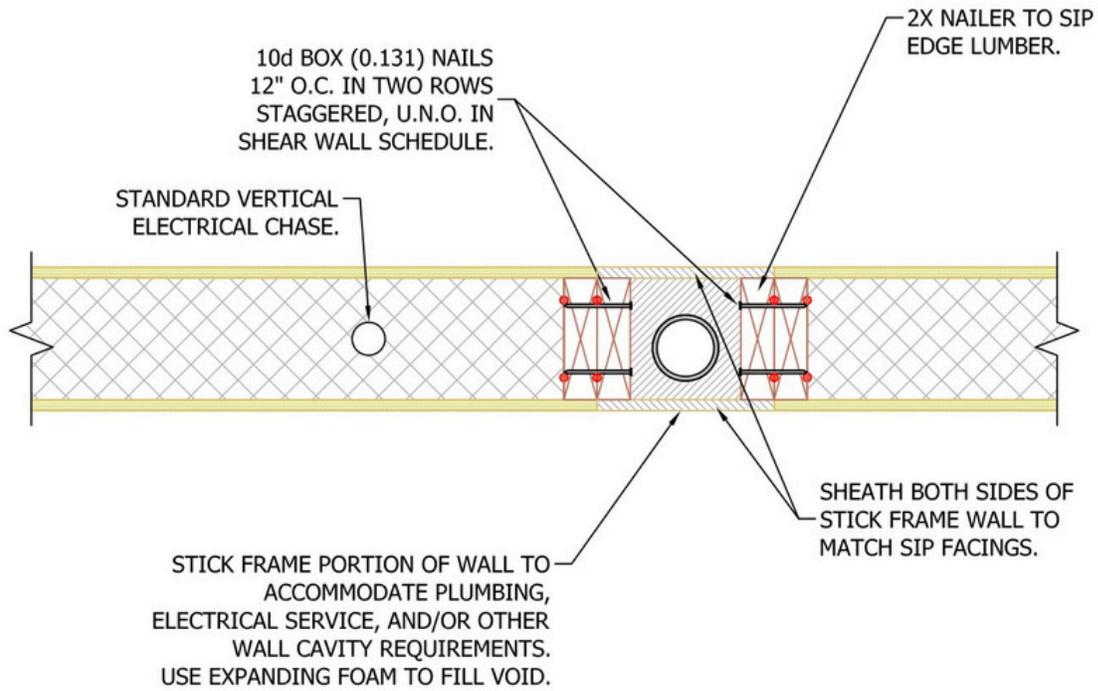
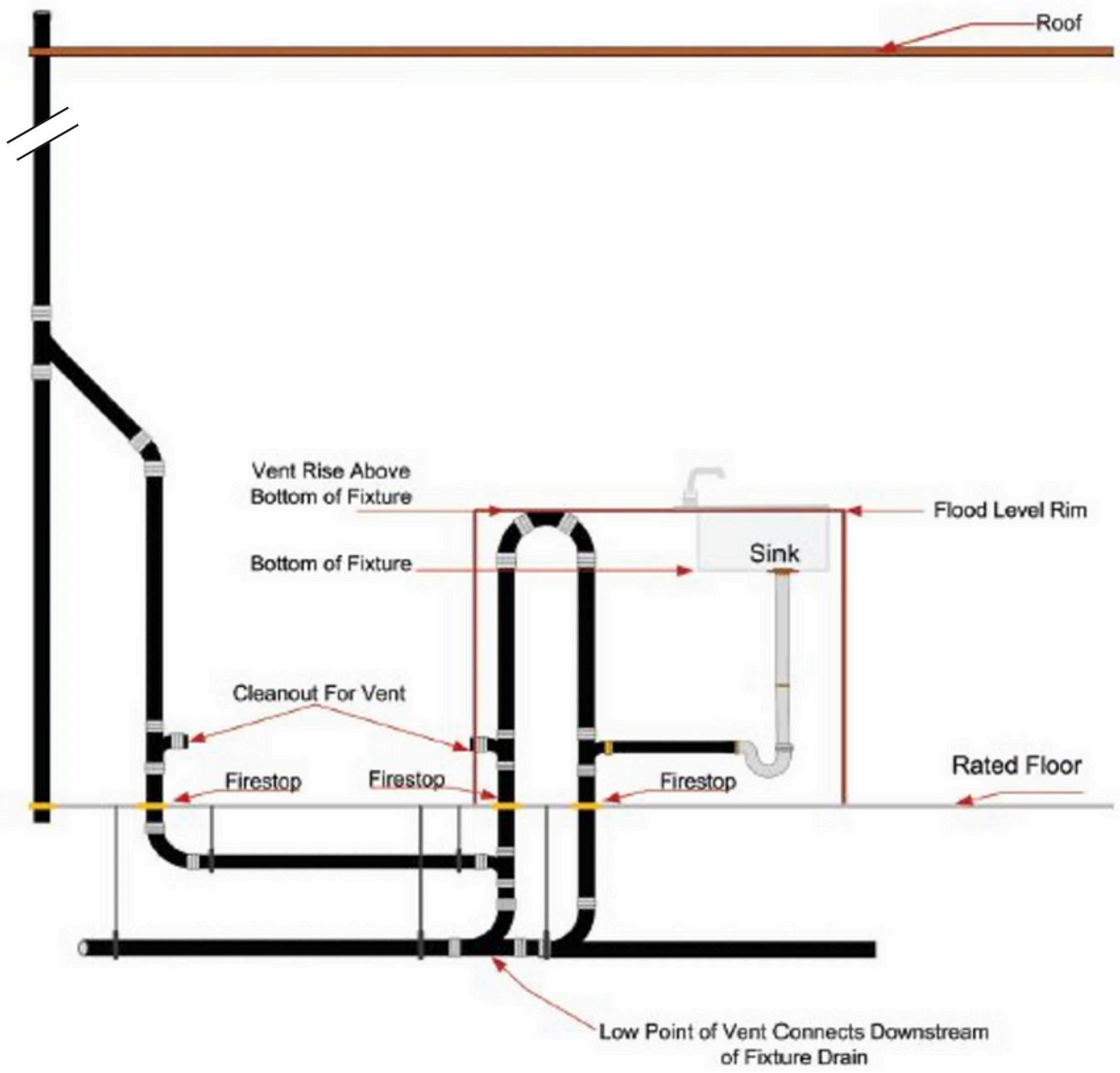


IMAGE 10.7
KITCHEN ISLAND WITH SINK



IMAGE 10.8
ISLAND FIXTURE VENT



Structural Insulated Panels:

BUILDING WITH SIPS: NEED TO KNOW



Building with SIPs: NEED TO KNOW

BUILDING CONSIDERATIONS	3
High-performance building envelopes use SIPs	4
SIP performance is based on more than its stated R-value	4
HVAC system rightsizing reduces costs and enhances comfort and performance	5
SIP structural capabilities cater well to virtually any design	5
SIPs are typically factory cut for accuracy, quality and reduced onsite labor	6
SIPs are manufactured using “SIP shop (or panelized) drawings”	6
SIPs are customized to varying levels depending on client needs	7
Roof and wall assemblies	7
Factory cut electrical chases reduce electrician time in the field	8
Design plumbing into interior walls	8
Resource to better understand the science of building with SIPs	8
CHECKLISTS	9
High-Performance Building Envelope	9
HVAC Systems	10
Structural Capabilities	11
SIP Sizes	12
Shop Drawings	13
SIP Fabrication	14
SIP Installation	15
Roof and Wall Assemblies	16
Electrical	17
Plumbing	18

BUILDING CONSIDERATIONS

This document was created specifically for builders to highlight important considerations during the construction phase of a structural insulated panel (SIP) structure. Decades of in-field project experience will help reduce the learning curve and leverage SIPs' exceptional qualities to achieve the high-performance results owners expect when building with SIPs. The experts at Premier Building Systems are always available to make your building process easier and more efficient.



High-performance building envelopes use SIPs

SIPs yield high-performance building envelopes with energy performance well beyond conventional framing. SIPs provide a core of high R-value solid insulation typically requiring no additional continuous insulation on the building exterior. Elimination of traditional batt or spray insulations eradicates the installation quality challenges these products create and removes the need for insulation subcontractors. The large size of SIPs results in fewer air gaps, reduced thermal bridging from fewer lumber connections (lower framing factor) and elimination of air spaces within the wall cavity. SIPs provide a virtually airtight envelope improving indoor air quality (IAQ) and creating healthier homes and businesses. Airtightness also reduces HVAC sizing and dramatically improves occupant comfort by providing consistent room temperatures, regardless of the number of floors. A SIP's thickness determines its insulation R-value, but the greatest gain comes from the tightness of the engineered design and the other high-performance components (HVAC, windows, etc.) as specified.



Stick Framed Building

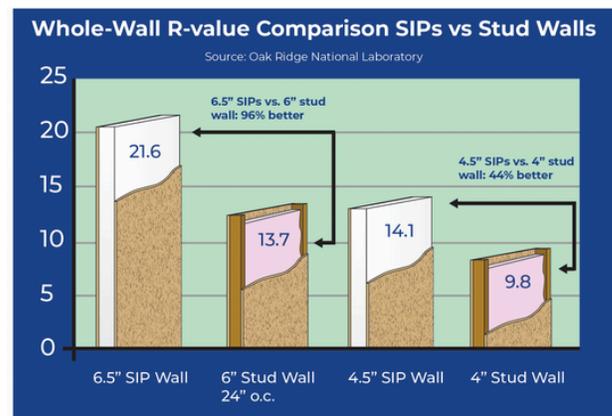


Premier SIPS Building

**Fifteen
Times More
Airtight**

SIP performance is based on more than its stated R-value

R-values of SIPs are readily available from SIP manufacturers. These are useful insulation metrics but only one component in the evaluation of a high-performance building envelope. Integration of all system components and airtightness of the envelope assembly are more important considerations when seeking performance over individual component metrics. To illustrate this, the Department of Energy's Oak Ridge National Laboratory (ORNL) tested the performance of large section wall assemblies. The resulting whole-wall R-value data revealed that a 4-inch SIP wall rated at R-14 outperformed a 2x6 inch wall with R-19 fiberglass insulation. The whole-wall R-value was R-21 for a 6-inch SIP wall or 96% higher than the whole-wall R-value of R-11 for the 2x6-inch wall using theoretically R-19 fiberglass insulation. ORNL also tested a SIP structure side by side with a conventional 2x4 structure to evaluate air leakage. The SIP structure had only 7% the air leakage of the conventional structure. In short, unlike for SIPs, joining real-world air-leakage rates and thermal bridging for conventionally framed structures lowers performance far below their theoretically calculated effective insulation R-values. For more information relating to key, high-performance building envelope metrics, visit the resources drop-down menu at www.premiersips.com.



HVAC system rightsizing reduces costs and enhances comfort and performance

SIP envelopes deliver a high-performance, virtually airtight shell. Because of this, the building must have mechanical make-up air. Several options introduce fresh air with varying degrees of complexity and cost. To ensure a balanced HVAC system, consider specifying a Heat Recovery Ventilator (HRV) or Energy Recovery Ventilator (ERV). Superior SIP energy efficiency and airtightness reduce HVAC equipment load and often provide savings via smaller unit requirements. Design should also include HVAC installed inside the conditioned SIP envelope. Conventional practice cannot be used in sizing HVAC equipment for SIP structures. Oversized equipment is not only more costly but short cycles inhibiting the building's ability to dehumidify causing comfort and mold concerns. SIP building designers, HERS raters and HVAC professionals can accurately calculate thermal performance of SIP envelopes using energy modeling with ASHRAE Manual J or REM/Rate or Ekotrope design software. Actual air leakage performance is best determined by a pre-drywall blower door test. SIP structures typically achieve less than 2 ACH@50pa at this stage, but values less than 1 ACH50 are often achieved with proper design and installation. While SIPs provide the basis for an airtight structure, overall performance can be compromised if proper consideration for energy load calculation inputs or installation is not given to the other critical system components (e.g. windows, HVAC, plumbing, etc.).



SIP structural capabilities cater well to virtually any design

SIP structural capacities comply with building codes through evaluation reports from third-party evaluators including ICC NTA, Intertek, and IAPMO. SIPs' increased strength over conventional framing enables greater design flexibility. A SIP can span up to 24 feet when incorporating structural connections (splines) eliminating intermediate support structures and creating spectacular vaulted ceilings. Many designs eliminate headers with conscious awareness of where point loads are located, reducing costs, labor, and thermal breaks. Load charts and capacities are published at www.premiersips.com. A Premier SIPS Representative can be an invaluable resource; each provides understanding on how SIP height, thickness, and connection methods affect the structure's design. Our Premier regional Representatives are listed at www.premiersips.com, and can provide lists of structural engineers experienced with SIPs.



SIPs are typically factory cut for accuracy, quality and reduced onsite labor

The cost and scarcity of construction labor is a challenge; the more that can be done by the SIP manufacturer, the less demand for what has become a scarce resource – jobsite labor. Because SIPs are manufactured in very large sizes (up to 8 x 24 feet), there are fewer connections, resulting in faster installations and a much tighter envelope. Working with Premier SIPS Regional Manager, designers and builders can reduce costs by employing common SIP dimensional sizes of 4', 8', 12', 16', etc. in their designs. Factory lumber installations minimize jobsite labor and waste while ensuring joint and boundary connection quality.

SIPs are manufactured using “SIP layout (or panelized) drawings”

Architectural drawings are converted to SIP layout drawings. Layout drawings specify SIP size, layout, assembly details, and installation specifications. They are also used for factory fabrication purposes and on site installation. Shop drawings are provided to the client, or their authorized representative, for review and approval. Commitment to the drawing review process is crucial. Attention to detail during review ensures fabricated panel accuracy, installation ease and meeting SIP performance expectations. Early interaction with your Premier Regional Representative helps design optimization resulting in material cost savings and installation speed. They also can share samples of SIP shop drawings for your review and understanding.



SIPs are customized to varying levels depending on client needs

Premier offers differing levels of SIP fabrication. They include blank SIPs, prefabricated SIPs and ready-to-assemble (RTA) packages.

BLANK SIPs are the least expensive, but limit your installation speed advantage, create additional waste, and require a higher degree of installation skill as all cutting is performed onsite.

PREFABRICATED SIPs are designed and cut in the factory increasing site installation speed, improving fit and finish.

RTA packages include factory preinstalled internal lumber and headers maximizing onsite speed and efficiency.

Prefabricated is typical although, as labor becomes scarce, RTA packages are gaining in popularity. Your Premier SIPS Regional Manager can provide detail concerning benefits of each option.

Roof and wall assemblies

SIPs are compatible with conventional roof and wall claddings. Unlike traditional framing, there is no internal air cavity within the SIP. The foam core of SIPs is solid and continuous throughout the wall and roof, eliminating convection and condensation issues occurring in conventional cavities. It is important to ensure a code-approved weather-resistive barrier is specified under wall claddings and approved underlayments for roof covering. Designing for the appropriate climate zone will help maximize durability. In some climate zones, a back-ventilated assembly may be appropriate. Because SIPs use very little solid lumber, an increased fastener schedule could be required when attaching exterior cladding. Application of fully adhered products to SIPs roofs is not recommended. A separation layer should be added between the SIP roof and underlayment to avoid damage to the exterior SIP facing should there be a need to remove and replace the underlayment in the future.



Factory-cut electrical chases reduce electrician time in the field

Electrical chases are factory installed during panel fabrication simplifying electrical rough-in and saving electricians labor by eliminating time spent drilling holes in studs. Vertical and horizontal chases are provided in SIP walls to assist with wiring. Standard practice is to cut chases horizontally at outlet and switch heights. Chases can be added to SIP roofs upon request. Use of surface mounted LED lighting is recommended in place of recessed lighting as they don't penetrate the envelope and jeopardize airtightness. Determining electrical requirements prior to SIP manufacturing increases efficiency of installation. Plan a shop drawing review with the electrician prior to final approvals to verify chase locations, accommodate electrical layout and ensure code compliance.

Design plumbing into interior walls

Eliminating the possibility of condensation or supply lines freezing within a SIP wall is an important design consideration. Plumbing should be relocated to interior walls wherever possible. If plumbing must be located on an exterior wall, it is recommended to fur the wall on the interior side of the SIP wall to conceal plumbing. Plumbing penetrations such as drain waste vent pipes can be placed perpendicularly through SIPs if thoroughly sealed to prevent air infiltration. Consult with Premier SIPS Regional Manager if this is necessary.

To better understand the science of building with SIPs

Review "Builder's Guide to Structural Insulated Panels for all Climates" by Joseph Lstiburek. This resource provides invaluable assistance in Building Science related details and can be purchased online at [Amazon](#) or www.sips.org.



Building with SIPs: CHECKLISTS

The following series of checklists should be used as a resource to ensure the best experience and outcome for designers, builders, and owners of structural insulated panel (SIP) buildings. With decades of experience in the intricacies of SIP design and construction, these checklists aim to assist you in leveraging SIP best practices and seamlessly integrating them into your projects.

CHECKLIST #1

High-Performance Building Envelope

SIPs are used to design high-performance building envelopes offering energy performance beyond conventional framing.

KEY POINTS:

SIP envelopes are intended to be high-performing. The objective is to build the building as tight as possible and allow mechanical ventilation to manage air flow. This will make for a healthier, more comfortable structure with improved indoor air quality (IAQ).



KEY HIGH PERFORMANCE ACTION ITEMS:

- 1. Contact your Premier SIPS Representative at www.premiersips.com to learn about the benefits of SIP construction.
- 2. Utilize Premier-approved sealing methods to limit air and vapor transmission through SIP joints. All sealing details are included in the construction details provided with each SIP package. Construction details are also available at www.premiersips.com.
- 3. Seal all penetrations (pipes, vents, chimneys) through the SIP envelope with Premier SIPS sealant.
- 4. Use a blower door test to verify your SIP installation.

CHECKLIST #2

HVAC Systems

SIP envelopes deliver high-performance, extremely airtight envelopes. The energy efficiency and airtightness positively affect the HVAC design resulting in smaller unit requirements.

KEY POINTS:

1. Oversizing equipment jeopardizes building and equipment durability while needlessly increasing expenses.
2. SIP building designers, HERS raters, and HVAC professionals must accurately calculate thermal performance of SIP envelopes.
3. An energy model using ASHRAE Manual J or REM/Rate or Ekotrope design software should be used to verify proper equipment sizing.
4. High-performance structures designed and built extremely airtight must have mechanical make-up air. There are several options with varying degrees of complexity and cost ensuring a balanced HVAC system that will introduce fresh air.
5. Penetrations in the SIP envelope should be sealed to maximize airtightness.

ACTION ITEMS FOR HVAC SYSTEMS & SIPS:

- 1. Work with an HVAC professional that is familiar with high-performing, airtight structures.
- 2. Use energy calculations reflecting proper SIP solid core long-term thermal R-values, energy efficiency and the extreme airtightness of the envelope to avoid HVAC equipment oversizing.
- 3. Keep all HVAC equipment and duct work inside the conditioned SIP envelope.
- 4. Consider specifying a heat recovery ventilator (HRV) or energy recovery ventilator (ERV), as referenced in ASHRAE 62.2 guidelines, for balanced fresh make-up air.



CHECKLIST #3

Structural Capabilities

SIPs have the structural strength to work well in virtually any design.

KEY POINTS:

1. The entire SIP works together to carry and manage loads. Therefore cutting SIP facings should only be done with manufacturer's or engineer's approval. Trimming of facings to attain a good fit is acceptable, as well as making cuts for small openings, such as electrical boxes.
2. Manufacturers publish construction manuals and load design charts that can be accessed to understand structural capacities.
3. SIPs are compatible with internal conventional framing when special structural requirements are met.
4. Point loads may dictate the need for additional structural components to be embedded internally. Avoid point loads over openings to allow SIPs to act as the header without the need for additional structural elements.

ACTION ITEMS FOR SIPS STRUCTURAL CAPABILITIES:

- 1. Contact your Premier SIPS Regional Representative at www.premiersips.com to request their structural information and building code evaluation reports.
- 2. Check foundation or floor deck for square, level, and correct dimensions. Shim and adjust as needed.
- 3. Follow Premier's recommended spline fastening schedules. All fastening details are provided in the construction details included with each SIP package. Details are also available at www.premiersips.com.



CHECKLIST #4

SIP Sizes

SIPs can be manufactured in very large sizes (up to 8 x 24 feet). Large monolithic SIPs provide faster installation and reduce the number of connections which results in a much tighter envelope.

KEY POINTS:

1. SIPs are large and adequate room is needed for receiving, staging, and lifting panels. Three-inch-wide supports are recommended every 8 feet minimum to keep SIPs off the ground and to keep them level.
2. Lifting equipment such as a SkyTrak or telehandler (all-terrain forklift) is recommended for unloading and stacking SIPs. Fork extensions for 8-foot-wide SIPs are recommended.
3. If the crew size or site conditions dictate smaller hand setting of SIPs, make sure your Premier Regional Representative or Project Manager is aware of limitations upfront. This will also assist with coordinating delivery to the jobsite



ACTION ITEMS:

- 1. Work with your Premier SIPs Regional Manager to learn about our SIP size capabilities.
- 2. Protect the SIPs from weather upon delivery until time of installation.
- 3. Use appropriate methods for moving, stacking, handling and erecting SIPs to maintain the integrity of the SIPs and promote the safety of the construction team.

CHECKLIST #5

Layout Drawings

SIP manufacturers typically convert your architectural drawings into SIP shop drawings. Shop drawings specify SIP size, layout, assembly details and installation specifications. They are also used by the SIP manufacturer for accurate CNC fabrication.

KEY POINTS:

1. Understand the difference between purchasing SIPs without any fabrication, fabricated SIPs, and a full ready-to-assemble (RTA) package. Fabricated or ready-to-assemble SIP packages reduce waste onsite and require less time and skill.
2. Depending on complexity of design, need for engineering, permitting and possible revisions, the development of shop drawings is a process that relies on engagement from those reviewing these drawings on behalf of the building owner.
3. Window/door schedule will have to come with the plans so the designer can draw the proper plans.
4. SIPs are pre-cut in the factory per the shop drawings. Building the foundation as accurately as possible will help reduce onsite adjustment. Slightly larger in size is preferred to allow for minor adjustments onsite.
5. Shop drawings are provided for client review and approval.
6. There will be a lead time from shop drawing approval to delivery.

ACTION ITEMS FOR LAYOUT DRAWINGS:

- 1. Ask your Premier SIPS Regional Representative for a sample SIP layout drawing for your review and understanding.
- 2. Involve your Regional Representative early to ensure SIP design optimization. Minor alterations can provide dramatic savings in material costs and speed of installation.
- 3. Communicate with your Regional Representative regarding any unique needs such as backers, structure in SIPs, solar panels, or hanging floor system to assure a quality build.
- 4. Understand what lumber and other accessories are coming with the SIP package and what must be ordered (top/bottom plates, bucks, posts, beams, etc.). This will reduce onsite delays.

CHECKLIST #6

SIP Fabrication

Premier offers three different levels of SIP fabrication to choose from. These are: blank SIPs, prefabricated SIPs, and ready-to-assemble (RTA) packages.

KEY POINTS:

1. Blank SIPs are the least expensive, but limit your speed of installation advantage, create additional onsite waste, and require a higher degree of installation skill as all cutting is performed onsite.
2. Prefabricated SIPs are designed and cut in the factory per exact floor plans. Fabrication is factory automated with precision, CNC equipment and quality controls. This increases the speed of installation and improved fit and finish on the jobsite.
3. An RTA package includes internal lumber and headers provided and preinstalled in the factory to maximize speed and efficiency onsite.

ACTION ITEM:

- 1. Contact your Premier SIPS Regional Representative at www.premiersips.com to learn more and choose which fabrication option is best for your project.



CHECKLIST #7

SIP Installation

SIPs are high-performance building envelopes and an experienced SIP installer is strongly recommended.

KEY POINTS:

1. Assure there is a capillary break between the SIPs and concrete floors, foundations and walls.
2. Typically, it is best to start installation of wall SIPs at a corner.
3. The use of ratchet straps to pull SIPs together can be very helpful during installation.
4. During installation, it is important to drill plates and connectors for access to electrical chases.
5. Brace SIPs appropriately during construction to withstand wind-related issues.
6. When installing roof SIPs, install splines on the ground, to make the process easier.
7. Due to the “stack effect” (air exfiltration), the ridge joint is the most important joint. Follow ridge sealing detail to the letter. (Provided with Layout Drawings)
8. A Regional Representative can assist with a job site start for new SIP installers to help expedite the SIP installation. This first hand training can help ensure the system is installed as required and meets performance targets.
9. After the project has been erected, review all SIP joints to ensure properly nailed and sealed per construction details in Layout Drawings.
10. Training resources ensure that an educated installer understands the importance of properly installing and sealing the SIP package. Your local Premier SIPS Rep can direct you to the best installation videos and training to meet your needs.

ACTION ITEMS FOR SIPS INSTALLATION:

- 1. If needed, your Premier SIPS Representative will assist with identifying a SIP installer. Jobsite start training is also available upon request.
- 2. Review recommended job site materials list to ensure appropriate installation tools are ready. These include lifting plates, sealant applicators, 8' level, and more.
- 3. Spot check site dimensions versus SIPs, to assure a good fit, prior to lifting roof panels.
- 4. Use semi-permeable membranes on SIP roofs to allow for water vapor / moisture escape. Peel and stick membranes are not recommended to cover the entire roof. Refer to Premier’s Technical Bulletins for specific recommendations. .
- 5. Use a blower door test to verify your SIP installation is tight and sealed. This can help identify any problems that can be fixed pre-drywall.

CHECKLIST #8

Roof and Wall Assemblies

SIPs are compatible with conventional roof and wall claddings. As with all high-performance building envelopes, proper detailing is critical.

KEY POINTS:

1. Verify recommended sealing of SIP joints is completed prior to installation of finishes.
2. In climate zones 4 and colder, SIP Tape should be installed on the interior of the structure. Do not provide complete coverage on the exterior of a vapor barrier such as peel and stick underlayment. Standard application of ice and water underlayment at eaves and valleys is acceptable over a SIP roof.
3. Application of fully adhered products to SIP roofs is not recommended. A separation layer is recommended to facilitate future roofing replacement.
4. SIPs can withstand minor wetting during the construction process. Covering SIPs with roof and wall cladding should be completed as soon as practical but only when SIPs are dry.

ACTION ITEMS: ROOF & WALL ASSEMBLIES

- 1. Review “Builder’s Guide to Structural Insulated Panels for all Climates” by Joseph Lstiburek. This resource will provide invaluable assistance in Building Science details.
- 2. Verify Premier SIPS recommended sealing of SIP joints is completed prior to installation of cladding.
- 3. Use code-approved underlayment and roof covering. See Premier Technical Bulletins for more information.
- 4. Use code-approved weather-resistive barrier under cladding for walls. See Premier Technical Bulletins for more information.
- 5. Follow cladding manufacturer’s recommendations for fastening to SIPs. If not available, review fastener capacities in OSB to determine fastening schedule. See Premier Technical Bulletins for more information.
- 6. Provide specific instructions to the wall cladding and roofing trades. This input should be consistent with the detailing needed for the climate and type of cladding.

CHECKLIST #9

SIP Electrical

Electrical chases are factory fabricated at the time of panel production to simplify the electrical rough-in, saving the electrician a great deal of time in the field.

KEY POINTS:

1. Vertical and horizontal chases are provided in SIP walls assisting with wiring at outlet and switch heights.
2. Layout drawings will confirm all chase locations to avoid cutting SIPs in the field unnecessarily. Pre-planning for installation and special chase locations is critical.
3. Wall and roof chases can be added or removed, prior to SIP manufacture.
4. Electrical chases should be sealed at the time of electrical rough-in inspection to maximize airtightness.
5. Recessed lights are not recommended for installation in SIP roofs. Use of surface mounted LED lighting is recommended.

ACTION ITEMS FOR SIP ELECTRICAL INSTALLATION:

- 1. Prior to production, plan a review of the panel layout drawings with the electrician to verify chase locations will accommodate electrical layout and code compliance.
- 2. Do not cut SIP facings for electrical access, with the exception of adding electrical boxes.
- 3. Double check panels for electrical chase marks, and if not, mark those that are not.
- 4. Consult with your Premier SIPS Regional Representative concerning electrical chases in roofs. Guidelines can be found in Premier's Technical Bulletins.

CHECKLIST #10

SIP Plumbing

Plumbing should be placed within interior walls to protect the integrity of the high-performance envelope and to avoid the freezing of the supply lines in cold climates.

KEY POINTS:

1. Plumbing is recommended to be placed in interior walls to provide for an optimal exterior building envelope.
2. Minimize roof penetrations and consider consolidating where feasible and insulate any vent openings with expanding foam.

ACTION ITEMS FOR SIPS & PLUMBING:

- 1. If plumbing needs to be placed in exterior walls, consult with your Premier SIPS Rep on best strategies, and review Premier's Technical Bulletins for recommendations.





Discover how easily you can start or deepen your understanding of designing, installing, and excelling with Premier SIPs in your next commercial or residential project.

The following resources are available online, anytime:

- [SIP Industry AIA/MasterSpec Specification](#)
- [Designing with SIPs: Design Considerations](#)
- [Building with SIPs: Need to Know](#)
- [Installation Videos & How-To's](#)
- [SIP Best Practice Deeper Dives](#)
- [Technical Bulletins](#)
- [Structural Insulated Panel \(SIP\) Comprehensive Resource Manual](#)
- [Builder's Guide to SIPs book by Joseph Lstiburek of Building Science Corporation](#)
- [Detailed case studies, award-winning project briefs](#)

Get all this and much, much more at www.premiersips.com



LET'S CONNECT

Premier is ready to help you convert from your current building practices to SIPs. In the office or in the field, our construction support is why our clients come back to us year after year. Find your Regional Premier Contact at www.premiersips.com.

IMAGE 10.9

AIR ADMITTANCE - INDIVIDUAL VENT

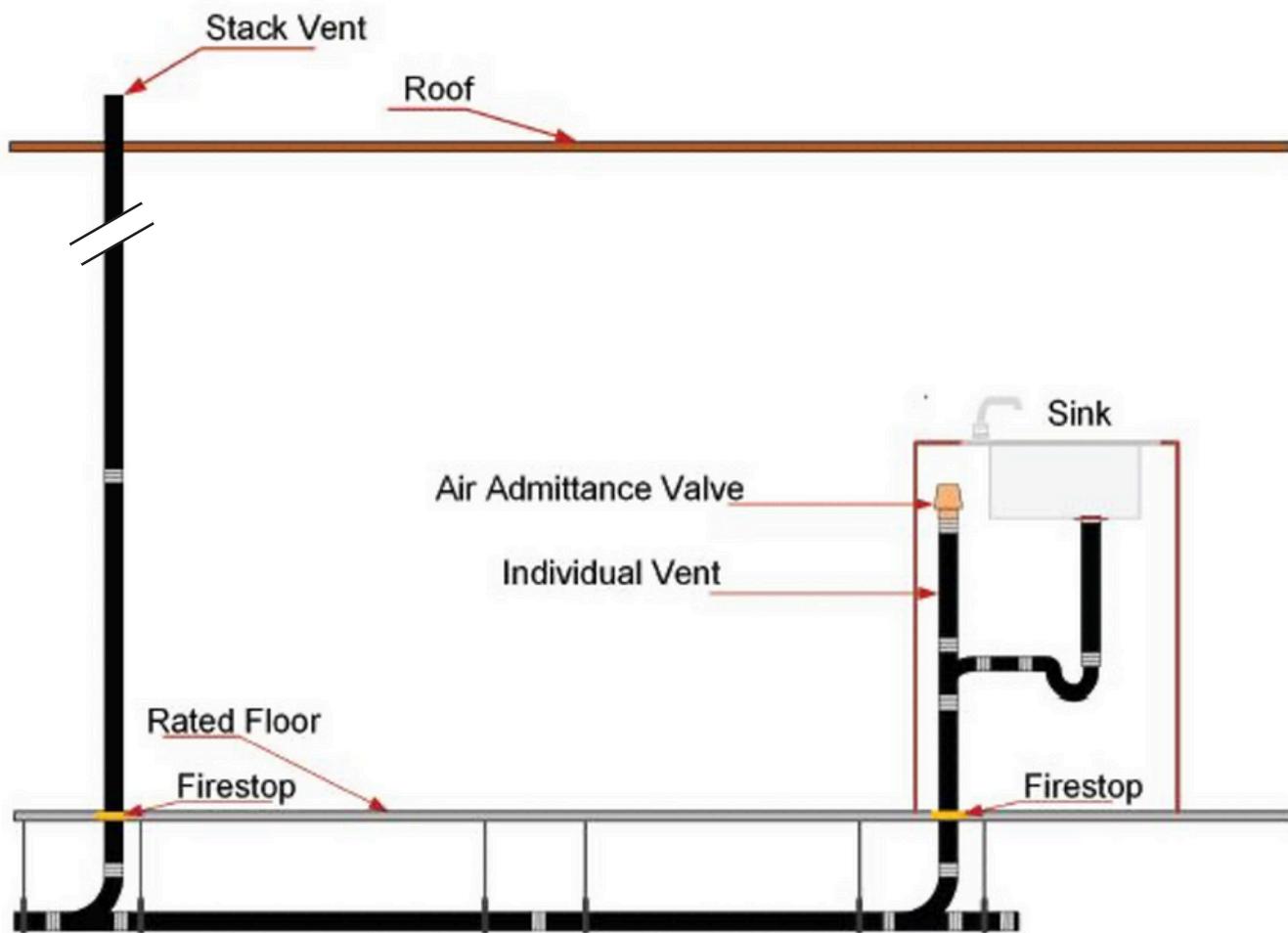
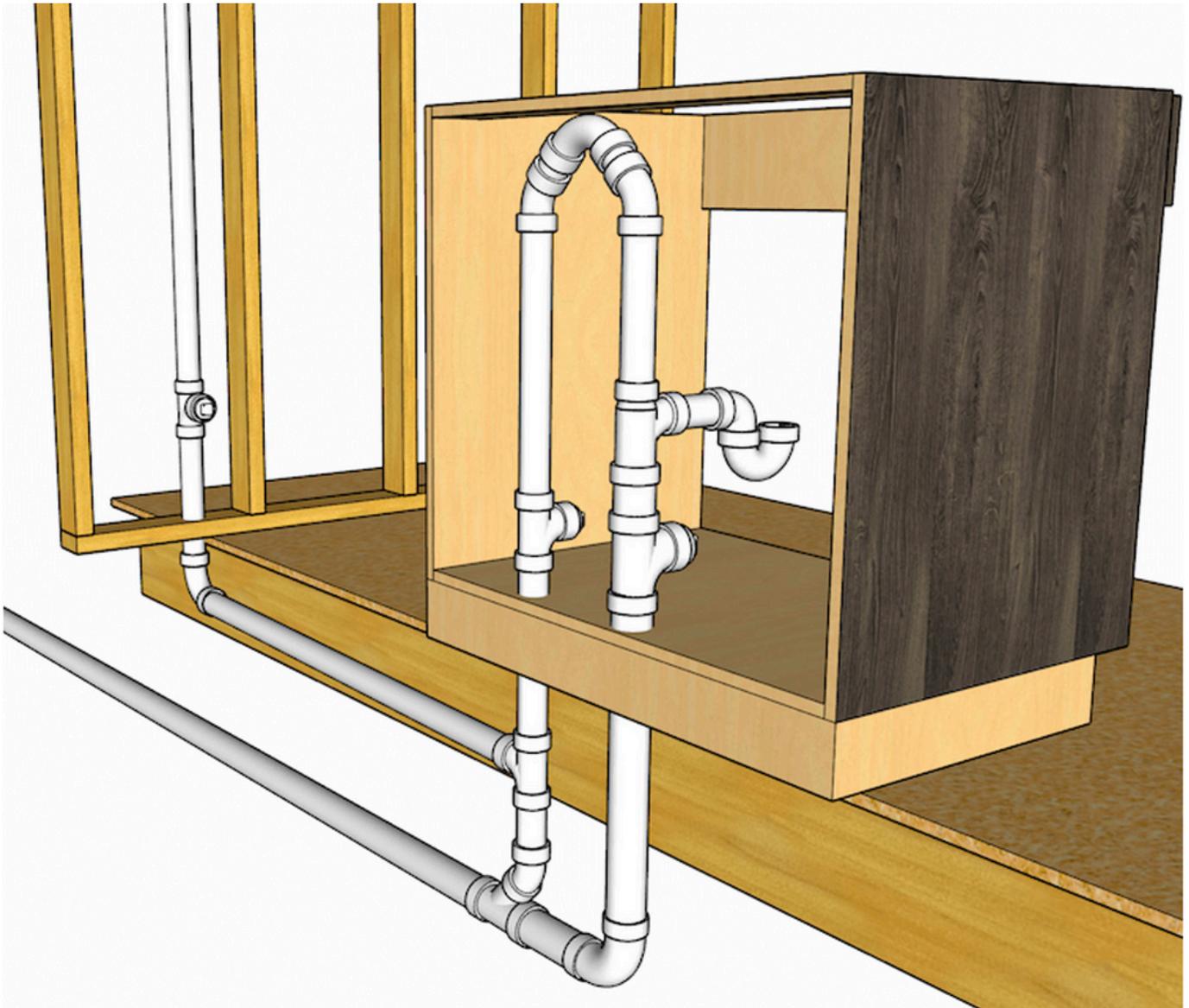


IMAGE 10.10
LOOP STYLE VENT



Note: in this drawing, the exterior wall has been removed for clarity; i.e., this does not depict a kitchen island.

IMAGE 10.11

PLUMBING SUPPLY AND DRAIN PIPING ROUGHED IN FROM FLOOR TO BE HIDDEN IN A CABINET



SIP BUILDER-BP 10.2: Minimize roof penetrations and consider consolidating all vents away from south facing roof planes for potential solar array.

Limiting penetrations through a SIP roof is advised. Penetrations lend themselves to air and moisture leakage. SIPs are considered a high-performance building system based on the airtightness created when monolithic panels are assembled with the intent of reducing joints and air movement. It is strongly recommended that no SIP penetrations are made by trades without field supervision's approval so a structural review can be done and follow-up sealing accomplished to minimize moisture and air leakage at the new penetrations.

Every effort should be made to avoid disturbing a properly sealed SIP joint, which has already been field assembled to limit movement of air and moisture. If it is necessary to modify a roof panel in any way, it is important to avoid compromising structural elements such as I-joists or double lumber supports. Be sure to reference SIP shop drawings (see [SIP DESIGN-BP 5 SIP Shop Drawings](#)) to determine which joints are structural in nature.

Key considerations when penetrations are necessary in a SIP roof:

- 1) Limit openings to as small a diameter as possible.
- 2) Always apply a high-expanding foam around the perimeter of a vent pipe, where it exits the SIP. Include this note in plans (see Image 10.12).
- 3) With sustainable, zero-energy-ready design in mind, avoid running vent piping through south-facing roof planes. Whether in initial design, or added later, avoiding a south-facing roof plane will make a future solar array easier to install.
- 4) Combining vents, where feasible, will help to limit penetrations.
- 5) Avoid running plumbing through a SIP-to-SIP spline joint connection.
- 6) As is the case with any roof system, consideration should be given to avoid venting in a path created to remove water from a roof, as is the case in the eave of a dormer (see Image 10.13).

IMAGE 10.12

ROOF PENETRATION

NOTE:

PROTECT SIP CORE FROM TEMPERATURES OF 160°F OR ABOVE. USE ZERO CLEARANCE INSULATING MATERIAL DESIGNED FOR HIGH TEMPS AS REQUIRED.

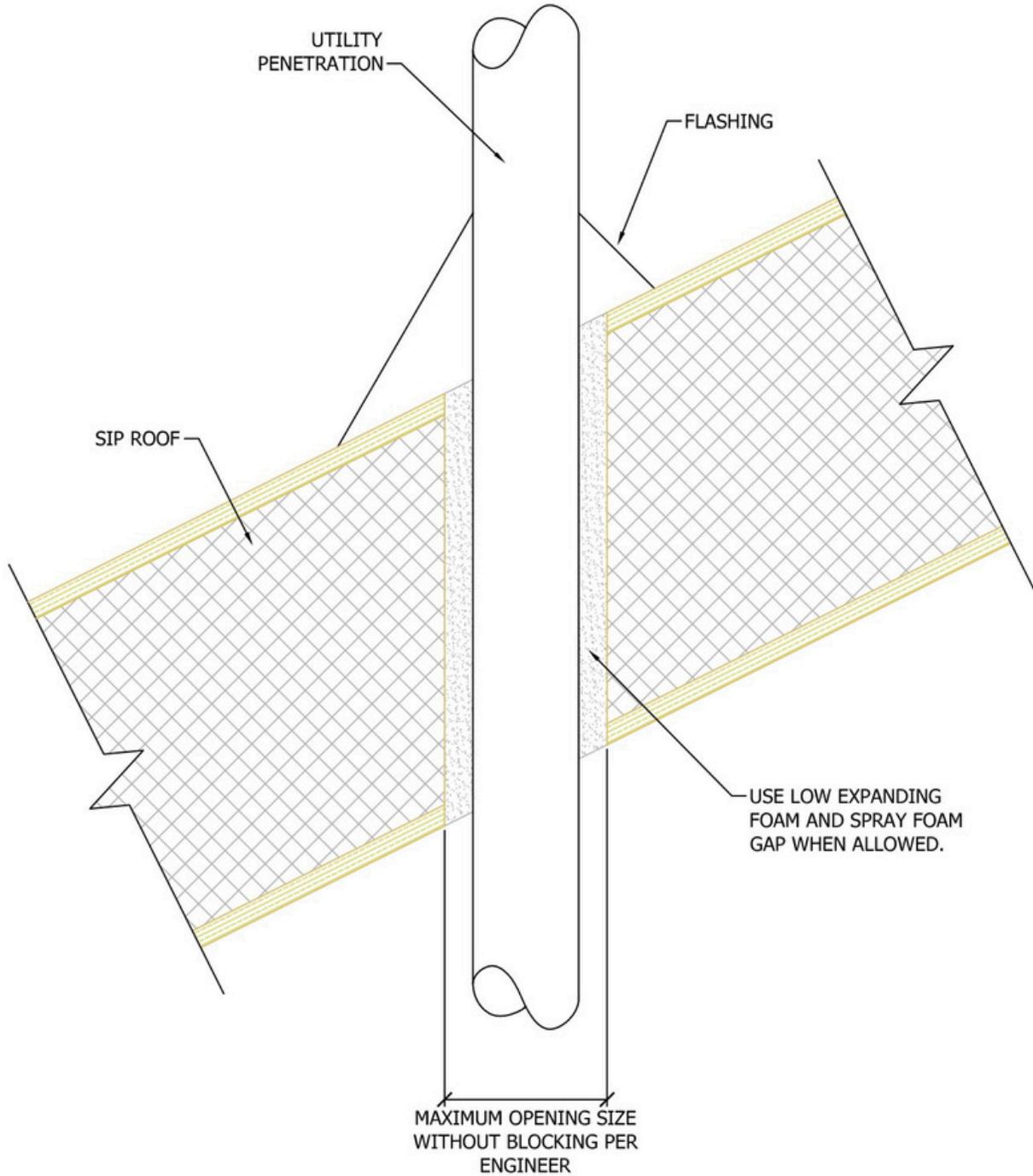


IMAGE 10.13

ROOFING PENETRATION: WHAT NOT TO DO. DO NOT LOCATE VENT PIPES BELOW THE EAVE OF A DORMER WHERE THEY CAN GET FILLED WITH WATER OR SNOW.



Glossary of Terms

Air admittance valve: See Image 10.9. Not allowed in all states.

Island vent: See Images 10.8 and 10.10. Sometimes called loop vent.

Loop vent: See Images 10.8 and 10.10. Sometimes called island vent.

SIPA: Structural Insulated Panel Association (www.sips.org), a non-profit trade association representing manufacturers, suppliers, dealer/distributors, design professionals and builders committed to providing quality structural insulated panels for all segments of the construction industry.

SIPs: Structural Insulated Panels, a high-performance building component for residential and light commercial construction.



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