A.2 PEER Wall — 2x4 Framed Panel Wall System

Framed panel for prefabricated exterior energy retrofit using advanced materials and techniques.

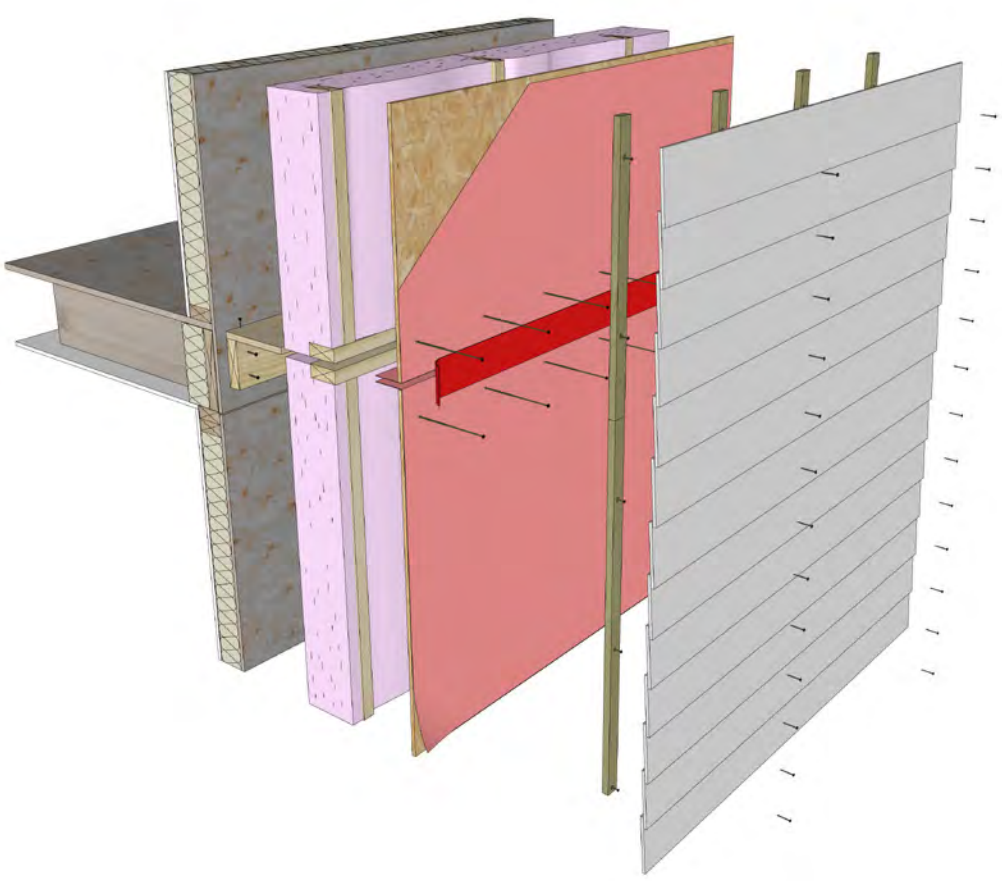

Figure 1 Exploded view of partial retrofit panel components at floor line transition

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

A.2 PEER Wall — 2x4 Framed Panel Wall 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)
- Wall sheathing
- 2x4 framing with site installed blown-in cellulose insulation
- Existing assembly (not shown)

Interior

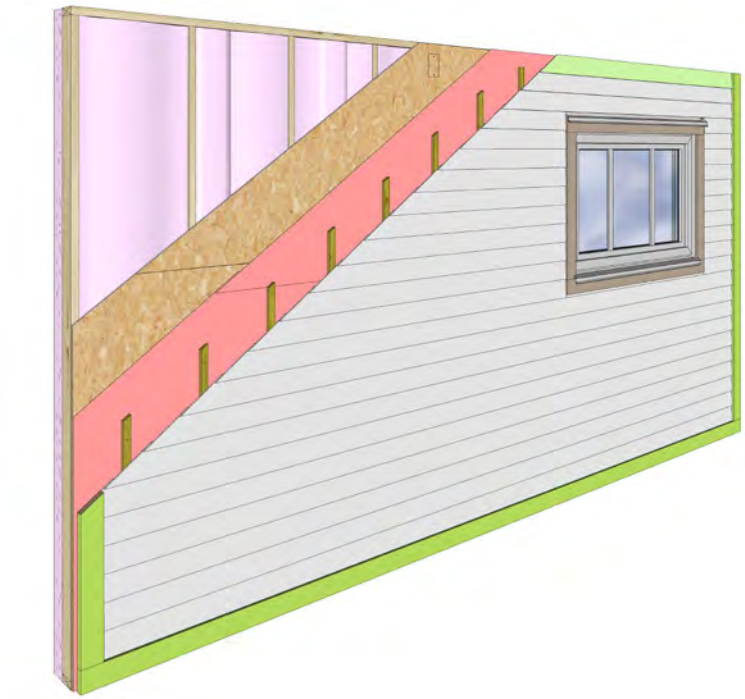

Figure 2 Retrofit 2x4 wall panel overview (green highlights indicate site-applied perimeter joint/tie-in components)

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.
- 2x4 panels are fastened to a continuous insulated box beam supported by intermittent foundation brackets at the base of the above grade wall.
- 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 sheathing, with various edges returning into joints and face sealed with 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 panel.
- The drained and ventilated rainscreen cladding comes pre-installed except at panel joints and at window interfaces (if site installed).
- Intermittent insulation fill holes are included at the tops and bottoms of each panel stud cavity and below window openings so that fibrous insulation can be blown into the stud cavity and directly against the existing assembly.
- Insulation fill hole covers, AB/WRB membrane transition strips, closure cladding, flashing, and trim is installed as required at panel joints and windows.

Potential Benefits of a 2x4 Framed + Blown-in Insulation 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 uses manufactured panels to simplify 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 sheathed panels allows for larger panels and 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.

Key Considerations

Air sealing: The air barrier (AB) is provided by the self-adhered membrane at the exterior side of the panel. Flexible membrane flashings around panel joints, windows, doors, and other penetrations and transitions complete the AB. Sealing at the top plate and base-of-wall where the new wall connects to the existing house is also required. Openings around electrical, mechanical, and other service 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 panel at its base. A continuous plywood tie-in plate at the floor line of the following storey is attached to the existing structure and provides lateral support for the top of the first storey panel and bottom of the second storey panel. Windows moved to the exterior provide for easy sealing to the AB/WRB.

Water control: The membrane on the exterior sheathing acts as the water resistive barrier (WRB). Vertical strapping is factory installed over the WRB 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 installation of some cladding around panel joints and windows may be required.

Insulating: While this retrofit makes very efficient use of materials, careful attention is required to ensure that all cavities are fully filled with fibrous insulation to their target density. Pre-installing cladding limits access points for site-installation of insulation and also makes QA/QC by thermography challenging. Uninsulated voids can result in convective air flows and condensation risk on the back of the sheathing.

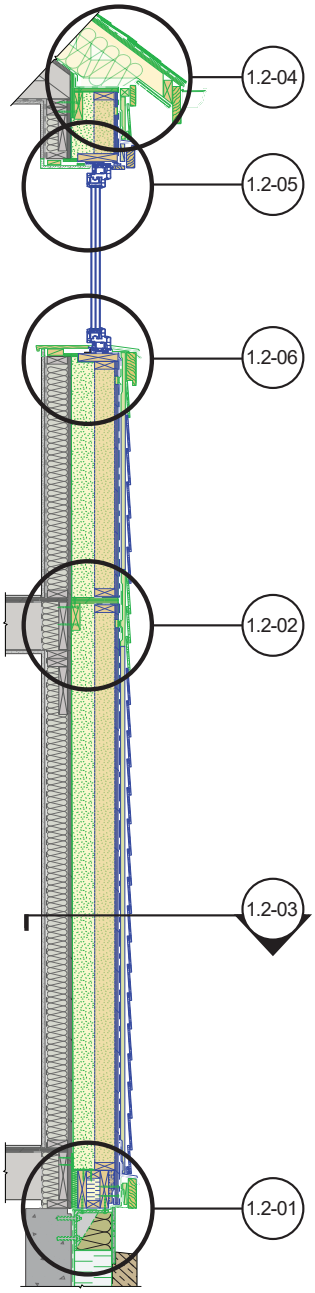

Figure 3 House section detail wayfinder.

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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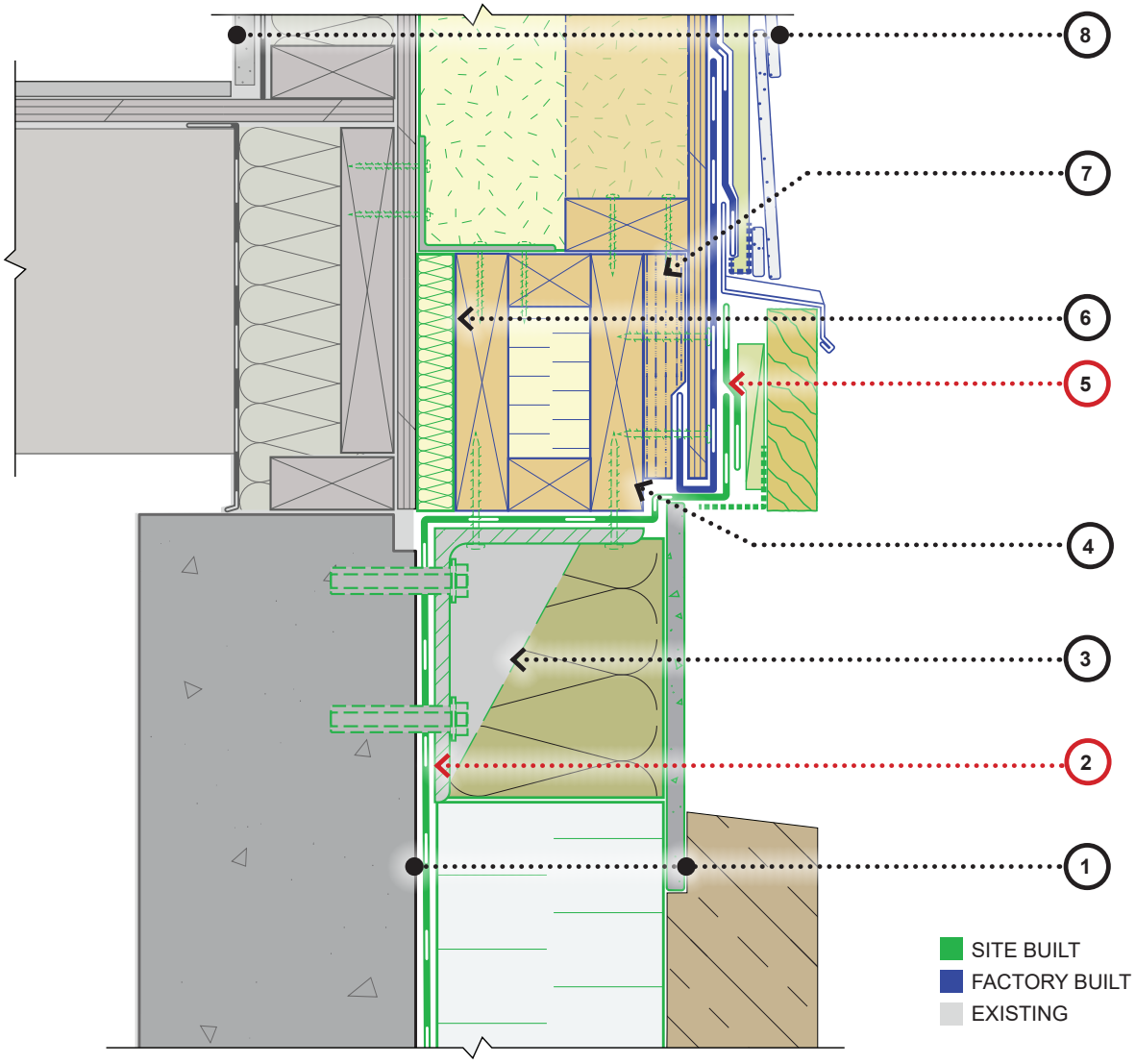
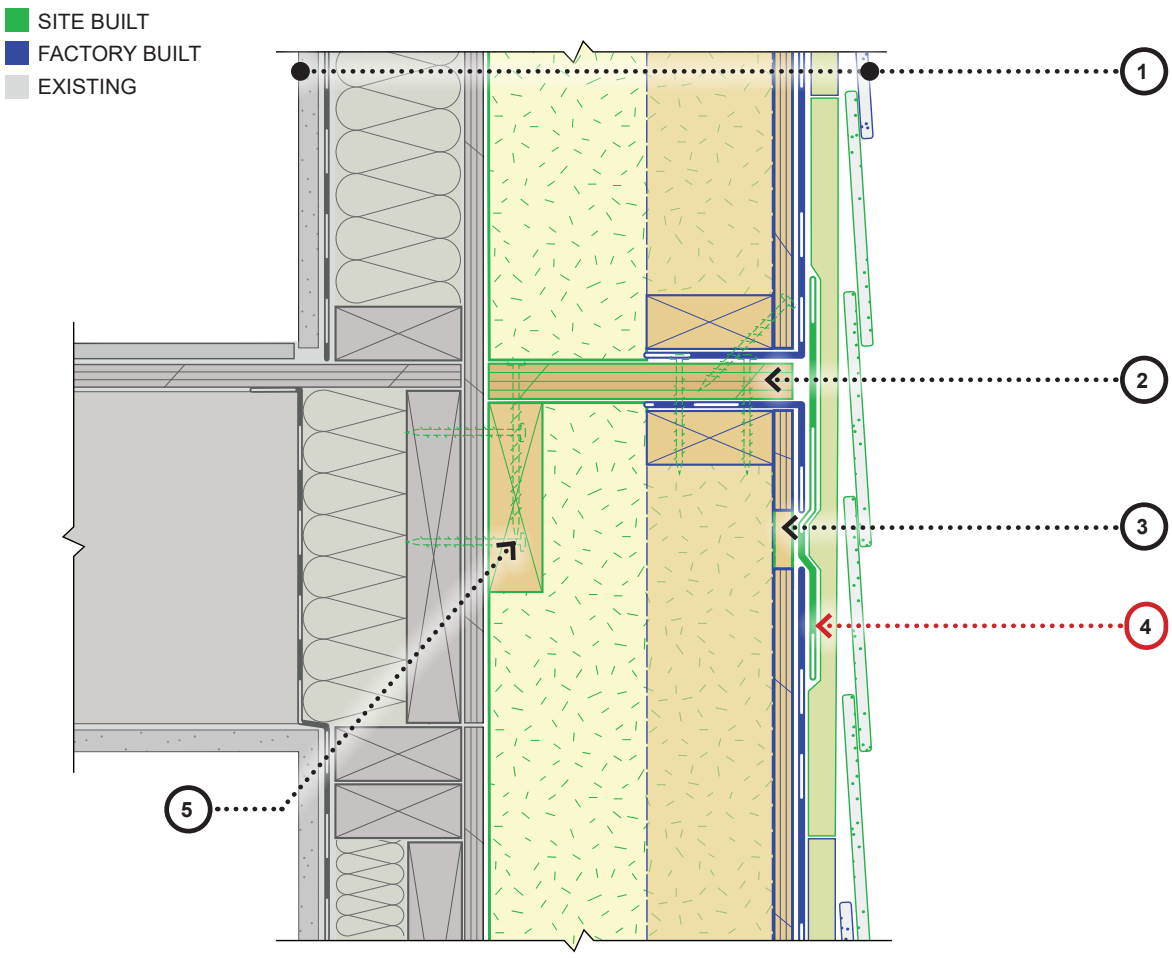


LEGEND

1. Below-grade wall assembly:
   - 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.
4. Continuous insulated box beam fastened to existing structure with intermittent deck ties.
5. Site- applied transition membrane reverse lapped over factory installed VP membrane with leading edges sealed with high performance tape. (AB/WRB)
6. Compressible mineral fibre gap fill insulation.
7. LSL plate at base of 2x4 frame fastened to box beam.
8. 2x4 Framed Assembly.

Detail A.2–01 | Base of Wall at Foundation

PEER Wall A.2 — 2x4 Framed



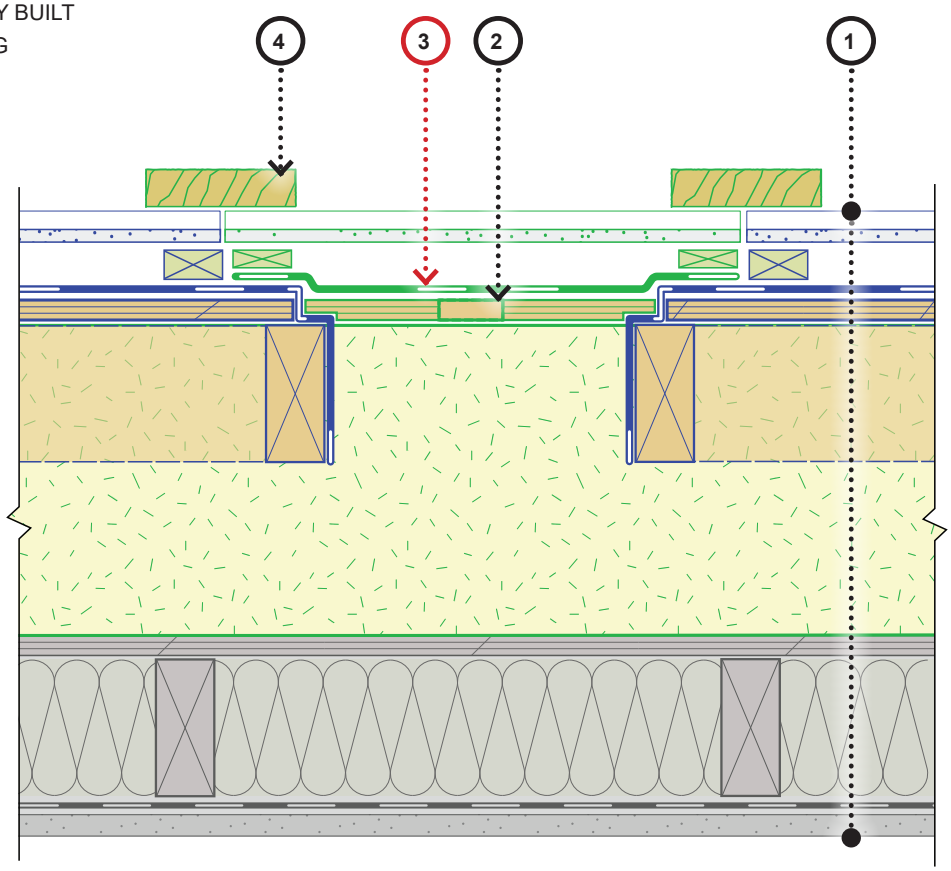
LEGEND

1. 2x4 Framed Assembly.
2. Wood panel fastened to plywod plumb shim.
3. Intermittent lifting hole and insulation fill slot. Slot to be sealed after installation of insulation.
4. Second floor self-adhered VP membrane sealed to first floor membrane and over lifting hole/insulation fill slot with high performance tape. (AB/WRB)
5. Wood blocking fastened to plywood plumb shim to support panel.

Detail A.2–02 | Horizontal Panel Joint

PEER Wall A.2 — 2x4 Framed

SITE BUILT
FACTORY BUILT
EXISTING

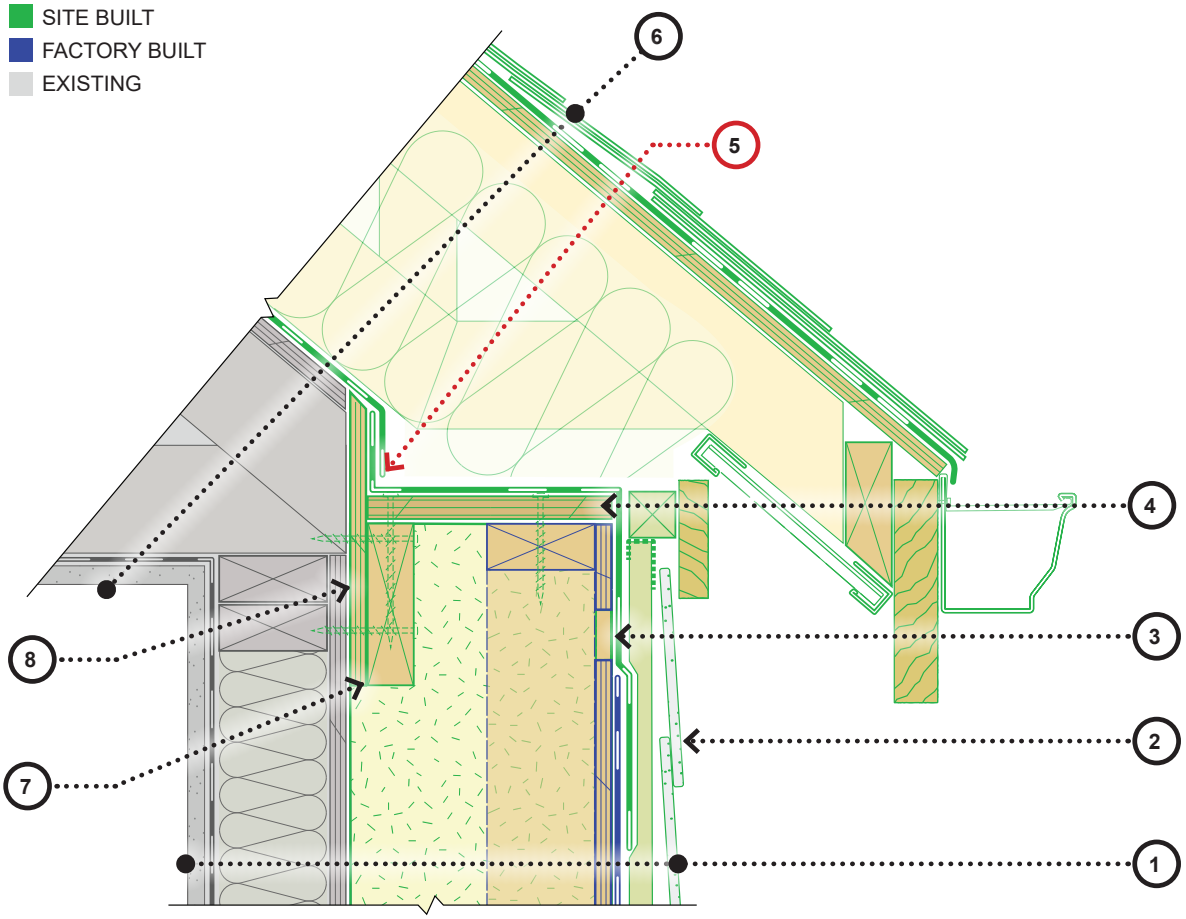


LEGEND

1. 2x4 Framed Assembly.
2. Intermittent insulation fill slot through sheathing spline. Slot to be over-clad after installation of insulation.
3. Site installed self-adhered VP membrane over spline. (AB/WRB)
4. Site installed trim over vertical cladding joints.

Detail A.2–03 | Vertical Panel Joint

PEER Wall A.2 — 2x4 Framed

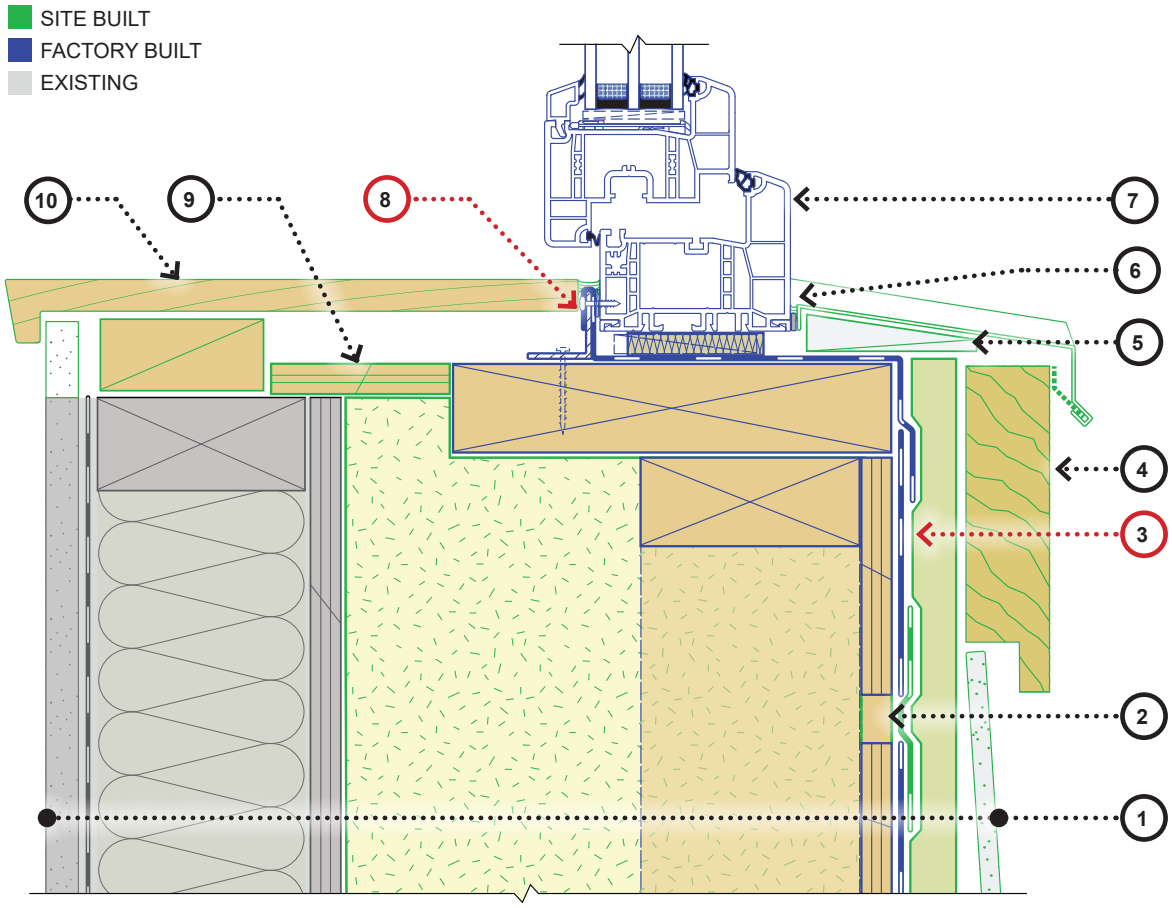


LEGEND

1. 2x4 Framed Assembly.
2. Site-applied closure cladding and trim near top of wall.
3. Intermittent lifting hole and insulation fill slot. Slot to be over-clad after installation of insulation.
4. Rim panel fastened to plywood plumb shim. Panel framing fastened to continuous rim panel.
5. Self-adhered membrane adhered to existing assembly and plumb shim to receive roof membrane. (AB/WRB)
6. Chainsaw retrofit roof assembly.
7. Wood blocking fastened to plywood plumb shim to support rim panel.
8. Plywood plumb shim fastened at cut back existing roof structure (chainsaw retrofit).

Detail A.2–04 | Top of Wall

PEER Wall A.2 — 2x4 Framed

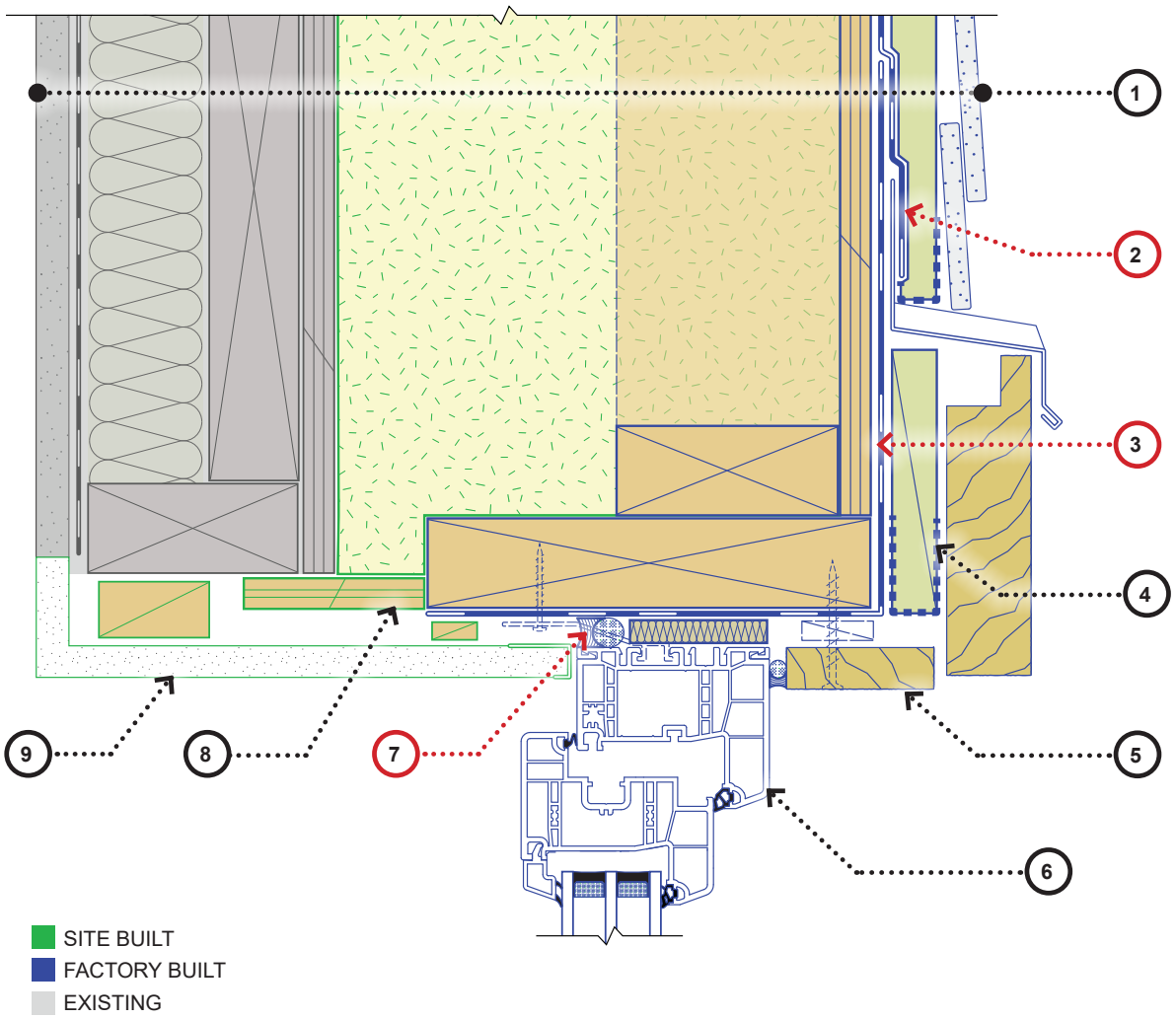


LEGEND

1. 2x4 Framed Assembly.
2. Intermittent lifting hole and insulation fill slot. Slot to be sealed with high performance tape and over-clad after installation of insulation.
3. Self-adhered VP membrane. (AB/WRB)
4. Site-applied closure cladding and trim around window.
5. Intermittent angled foam block to support sill flashing.
6. Window sill flashing clipped to sill trim with perforated metal receiver and adhered to face of window frame with foam tape and sealant.
7. Factory installed triple-glazed window secured in place with sill angle at sill.
8. Window set into continuous sealant against sill angle and secured with screws. (AB/WRB)
9. Plywood shim to tie retrofit with existing assembly.
10. Interior window trim and closure sealant over sill angle as required.

Detail A.2–05 | Window Sill

PEER Wall A.2 — 2x4 Framed



LEGEND

1. 2x4 Framed Assembly.
2. Factory-applied self-adhered membrane over head flashing and lapped over head flashing membrane. (AB/WRB)
3. VP head flashing membrane. (AB/WRB)
4. Factory installed window head prestrip and strapping.
5. Head trim fastened into 2x8 window buck.
6. Factory installed new triple-glazed window secured in place with clips at head and jambs.
7. Continuous sealant installed between rough-opening and window head/jambs.
8. Plywood shim to tie retrofit with existing assembly.
9. Interior gypsum.

Detail A.2–06 | Window Head

PEER Wall A.2 — 2x4 Framed