SIP DESIGN-BP 5:

SIP Shop Drawings

This document is created specifically for design professionals 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 Design with SIPs: DESIGN CONSIDERATIONS overview which highlights important considerations during the design phase of a Structural Insulated Panel (SIP) structure. Decades of combined knowledge from SIPA manufacturers 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 design are explored here.

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

SIP DESIGN-BP 5.1:

Depending on complexity of design, need for engineering, permitting, and possible revisions, the development of SIP shop drawings is a process that relies on engagement from those reviewing these drawings on behalf of the building owner.

Local building code jurisdictions may require design-professional-stamped architectural building plans for
all structures. These plans may be prepared by an architect, engineer or building designer. The plans may range from simple 2D drawings to complex 3D drawings and contain plan views, elevations and installation details necessary to complete the construction of the building in compliance with the applicable codes. In many instances the architectural plans may include prefabricated building components such as SIPs which require shop drawings. The SIP shop drawing process (similar to manufactured trusses) may require weeks of planning prior to the fabrication and delivery of the SIPs, depending on complexity of project and customer approval
processes. This upfront planning ensures smooth installation with minimal field changes, resulting in reduced installation time and waste.

SIPA manufacturers use architectural drawings as the basis to create a set of SIP shop drawings which will be used by the manufacturer to fabricate SIPs to exacting standards. In order to ensure that these SIP components will fit precisely, meet all architectural plan requirements and optimize construction time, the importance of the drawing review process, by either the owner or an authorized representative of the owner, cannot be overstated. The old adage, “measure twice, cut once” cannot be more appropriate than to the SIP shop drawing review. SIP shop drawings specify SIP size, layout, assembly details and installation specifications. The SIP manufacturer is best positioned to factor in material yield, ease of installation, cost of fabrication, structural requirements and building design intent when designing the SIP panel layouts. When it comes to designing and building a high-performance SIP structure, the upfront investment in the SIP drawing review will prove to be the best investment, resulting in a faster install and a reduction in the manpower needed on the jobsite.

A detailed description of the process associated with the preparation, review and approval of these SIP shop drawings is provided in SIP DESIGN-BP 5.2.

www.preflexinc.com
3411 3rd Ave. San Diego, CA. 92103, USA
+1 866 784 4462

SIP DESIGN-BP 5.2:

SIP shop drawings are provided for client review and approval.

SIP manufacturers will use the architectural construction drawings (see Image 5.1) provided by the client/ customer to create SIP shop drawings.

IMAGE 5.1:
ARCHITECTURAL CONSTRUCTION DRAWINGS

The SIP shop drawing is the SIP manufacturer's drawn version of information shown in the architectural construction documents. This usually starts with constructing a 3D model of the project as seen below in Image 5.2.

IMAGE 5.2:
3D MODEL SIP SHOP DRAWINGS

The SIP shop drawings normally show more detail (see Image 5.3) than the architectural construction documents regarding the SIPs. The SIP shop drawing is drawn to explain the fabrication and/or installation of the SIPs to the SIP manufacturer's production crew and the contractor's installation crews. The information shown on the SIP shop drawing is usually very different from that of the designer's or architect's construction drawing. The SIP shop drawings' primary emphasis is on the SIP product and excludes notation concerning other products and installations unless integration with the SIP is necessary.

IMAGE 5.3:
SIP SHOP DRAWINGS

It is very important that the client/customer review the SIP shop drawings prior to manufacture of the SIPs for dimensional accuracy, rough opening dimensions and placement, panel thicknesses, roof pitch and other items pertinent to the project.

The customer will be asked to "red line" or comment on the SIP shop drawings as necessary and to approve the SIP shop drawings before manufacturing is initiated. Prompt return of the approved SIP shop drawings ensures the timely delivery of materials. Production lead times vary by manufacturer, time of year, and the size and complexity of the project. Approval of the SIP shop drawings usually consists of signing and dating an approval stamp that is placed on each sheet of the SIP shop drawings. A sample approval stamp is shown below in Image 5.4.

IMAGE 5.4:

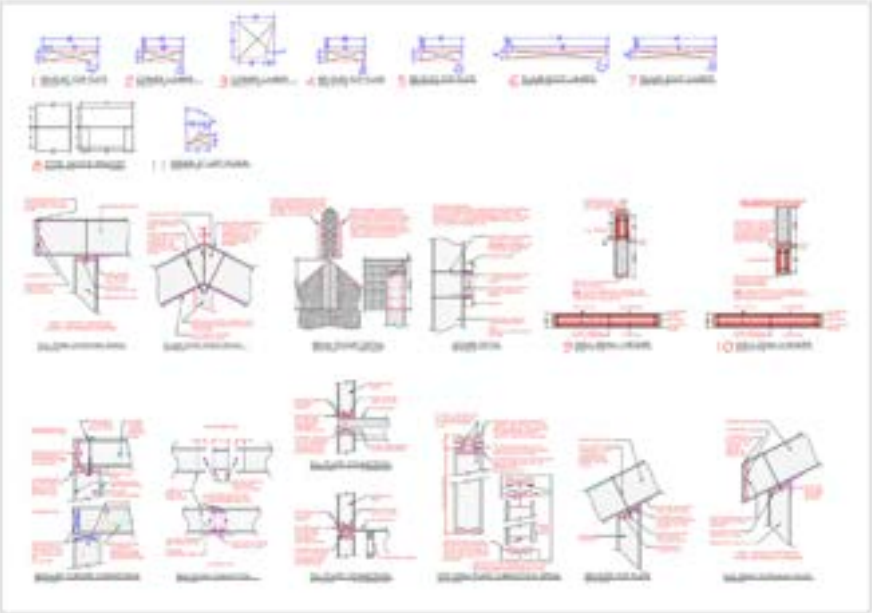
SIP MANUFACTURER APPROVAL STAMP

SIP DESIGN-BP 5.3:

Let the SIP manufacturer do the work of establishing initial SIP layout and associated details.

Once you have chosen the SIP manufacturer for the project, they will work with the architectural construction drawings as described in SIP DESIGN-BP 5.2 to create a set of SIP shop drawings. By allowing the SIP manufacturer to create the SIP shop drawings, they can utilize their details and best practices in the project (see Image 5.5). Through this process, they will be looking at the details needed to make the project a success.

IMAGE 5.5:
SIP SHOP DRAWING DETAILS



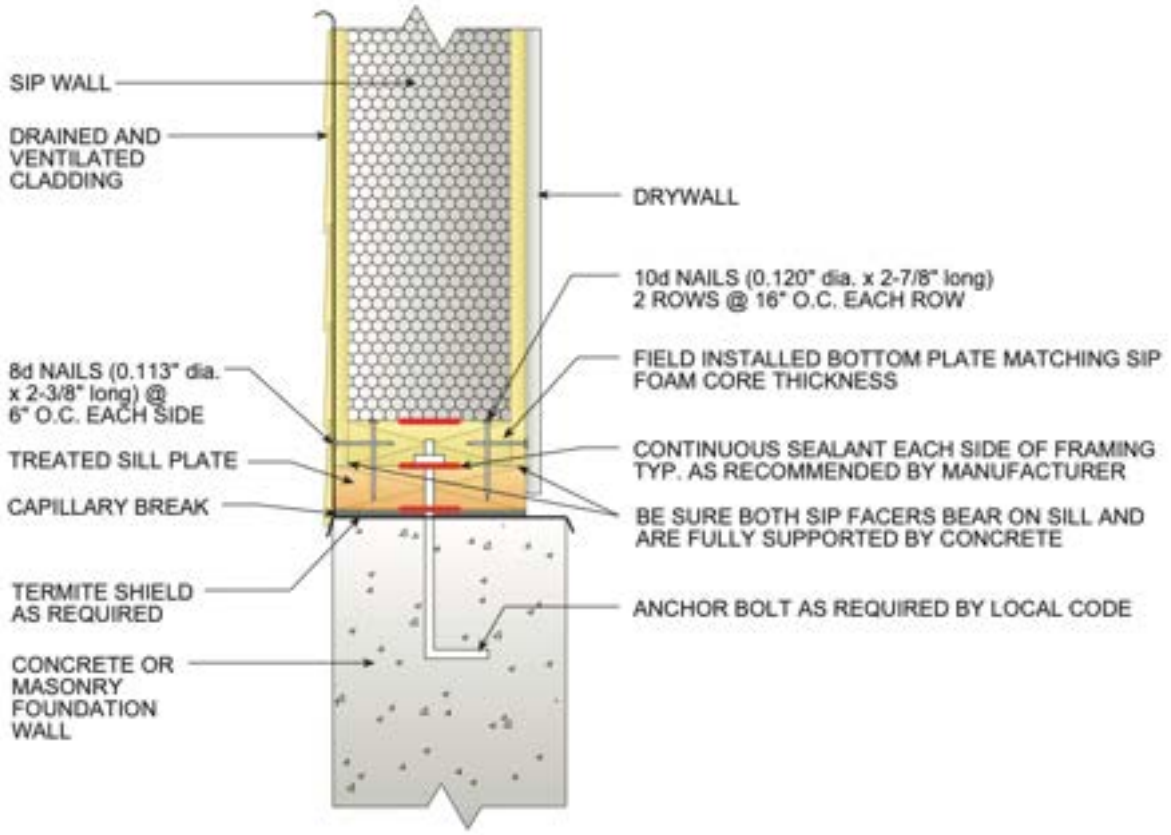
Having accurate window and door rough openings can save time. This way all openings can be created and headers, if necessary, can be sized. Columns for point loads like girder trusses, glulam beams or other structural loads are located to assure proper transfer of loads. Once the SIP shop drawings are completed and they have gone through the process of client review and approval, then, if necessary, drawings are sent to structural engineer for approval.

This process can save time once all materials show up on the jobsite (see Image 5.6) since the structural components have been taken into account through the SIP shop drawing process. The time invested during the SIP shop drawing process enables labor savings during installation.

IMAGE 5.6:
SIPS STAGED ON JOBSITE

SIP DESIGN-BP 5.4:
Both SIP wall skins (inner and outer facings) must fully bear on the support deck without any overhang. Detail accordingly.

In order to transfer gravity loads, in-plane loads and out-of-plane lateral loads in SIP wall construction, the OSB facers of the SIP must bear directly on the members supporting them. This is based on extensive research conducted by SIPA and is unlike conventional wood frame construction where the structural sheathing does not bear directly on the support members because the studs in the walls carry the gravity loads and out-of-plane lateral loads. Bearing of the OSB facers is achieved by following Figures 4 and 13, reproduced below, from SIPs Basic Connection Details*. Details illustrating full bearing of both facers are provided in SIPs Basic Connection Details and in manufacturers' literature, to guide design professionals in preparing their architectural construction drawings to include this detail.



FOUNDATION CONNECTIONS

SIP WALL ON FOUNDATION

Fig 4.

from SIPs Basic Connection Details.

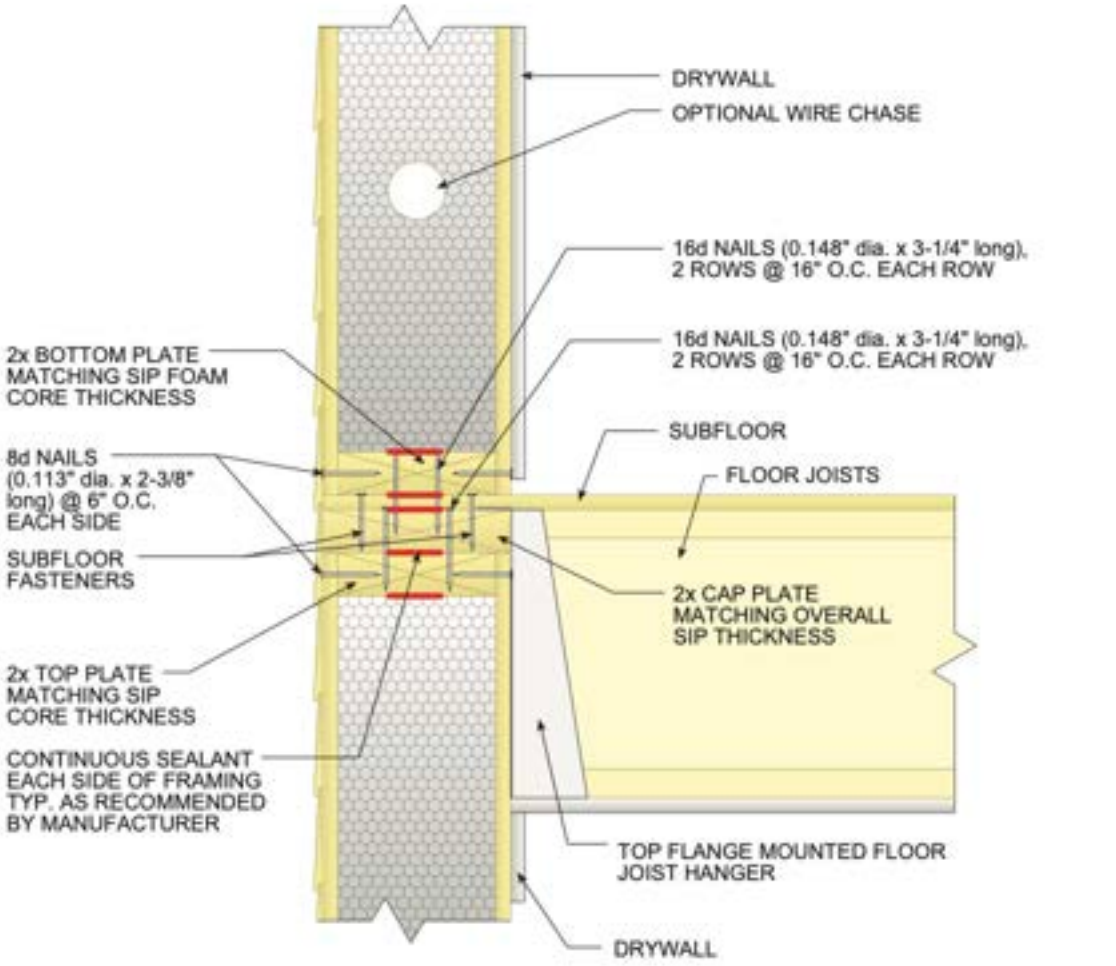


Fig 13.

from SIPs Basic Connection Details.

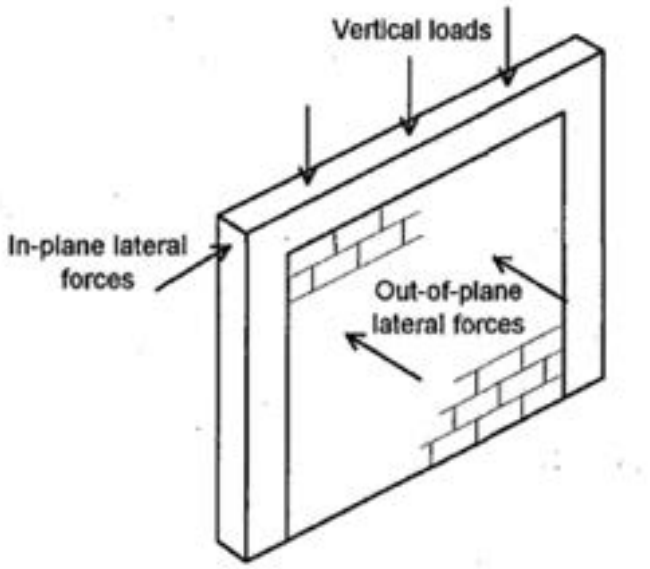
Glossary of Terms

Architectural Drawings: Also called construction drawings (used interchangeably), architectural construction drawings are made according to a set of conventions, which include particular views (floor plan, section, etc.), sheet sizes, units of measurement and scales, annotation and cross-referencing. These are not the same as SIP shop drawings.

CNC Machining: Computer Numerical Control (CNC) machining is a manufacturing process in which pre-programmed computer software dictates the movement of factory tools and machinery.

Gravity Loads: Also called vertical loads, gravity loads are those forces that are applied perpendicular to the roof or floor system (i.e., perpendicular to the ground). These are separated into two categories: dead loads and live loads.

In-Plane Load: A load acting horizontally to the SIP; e.g., wind load or earthquake load applied to the wall or roof parallel to the wall or roof surface.



Out-of-Plane Load: A load acting perpendicular to the wall; e.g., wind load applied on the wall is an out-of-plane load.

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.

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.

Transverse Load: A load applied perpendicular to the span of the member.

www.preflexinc.com
3411 3rd Ave. San Diego, CA. 92103, USA
+1 866 784 4462

Written and compiled by SIP Industry Professionals:

- David Gould – PorterSIPs
- James Hodgson – Premier Building Systems
- Jeremy Dieken – Extreme Panel Technologies
- Joe Pasma, PE – Enercept
- Tom Williamson, PE – Timber Engineering, LLC

Structural Insulated Panel Association Staff:

- Jack Armstrong, Executive Director
- Elaine Valby, Technical Coordinator