



A.1 PEER Wall — Structurally Insulated Panel Wall System

A SIP wall for prefabricated exterior energy retrofit using advanced materials and techniques.

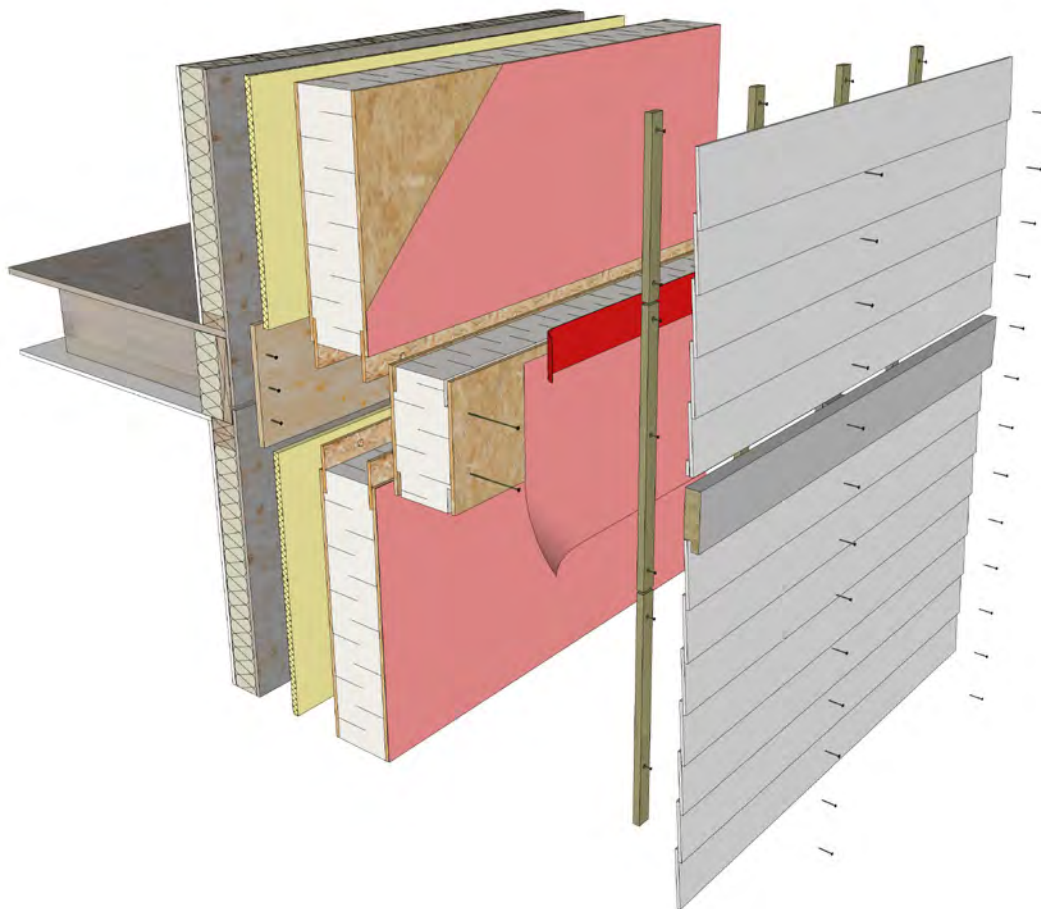


Figure 1 Exploded view of partial retrofit panel components at floor line transition

Developed by Natural Resources Canada's
Prefabricated Exterior Energy Retrofit (PEER) team

A.1 PEER Wall — Generation 2 SIP Enclosure Assembly Overview

The following is a description of the retrofit panel layers installed on the exterior of the existing house. See also the Typical Construction Details on page 5.

Exterior

- › Cladding
- › Borate-treated strapping + air cavity
- › Self-adhered vapour permeable membrane (air barrier and water resistive barrier)
- › SIP: Exterior OSB sheathing, EPS insulation, interior OSB sheathing, layers glued together
- › Compressible mineral fibre gap fill insulation
- › Existing assembly (not shown)

Interior

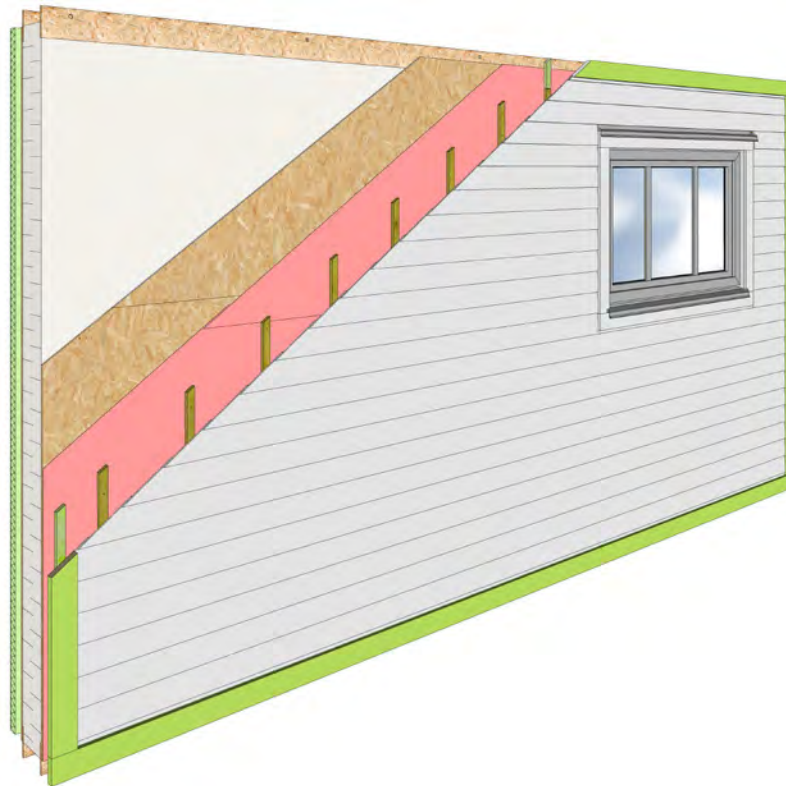


Figure 2 Retrofit SIP wall panel overview (green highlights indicate site-applied perimeter joint/tie-in components)

Retrofit Description

- › Panels can be installed over the existing wall either with the cladding removed or left in place, and the existing windows and interior trim removed. A mineral fibre insulation layer is installed over the existing assembly to provide for in-out tolerance of the panel installation while baffling the small space between the panel and the existing wall.
- › SIPs are positioned and fastened into a continuous insulated box beam supported by intermittent foundation brackets at the base of the above grade wall, a rim panel at the following storey floor line, and to a plywood plumb shim at the roof line.
- › The air barrier/weather resistive barrier (AB/WRB, denoted with red callouts in the details) is a factory-installed self-adhered membrane at the exterior OSB sheathing. Joints are face sealed with transition membrane and compatible pressure sensitive acrylic tape.
- › New windows (and their trim/closures) can be pre-installed into the panels at the factory or site installed after panel placement to accommodate for tolerances. Window AB/WRB transition/rough-opening membranes are factory installed on the SIP.
- › The drained and ventilated rainscreen cladding comes pre-installed except at panel joints and at window interfaces (if site installed).
- › Closure cladding, flashing, and trim is installed as required at panel joints and windows.

Potential Benefits of a Structural Insulated Panel Retrofit

- › All work (except interior window trim) is done from the exterior leaving the home livable during construction.
- › Site installation work is limited, reducing installation times and disruption to residents.
- › Eliminates on-site framing and using manufactured panels simplifies installation.
- › Insulation thickness can be varied to accommodate energy performance goals and lot-line setbacks.
- › Provides a layer of continuous insulation reducing thermal bridging through framing.
- › Increases air tightness, reduces drafts and noise, and lowers energy costs.
- › Reduces potential for moisture ingress with careful detailing.
- › Provides opportunity for seismic upgrades to meet regional requirements.
- › The structural rigidity provided by SIPs allow for larger panels and provide some load bearing capacity for exterior window installation.
- › Allows for quality control of the air barrier system at the factory before it is covered with cladding.
- › Allows for quality assurance of the air barrier system transitions on site prior to installing closure cladding.
- › Use of full SIPs enables larger panels with more load bearing capacity compared to nailbase panels.
- › CCMC approved SIP systems available which may facilitate permitting.

Key Considerations

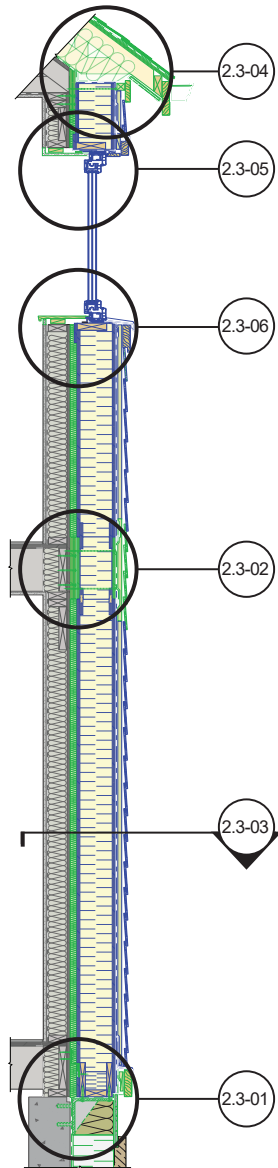
Air sealing: The air barrier (AB) is provided by the membrane at the exterior side of the SIP. Flexible membrane flashings around panel joints, windows, doors, other penetrations and transitions complete the AB. Sealing at the top plate and foundation where the new wall connects to the existing house is also required. The openings around electrical, mechanical, and other penetrations are sealed throughout the construction process. These are critical details to ensure an airtight barrier.

Connection to existing structure: This retrofit uses structural brackets and a continuous box beam at the base of the above grade wall to support the first floor SIP at its base. A rim panel at the floor line of the following storey is attached to the existing structure and provides support for the top of the first floor SIP and bottom of the second storey SIP. Long screws through the SIP into a plywood plumb shim and existing building framing produces a self-supporting sandwich at the top of the second storey SIP. Windows moved to the exterior provide for easy sealing to the AB/WRB.

Water control: The membrane on the exterior sheathing of the SIP acts as the water resistive barrier (WRB). Strapping is factory installed over the WRB and fastened to wall framing to provide a rainscreen cavity behind the cladding.

Cladding: This system must be easily transported and therefore only allows for lighter cladding materials. Materials such as cement board or pre-finished wood are factory installed directly to the strapping. Site install of some cladding around panel joints and windows may be required.

Durability: The SIP panels will have a reduced drying potential dependant on the thickness of the EPS insulation. Applications should be modelled to assess risk.



Typical Construction Details

The sample details shown in the following pages are intended to illustrate typical transition approaches both for air barrier and panel/insulation continuity. Note that these are example details, and project-specific details should always be developed to account for the unique conditions of each project.

The annotations and legend in each sample detail contains red "AB" and "AB/WRB" icons to indicate the various air barrier and where applicable water resistive barrier components are present.

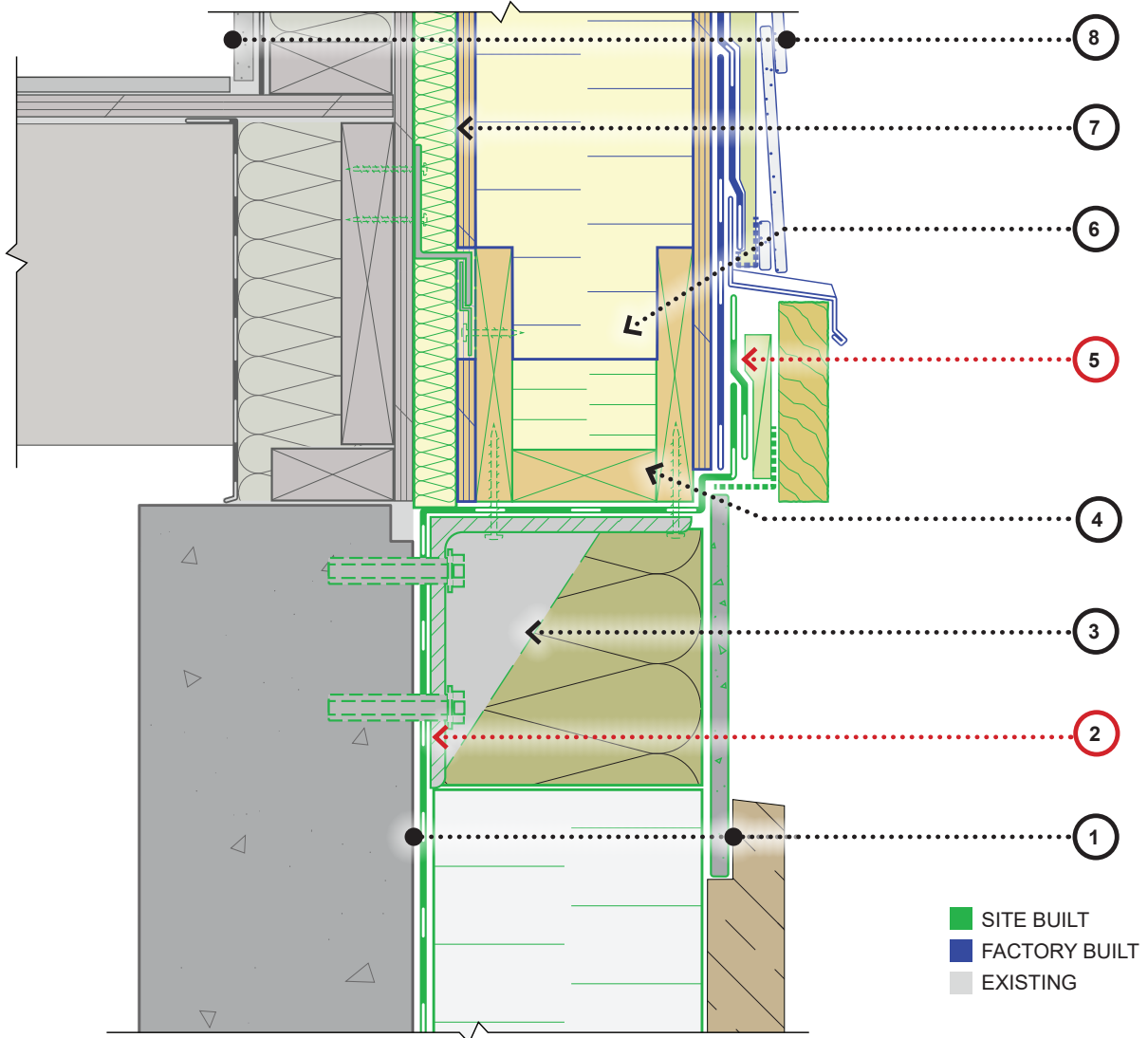
Each detail also include a colour legend as follows for the grey, green, and blue components shown:

- SITE BUILT
- FACTORY BUILT
- EXISTING

List of Details

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Figure 3 House section detail wayfinder.

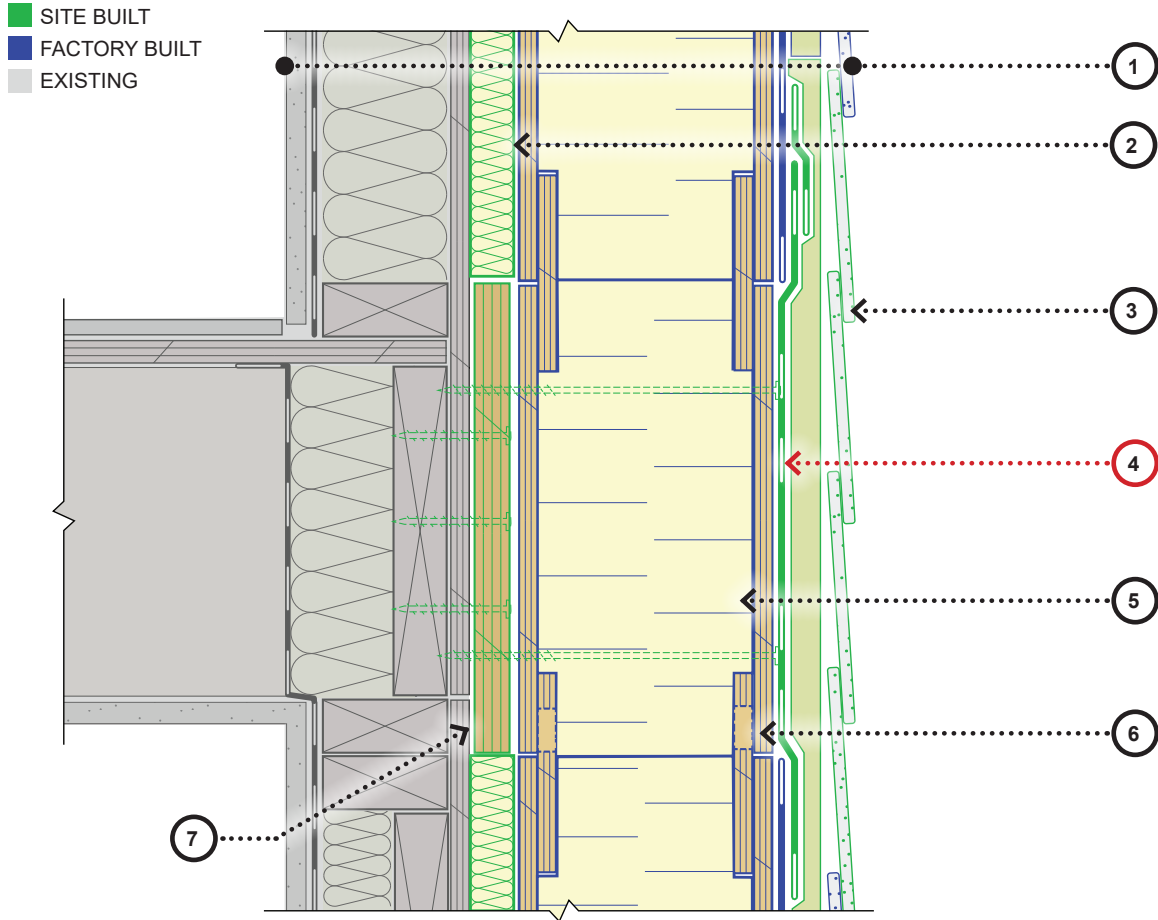


LEGEND

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| <ol style="list-style-type: none"> 1. Below-grade wall assembly: <ul style="list-style-type: none"> • Fiber cement board • EPS foam insulation • Self-adhered transition membrane (AB/WRB) • Existing assembly 2. Pre-strip transition membrane prior to foundation bracket install. (AB/WRB) 3. Intermittent foundation bracket surrounded with mineral wool insulation. | <ol style="list-style-type: none"> 4. Site installed continuous insulated box beam fastened to existing structure with intermittent clips. 5. Transition membrane reverse lapped over factory installed VP membrane with leading edges sealed with high performance tape. (AB/WRB) 6. SIP panel positioned into site installed box beam. 7. Compressible mineral fibre gap fill insulation. 8. SIP Wall System 2.0. |
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Detail A.1-01 | Base of Wall at Foundation

PEER Wall A.1 — SIP 2.0



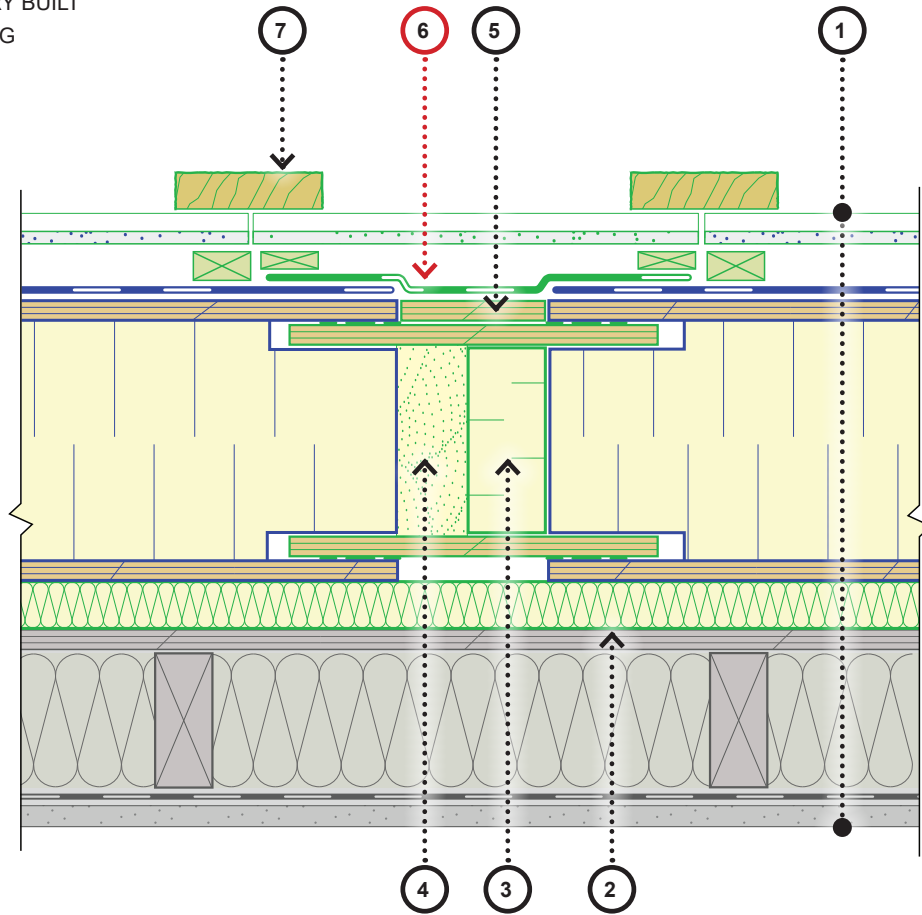
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| <ul style="list-style-type: none"> 1. SIP Wall System 2.0. 2. Compressible mineral fibre gap fill insulation. 3. Site applied cladding and strapping across joint. 4. Self-adhered VP transition membrane sealed over rim panel first floor membrane. Reverse lap at leading edge sealed with high performance tape. (AB/WRB) | <ul style="list-style-type: none"> 5. Rim panel fastened and adhered to plywood plumb shim with construction adhesive. 6. Reinforced lifting hole in top of SIP splines. 7. Plywood plumb shim fastened to existing structure at floorline. |
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Detail A.1-02 | Horizontal Panel Joint

PEER Wall A.1 — SIP 2.0

- SITE BUILT
- FACTORY BUILT
- EXISTING

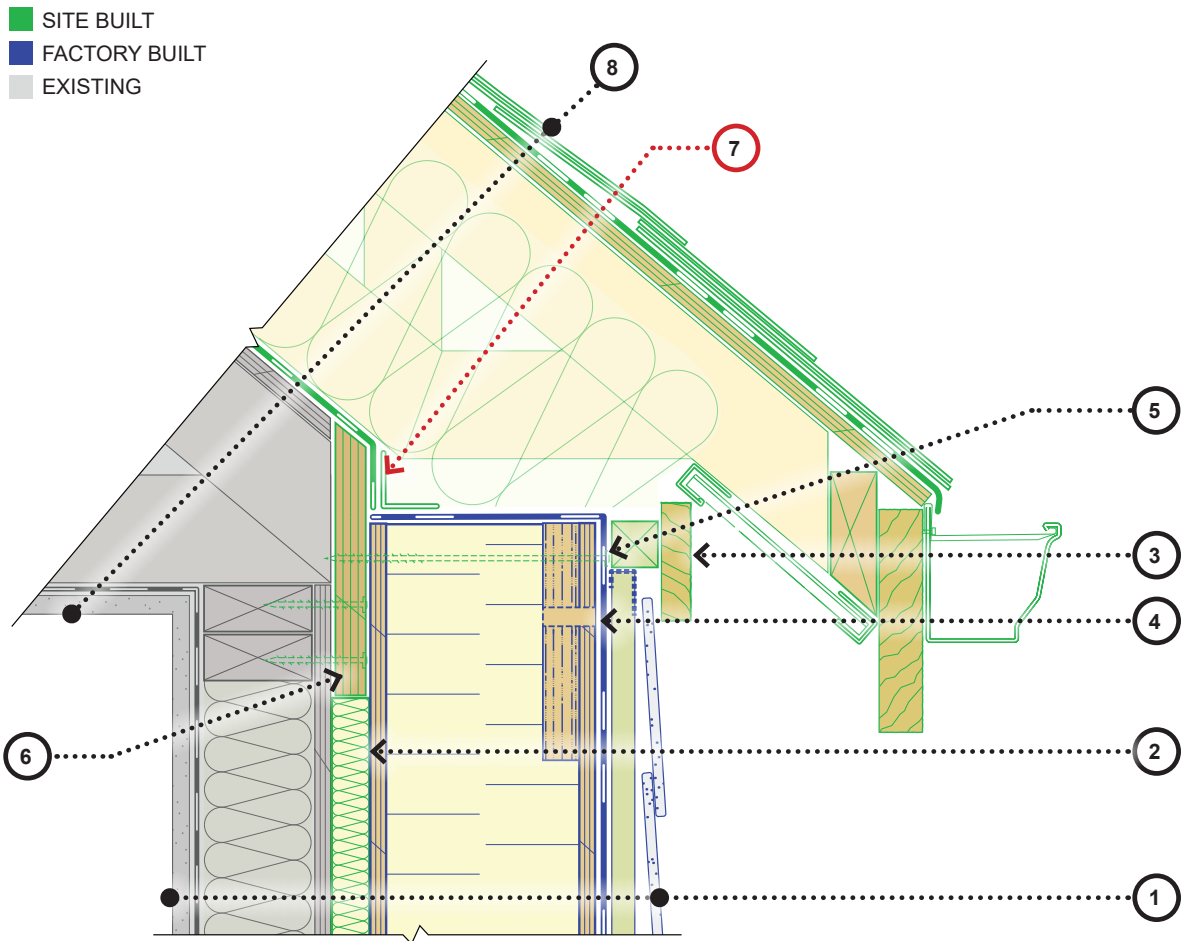


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| <ul style="list-style-type: none"> 1. SIP Wall System 2.0. 2. Compressible mineral fibre gap fill insulation. 3. EPS filler block. 4. Self-expanding foam joint sealant. | <ul style="list-style-type: none"> 5. Front and rear splines glued in place. 6. Site installed self-adhered VP membrane over splines.
(AB/WRB) 7. Site installed trim over vertical cladding joints. |
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Detail A.1-03 | Vertical Panel Joint

PEER Wall A.1 — SIP 2.0

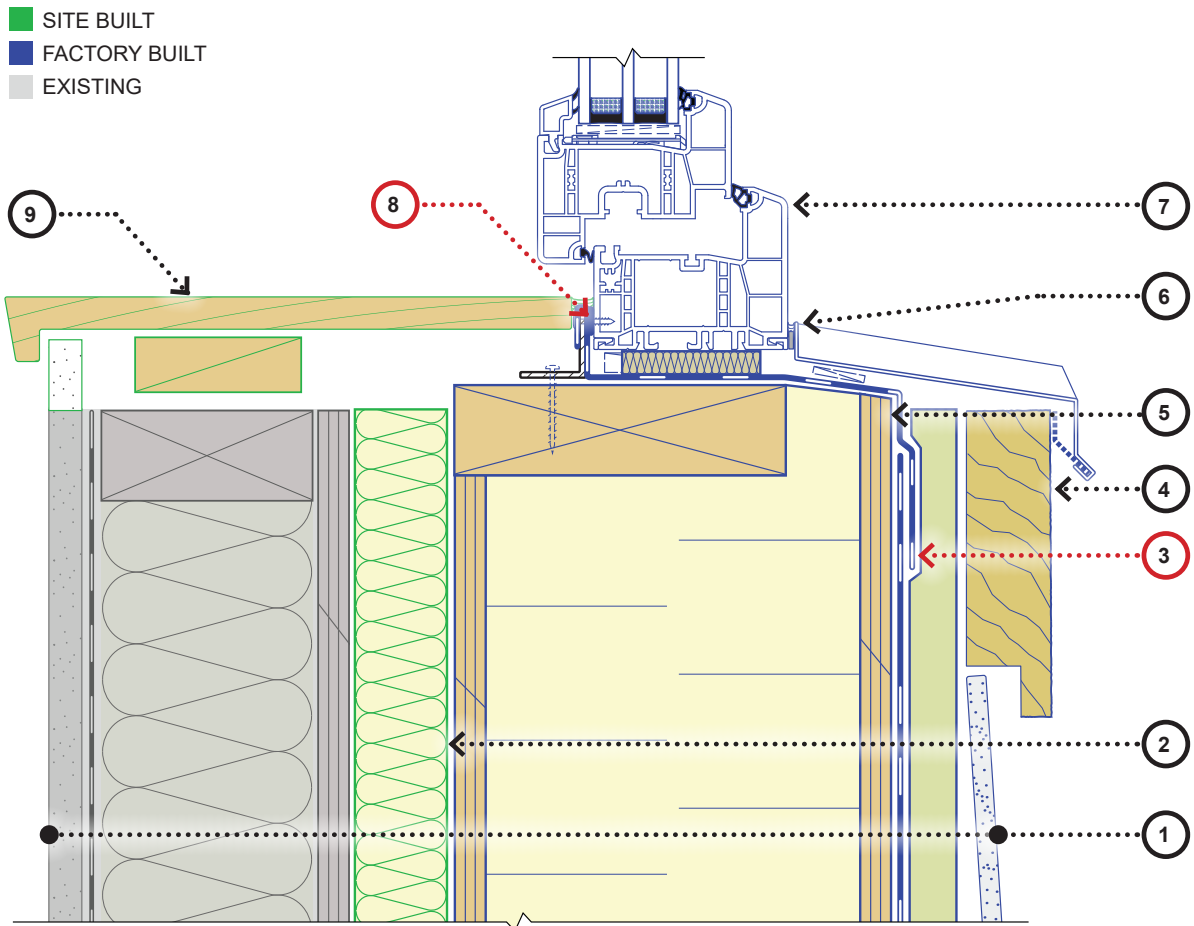


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| <ul style="list-style-type: none"> 1. SIP Wall System 2.0. 2. Compressible mineral fibre gap fill insulation. 3. Lifting holes through exterior sheathing and LSL beam. 4. Site-applied closure trim at top of wall. 5. Panel fastened to existing roof structure. | <ul style="list-style-type: none"> 6. Plywood plumb shim fastened at cut back existing roof structure (chainsaw retrofit). 7. High performance tape sealed to factory installed self-adhered membrane and roof assembly membrane. (AB/WRB) 8. Chainsaw retrofit roof assembly. |
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Detail A.1-04 | Top of Wall

PEER Wall A.1 — SIP 2.0

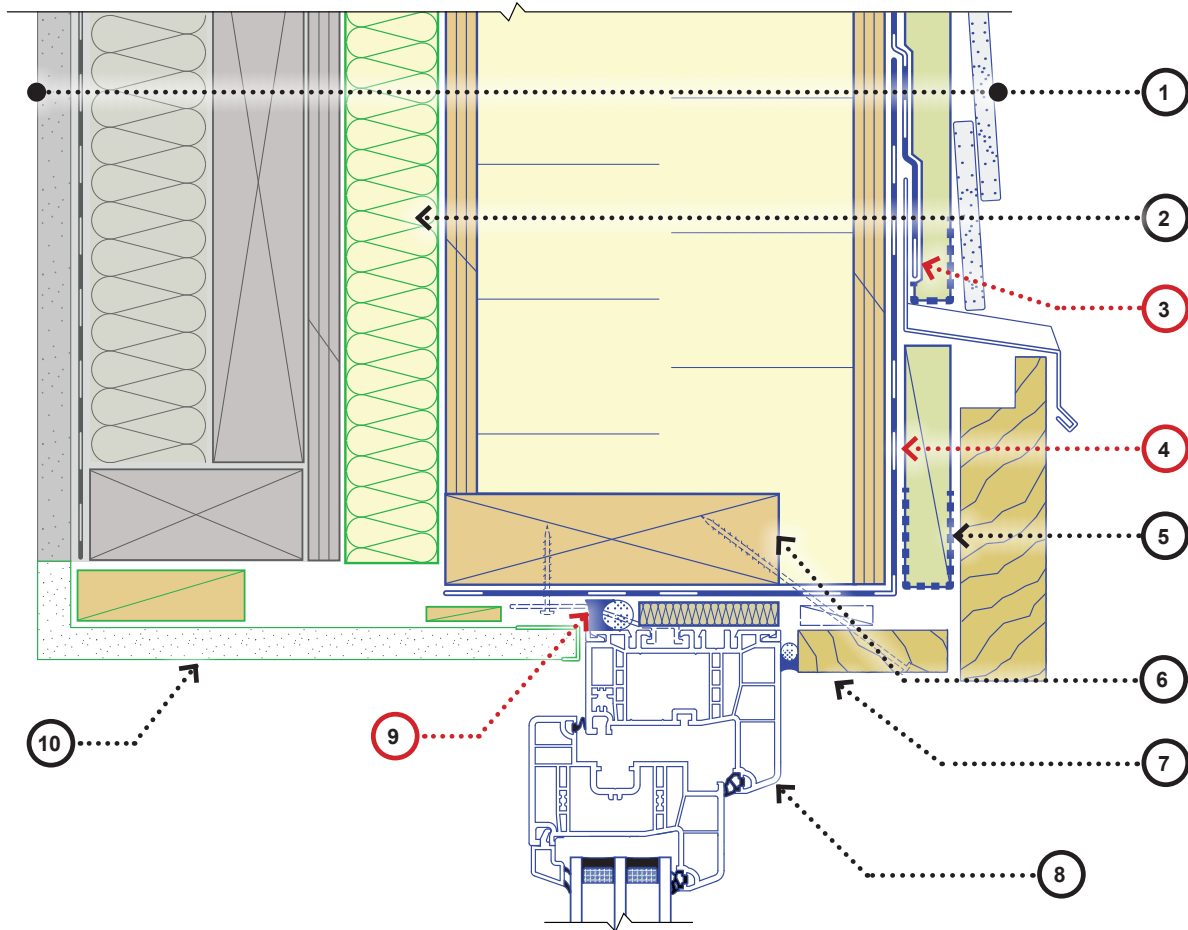


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| <ul style="list-style-type: none"> 1. SIP Wall System 2.0. 2. Compressible mineral fibre gap fill insulation. 3. Factory installed self-adhered sill membrane over sill angle and lapped onto field membrane. (AB/WRB) 4. Closure cladding and trim around window. 5. SIP insulation and exterior sheathing sloped at front edge. Intermittent shims to support sill flashing. | <ul style="list-style-type: none"> 6. Window sill flashing. 7. New triple-glazed window secured in place with sill angle at sill. 8. Window set into continuous sealant over sill angle and secured with screws. (AB/WRB) 9. Interior window trim and closure sealant over sill angle as required. |
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Detail A.1-05 | Window Sill

PEER Wall A.1 — SIP 2.0



- SITE BUILT
- FACTORY BUILT
- EXISTING

LEGEND

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| <ul style="list-style-type: none"> 1. SIP Wall System 2.0. 2. Compressible mineral fibre gap fill insulation. 3. Site installed closure cladding and self-adhered membrane over head flashing and lapped over head flashing membrane. (AB/WRB) 4. VP head flashing membrane. (AB/WRB) 5. Factory installed window head prestrip and strapping. | <ul style="list-style-type: none"> 6. 2x6 wood buck positioned at back of SIP panel. 7. Head trim toe nailed into 2x6 window buck. 8. New triple-glazed window secured in place with clips at head and jambs. 9. Continuous sealant installed between rough-opening and window head/jambs. 10. Interior gypsum. |
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Detail A.1-06 | Window Head

PEER Wall A.1 — SIP 2.0