

Building Homes with SIPS

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Earth Bound Construction

Residential SIP Construction

1. The Structurally Insulated Panel
2. Why build with SIPs
3. When and when not to build with SIPs in Residential Construction
4. Common details found in SIP structures
5. Assembly of SIPS as walls and roofs
6. Installation requirements for SIP structures
7. Care of SIPs

The Structurally Insulated Panel (SIP)

- The Indigestible mega sized Ice cream sandwich
- Sandwich of two sheets of 7/16" to 1/2" OSB with a polystyrene(R 3.8/in) or Polyurethane(R 6.7/in)
- Panel dimensions based on infill with KD lumber(6 in. panel is 6 1/2" thick and contains 5 1/2" of insulative foam) $5.5 \times 3.9 = 21.45$
- OSB is phenol-formaldehyde adhesive(ext. ply) and is a source of formaldehyde, but below HUD listing requirements for H₂CO source
- Burning PS evolves CO, CO₂ and H₂O
- Fire resistive - 15' with 1/2 sheetrock, 1hr. with 5/8" type C sheetrock or two layers 5/8" type X

The Strength of a SIP

PREMIER SIP SHEAR WALL SCHEDULE

WALL SYMBOL	PANEL TYPE	MINIMUM OSB FACE THICKNESS	ATTACHMENTS					SHEAR PLF	
			TOP PLATE	BOTTOM PLATE	VERTICAL FRAMING	SPLINES ⁴	SOLE PLATE NAILING		SILL ANCHORAGE
①	L OR S	1/2"	8d box nail 6" o.c.	8d box nail 6" o.c.	8d box nail 6" o.c.-2 rows ³	8d box nail 6" o.c.	(2) 16d @ 16" o.c.	5/8" x 10" A.B. @ 6'-0" o.c.	150
②	L OR S	1/2"	8d box nail 6" o.c.	8d box nail 4" o.c.	8d box nail 4" o.c.-2 rows ³	8d box nail 6" o.c.	(2) 16d @ 12" o.c.	5/8" x 10" A.B. @ 4'-0" o.c.	235
③	L OR S	1/2"	8d box nail 6" o.c.	10d common nail 3" o.c.	10d common nail 3" o.c.-2 rows ³	8d box nail 6" o.c.	(2) 16d @ 6" o.c.	5/8" x 10" A.B. @ 2'-0" o.c.	470
④	L OR S	1/2"	8d box nail 4" o.c.-2 rows ²	10d common nail 3" o.c.	10d common nail 2" o.c.-2 rows ³	8d box nail 4" o.c.	(2) 16d @ 4" o.c.	5/8" x 10" A.B. @ 1'-4" o.c.	700
⑤	L OR S	1/2"	10d common nail 3" o.c.-2 rows ²	10d common nail 3" o.c.	10d common nail 3" o.c.-2 rows ³	10d common nail 3" o.c.-2 rows ³	(2) 16d @ 4" o.c.	5/8" x 10" A.B. @ 1'-0" o.c.	1010
⑥	L OR S	1/2"	10d common nail 2" o.c.-2 rows ²	10d common nail 3" o.c.	10d common nail 2" o.c.-2 rows ³	10d common nail 3" o.c.-2 rows ³	(2) 16d @ 3" o.c.	5/8" x 10" A.B. @ 1'-0" o.c.	1280

NOTES

- FRAMING LUMBER SHALL BE A MINIMUM OF DOUGLAS FIR-LARCH HAVING A SPECIFIC GRAVITY OF 0.50.
- A DOUBLE TOP PLATE IS REQUIRED.
- A DOUBLE STUD OR NOMINAL 4x FRAMING MEMBER IS REQUIRED.
- SPLINES ARE 7/16" BY 4" OSB.

STICK FRAMED SHEAR WALL SCHEDULE

WALL SYMBOL	SHEATHING (8)	NAILING (4)		SOLE PLATE NAILING (4, 12)	SILL ANCHORAGE (6)	CAPACITY PLF
		EDGE, (10)	INTERMEDIATE SUPPORTS, (2)			
①	1/2"	8d @ 6" o.c.	8d @ 12" o.c.	16d @ 4" o.c.	5/8" x 10" A.B. @ 4'-0" o.c.	260 PLF
②	1/2"	8d @ 4" o.c.	8d @ 12" o.c.	16d @ 4" o.c.	5/8" x 10" A.B. @ 2'-8" o.c.	380 PLF
③	1/2", BOTH SIDES	8d @ 4" o.c.	8d @ 12" o.c.	(2) ROWS 16d @ 4" o.c.	5/8" x 10" A.B. @ 1'-4" o.c.	760 PLF

NOTES

- THE CAPACITY VALUES ARE APPLICABLE TO STUDS OF SPECIES GROUP II (DOUGLAS FIR-SOUTHERN PINE).
- NAILING THAT OCCURS AT INTERMEDIATE FRAMING MEMBERS WITHIN THE PANELS.
- ALL PANEL EDGES BACKED WITH 2 INCH NOMINAL OR WIDER FRAMING.
- ALL SHEATHING NAILS REFERENCED ARE COMMON WIRE NAILS (i.e. 8d=0.131", 10d=0.148"). SOLE PLATE NAILS REFERENCED ARE TO BE SINKER NAILS (i.e. 16d=0.148"). VALUES OF OTHER STANDARD CONSTRUCTION FASTENERS WILL REQUIRE SPACING ADJUSTMENTS AND MUST BE APPROVED BY KPFF PRIOR TO USE. MINIMUM NAIL PENETRATIONS INTO SUPPORT FRAMING: 8d=1.5", 10d=1.625", 16d=1.625". SEE GENERAL STRUCTURAL NOTES SHEET S1.0 FOR PRESURE TREATED WOOD APPLICATIONS.
- DO NOT PENETRATE SURFACE PLY OF SHEATHING WITH NAIL HEAD.
- A.B. = ANCHOR BOLT.
- WHERE PANELS ARE APPLIED TO BOTH SIDES OF THE WALL AND NAIL SPACING IS LESS THAN 6" o.c. ON EITHER SIDE, PANEL JOINTS SHALL BE OFFSET TO FALL ON DIFFERENT FRAMING MEMBERS OR FRAMING SHALL BE 3" NOMINAL OR THICKER AND NAILS ON EACH SIDE SHALL BE STAGGERED.
- C-D, C-C SHEATHING, PLYWOOD PANEL SIDING, OSB, AND OTHER GRADES COVERED IN UBC STANDARDS 23-2 OR 23-3.
- SHEATHING FACE GRAIN CAN BE APPLIED PERPENDICULAR OR PARALLEL TO STUDS PROVIDED THE STUDS ARE SPACED AT 16" o.c. OR LESS.
- NAILING OCCURS AT ALL PANEL EDGES.
- FOUNDATION SILL PLATES AND ALL FRAMING RECEIVING EDGE NAILING FROM ABUTTING PANELS SHALL NOT BE LESS THAN A SINGLE 3 INCH NOMINAL MEMBER WITH LOADS 350 PLF.
- WHERE TWO ROWS OF SOLE PLATE NAILS ARE USED, THE FRAMING MEMBER BELOW SHALL BE A (2) 2 INCH OR 4 INCH NOMINAL MEMBER MINIMUM. WHERE LAG SCREWS ARE REQUIRED, FRAMING MEMBER WIDTH BELOW SHALL BE 4 INCH NOMINAL MINIMUM.

Why Build With SIPs

- Energy efficiency(R13.7 vs. R21.7 = $\Delta 58\%$) DOE
- Speed of Installation
- Quality of Installation
- Consistency of materials
- Quality of finished product(sound, energy, finish(in and out))
- Strength of structure
- Material conservation
- No HFCs, CFCs or HCFCs

R-value @ 40"	R-value @ 75"
4" panel - R-16	4" panel - R-15
6" panel - R-25	6" panel - R-23
8" panel - R-32	8" panel - R-30
10" panel - R-40	10" panel - R-37
12" panel - R-48	12" panel - R-45

When to Build With SIPS

- Custom homes or large projects
- Timeliness is not the priority
- Highest efficiency home is the priority
- All of Crew is not highly skilled (simple structures only)
- Simple roof structures
- Vaulted ceilings preferred throughout house
- Steep sloped roof structures
- Site located in Noisy area/client sound sensitive
- Very cold areas
- No anticipated window, door or structural changes

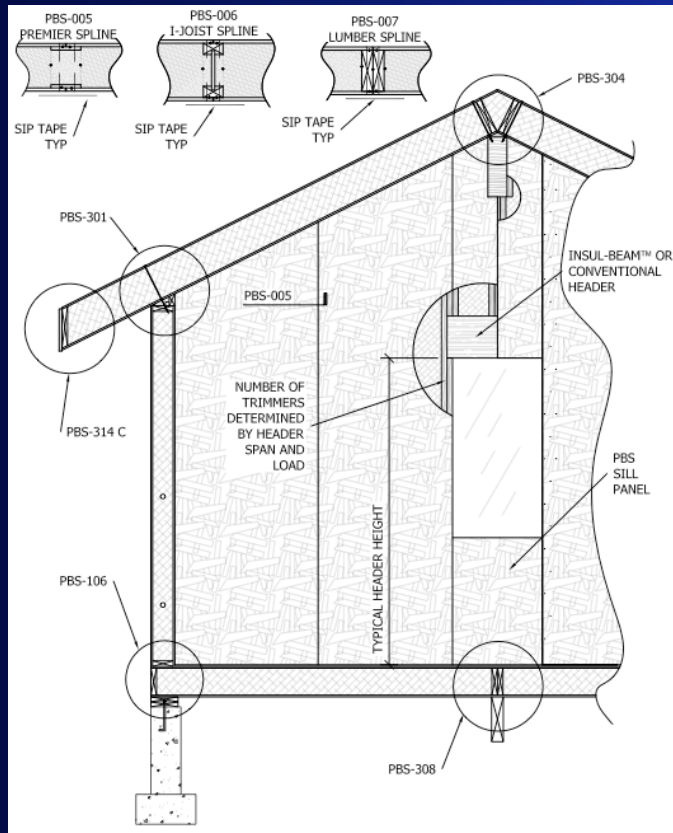
When Not to Use SIPs

- When time is of the essence(2+3+4=?#!%#*)
- Complicated roof structures
- Windows, doors, Hardy frames or steel frames break up wall to much
- Curves
- Small Jobs
- Lots of tie-in to existing structures, irregularities
- Uneven foundations or floors
- Slab-on grade with flat roofs
- Indecisive client, layout is still evolving
- Anything unknown

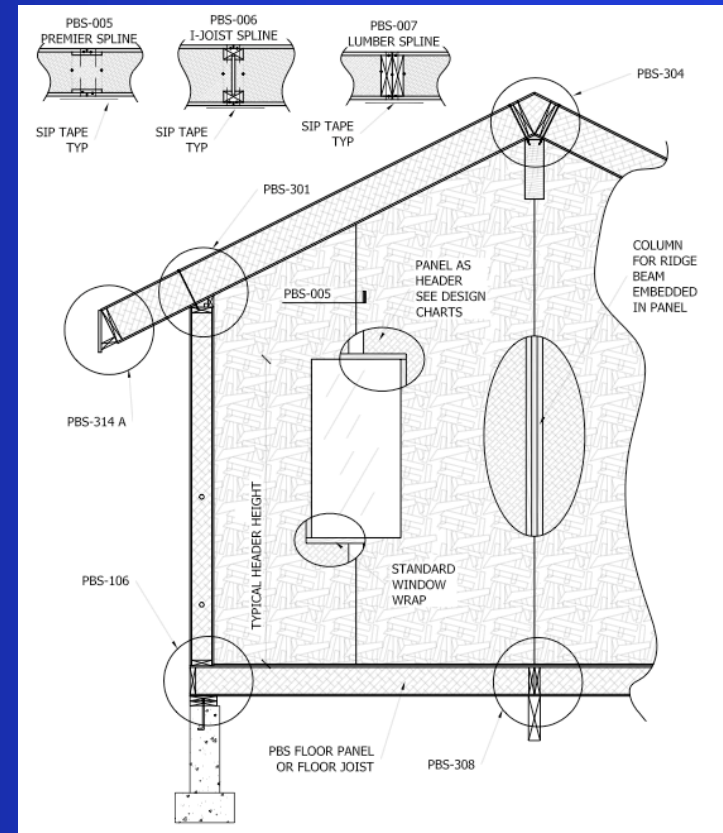
Wall Panels - Overview

Gable Wall

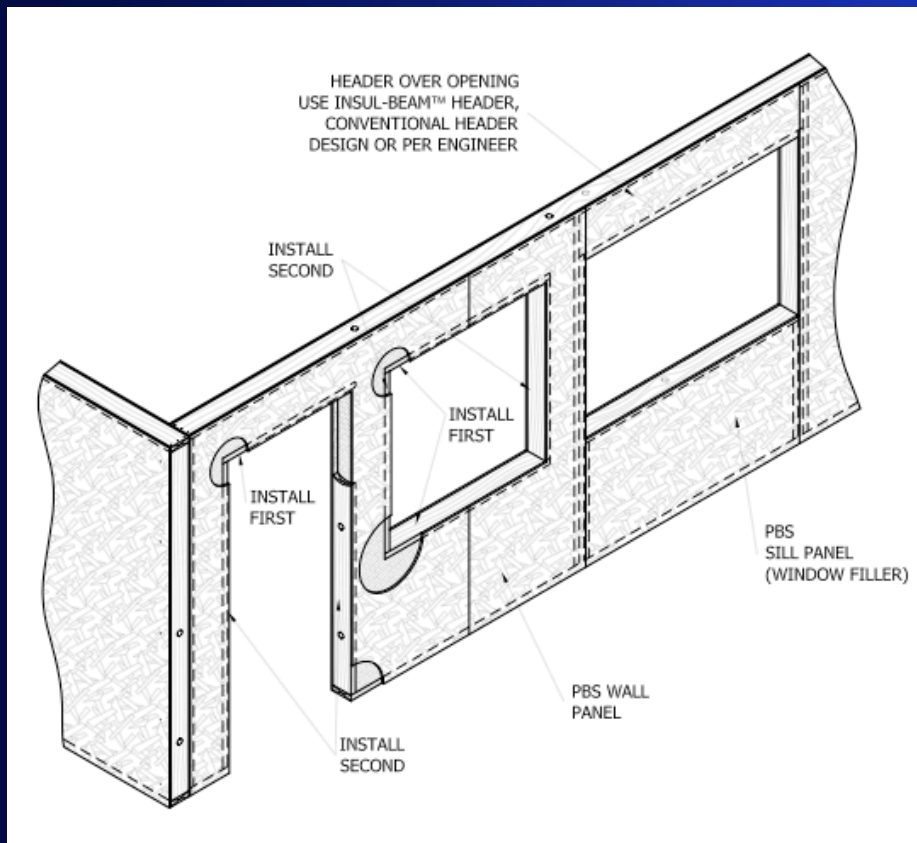
Point load



No point load

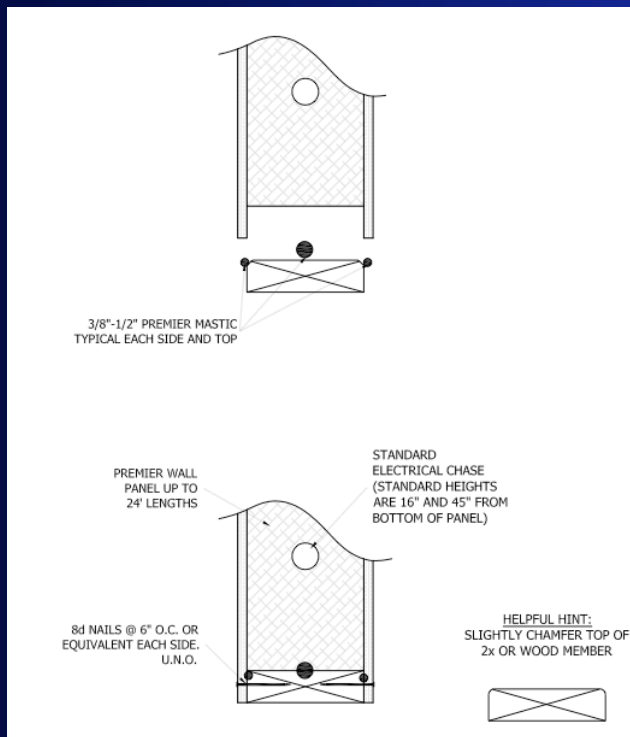


SIP Details Windows and Doors

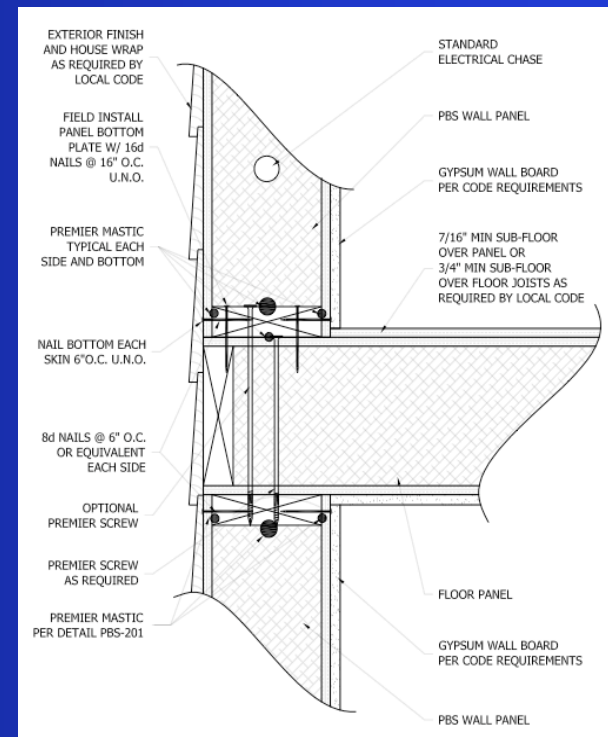


Wall Panel Detail - Floor

Sill Connection

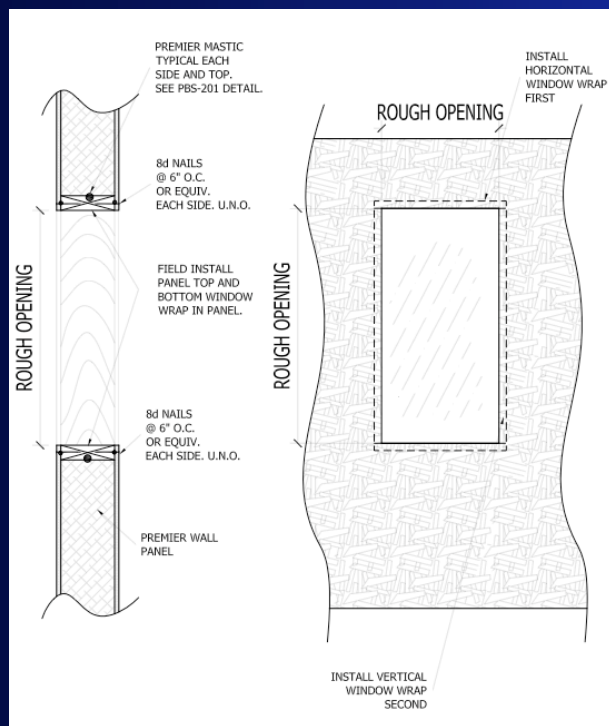


Floor to floor

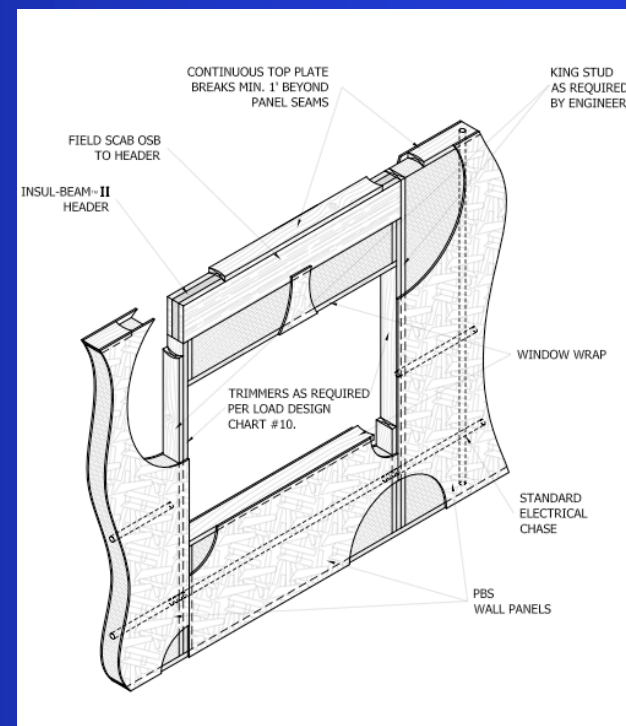


SIP Wall Headers

Wrapping openings

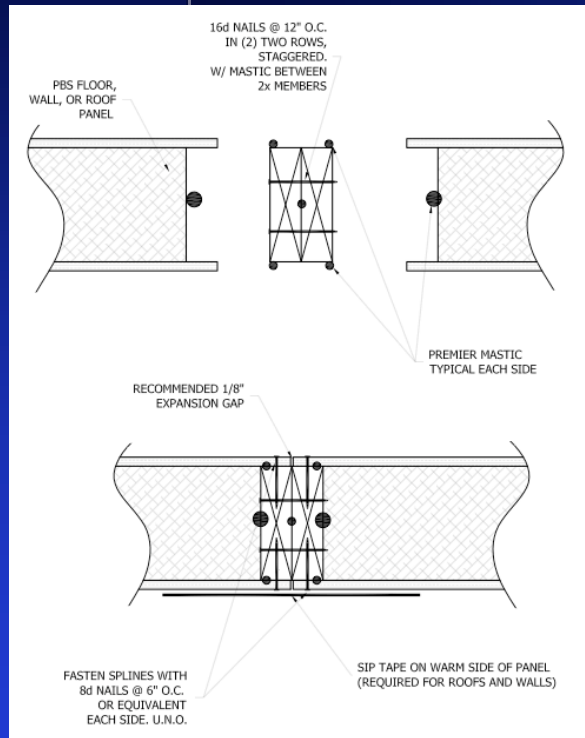


Insulbeams

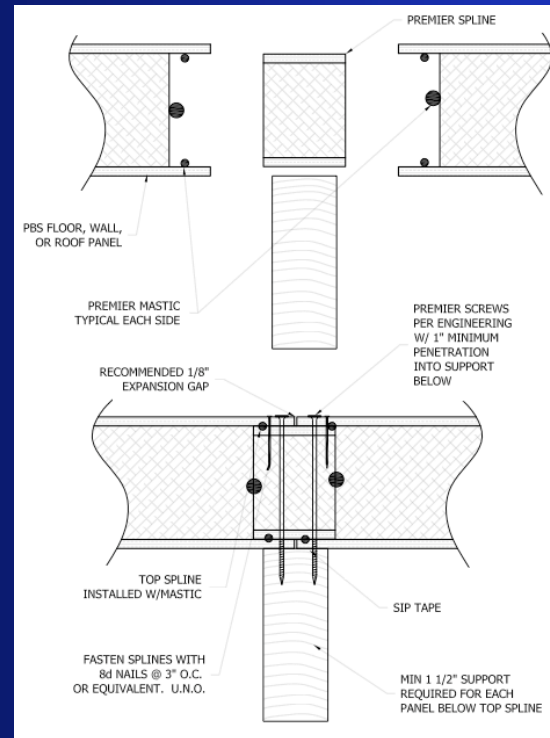


SIP Details - Infilling Panels

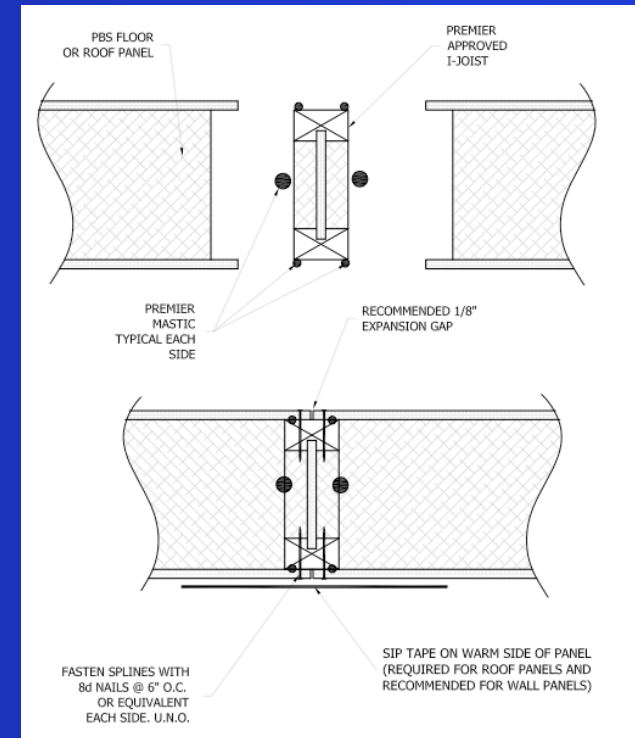
Lumber



Splines

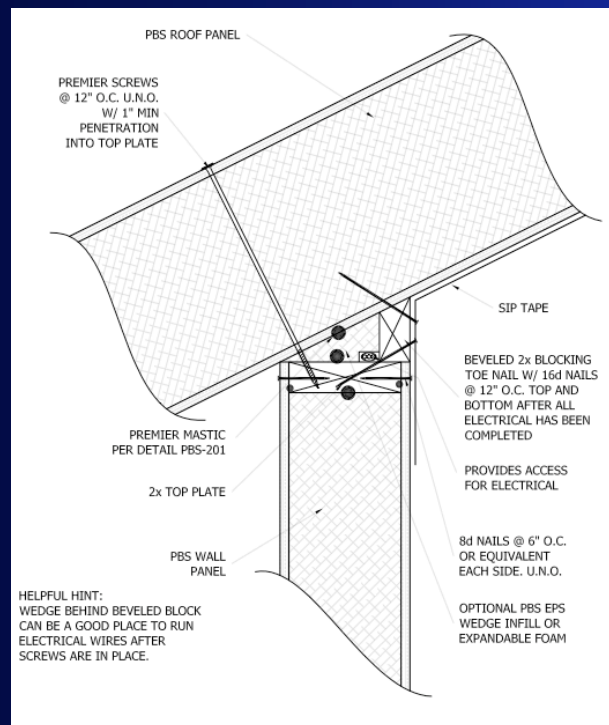


I-Joist

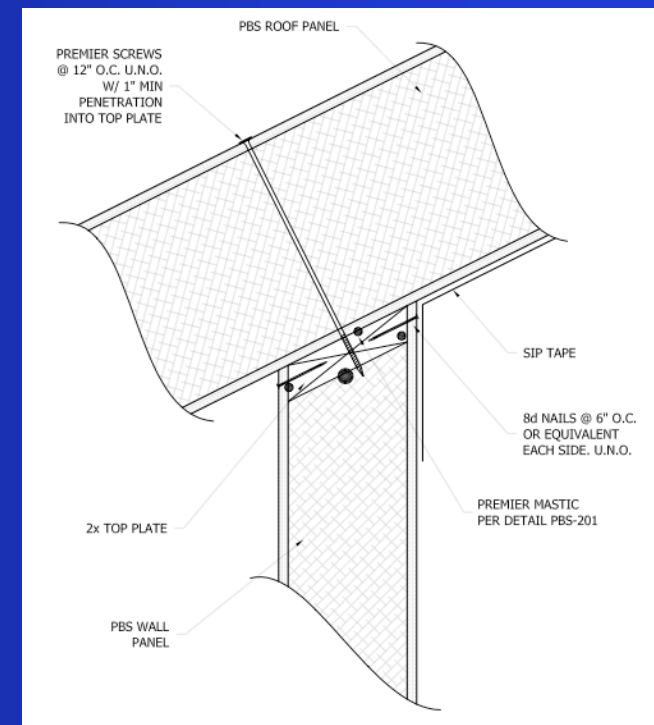


Wall Panel at Roof - Detail

Flat Wall/Bevel in-fill

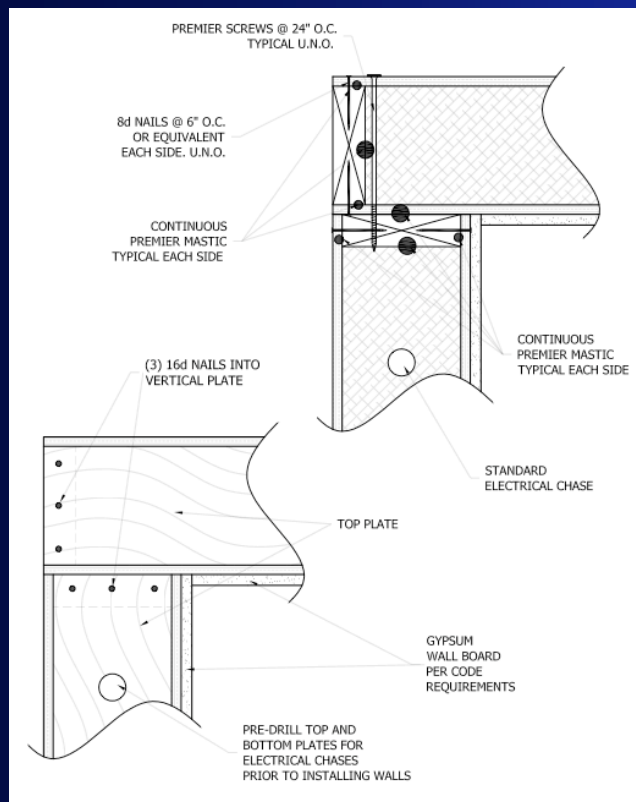


Beveled wall top

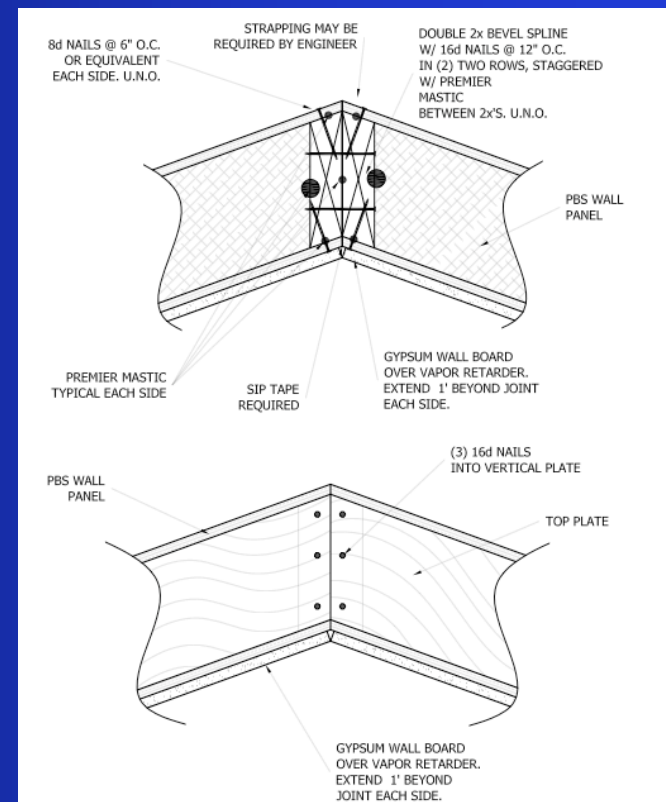


Wall Panel Detail - Corners

90° corner

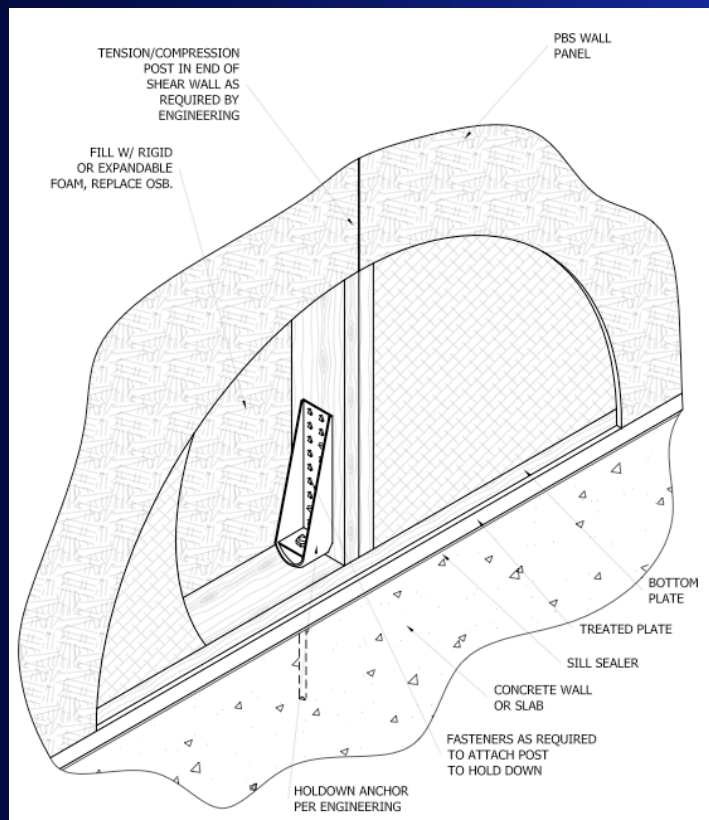


Angled corner

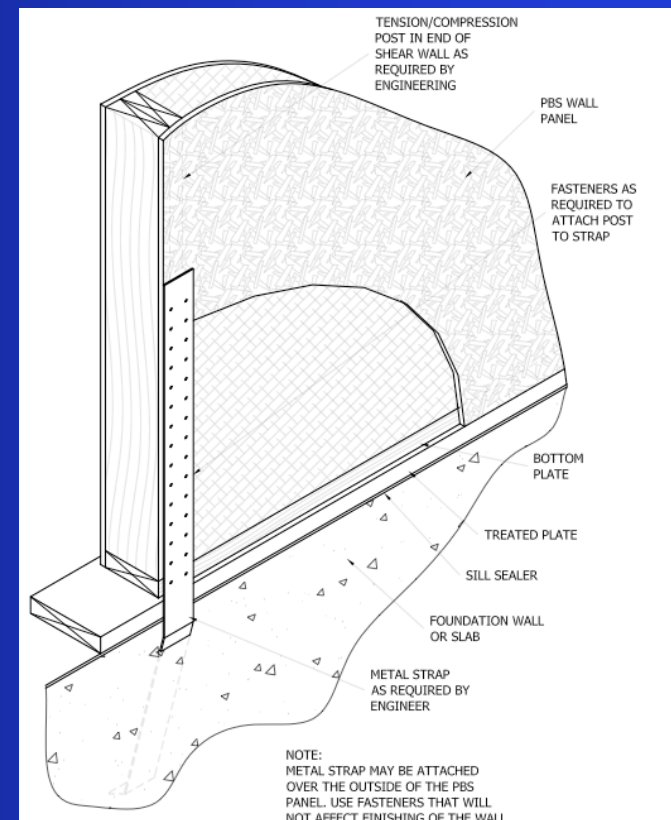


Wall Panel Detail - Holddowns

HD type

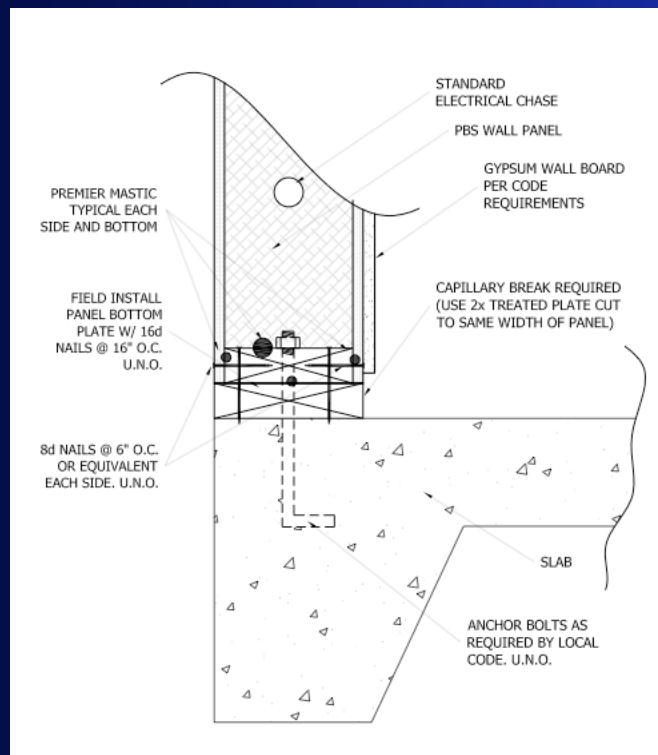


Strap Type



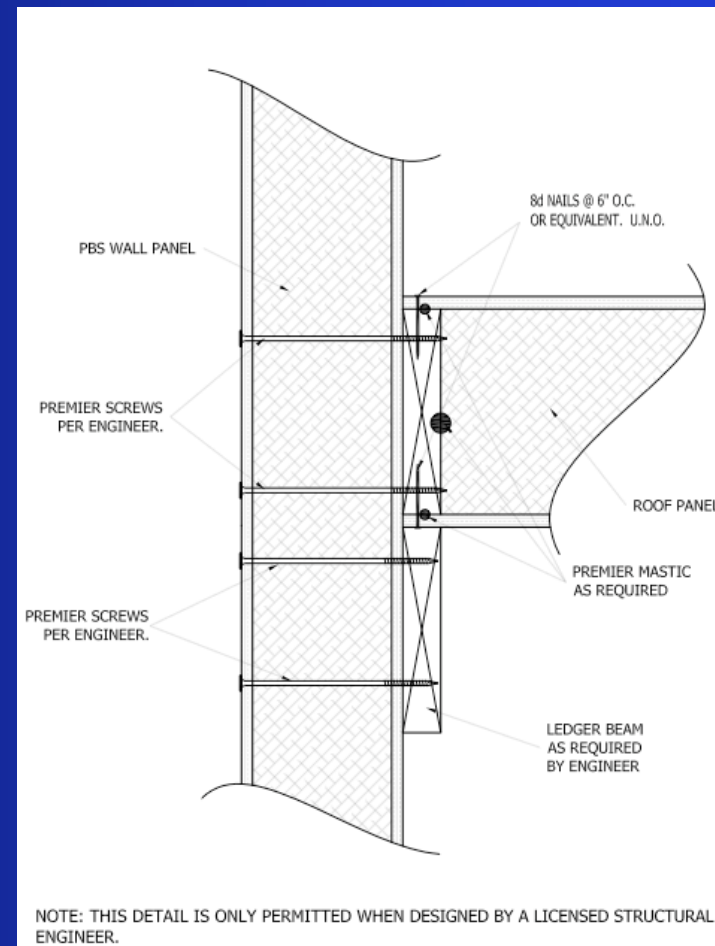
SIP Details - Slab Connections

Capillary Breaks Required



SIP Details - Floors and Roofs

Ledgers must be added to support bottom flange of panels

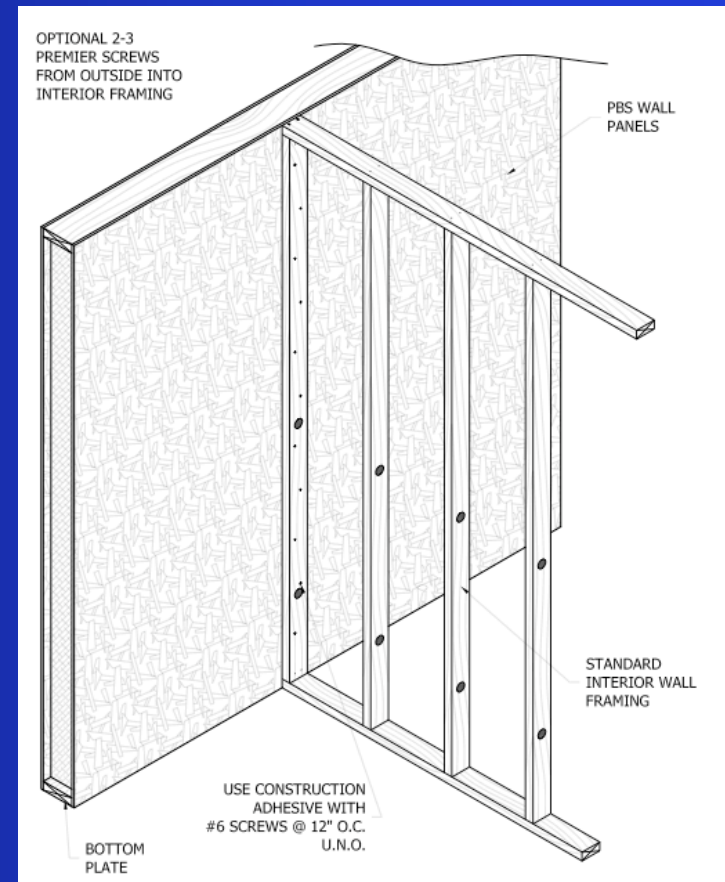


SIP Details

Connecting Interior Walls

Screws through panels anchor interior wall to panels required with single top plates

With two top plates, overlapping plates is the most secure interconnection method

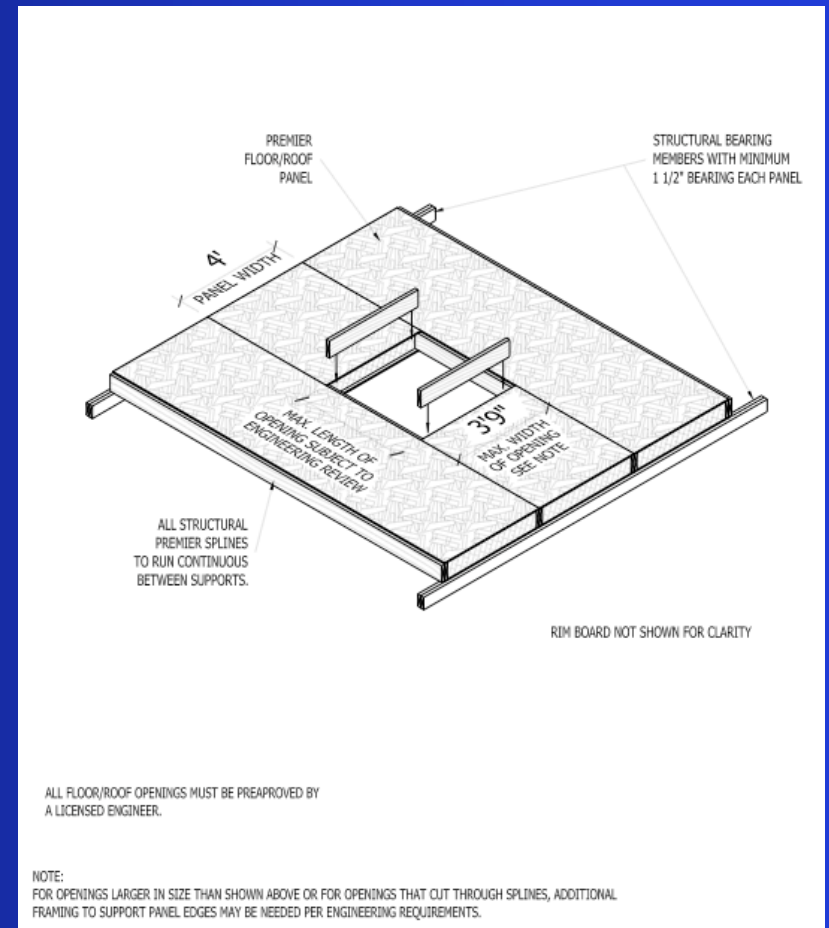


SIP Details

Roof Structure and Openings

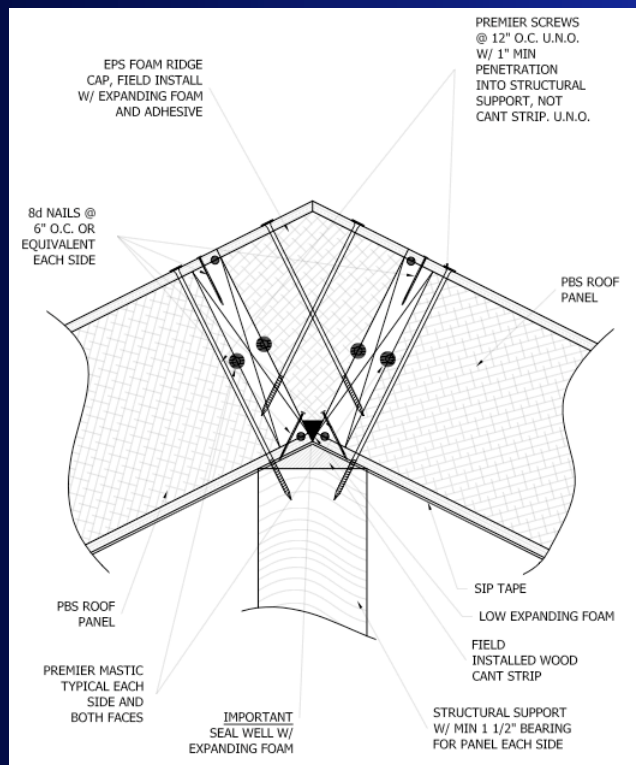
Opening must be smaller than 4' or additional structure required to support panel loads

Structural infill bears on ridge and outside wall and spans from ridge to eave

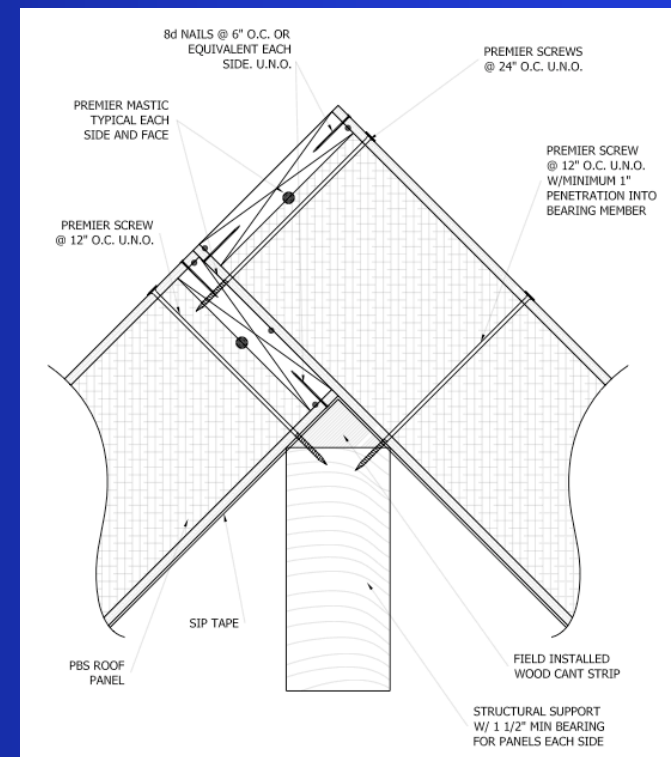


Roof Panel Detail - Ridge

Low Slope Ridge

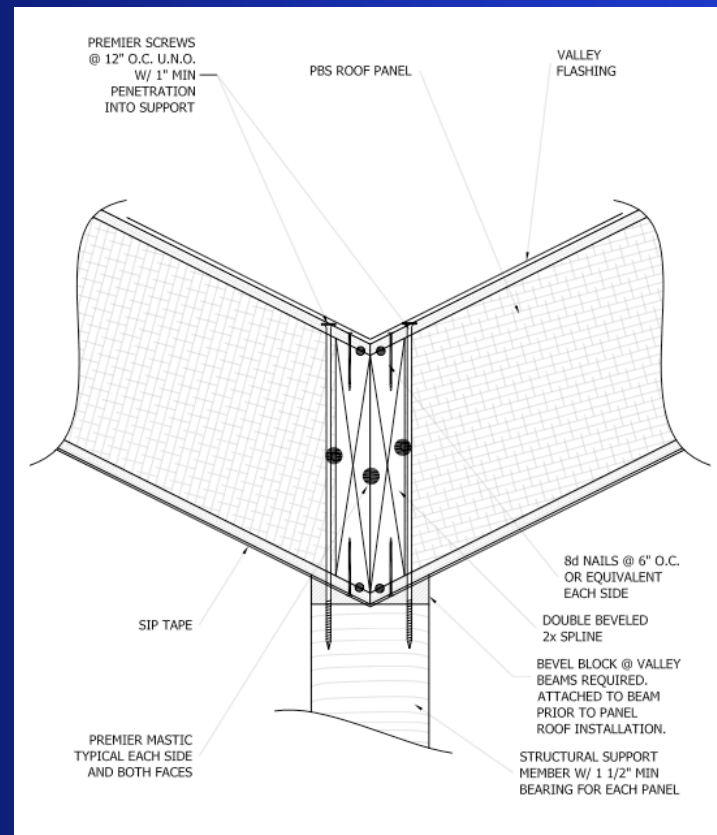


12/12 Ridge



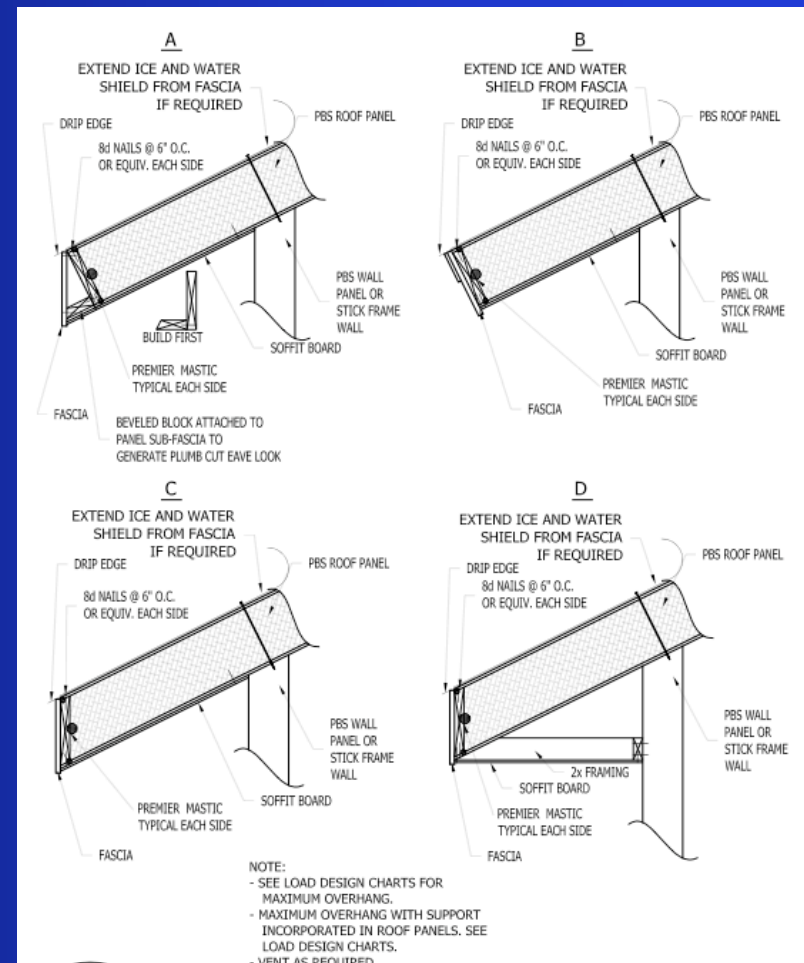
Roof Panel Detail - Valley

Valley Detail



Roof Panel Detail - Eaves

Plumb, Square and Soffitted Eaves

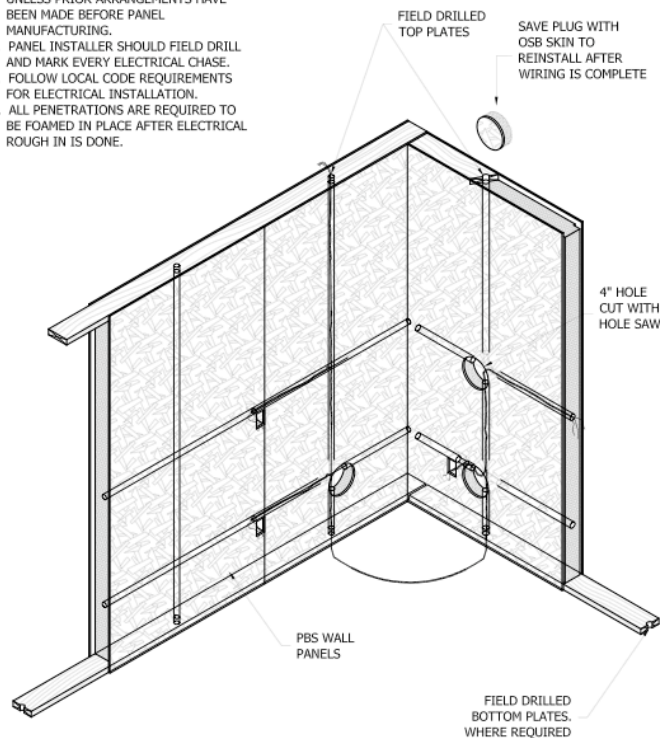


Wall Panel Detail - Electrical

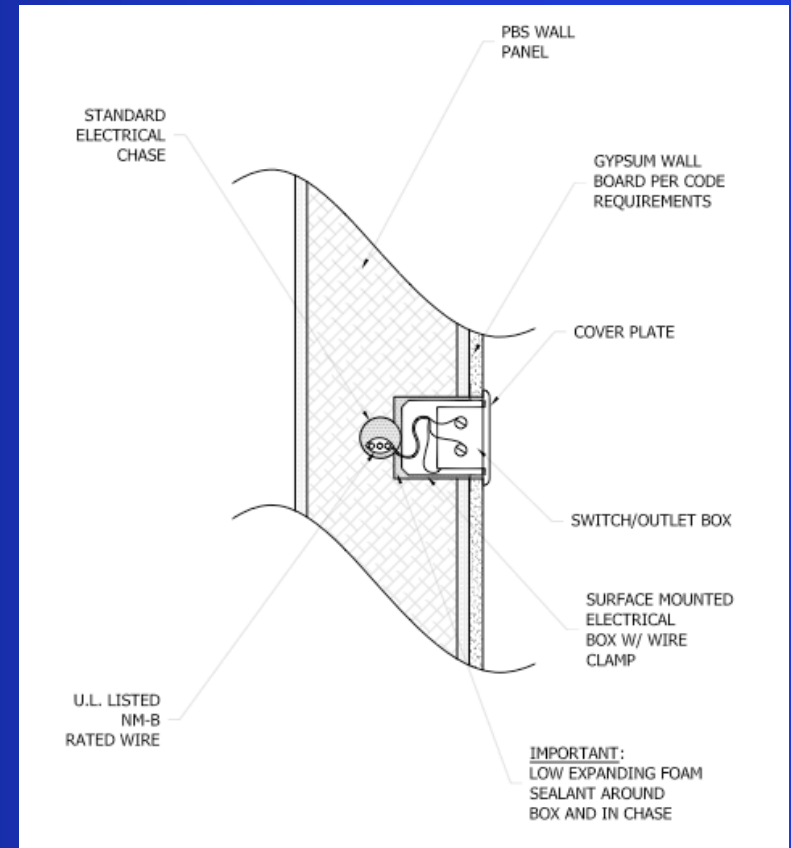
Chases through panels

NOTES:

1. FACTORY PROVIDED ELECTRICAL CHASES ARE STANDARD 16" AND 45" ABOVE BOTTOM OF PANEL AND ROUGHLY 48" O.C. VERTICAL UNLESS PRIOR ARRANGEMENTS HAVE BEEN MADE BEFORE PANEL MANUFACTURING.
2. PANEL INSTALLER SHOULD FIELD DRILL AND MARK EVERY ELECTRICAL CHASE.
3. FOLLOW LOCAL CODE REQUIREMENTS FOR ELECTRICAL INSTALLATION.
4. ALL PENETRATIONS ARE REQUIRED TO BE FOAMED IN PLACE AFTER ELECTRICAL ROUGH IN IS DONE.



Retro boxes



SIP Panels Care

- Store Panels Flat and covered
- Do not lift by top skin
- Do not drop panels
- Protect from rain

SIP Panels Install Requirements

- Support both skins on wall panels
- Drill electrical chases in top and bottom of panels
- Panels cannot sit on concrete without capillary break(p.t. lumber between concrete and panel edges)
- No Plumbing in wall panels
- Always install SIP panel tape at all joints
- Foam all penetrations
- Vapor Barrier in cold climate residential applications req.
- Mechanical Ventilation req.