porterSIPS™
structural insulated panels

QUALITY -MADE.
GREEN-DRIVEN

Product Catalog

FOREWORD : Advanced Panelized Construction

In the last two centuries, manufactured housing components have evolved slowly. From a church built in Dearborn, Illinois, in 1833, which used factory cut dimensional lumber, until today, stick-built framing has changed very little. Stick framing still dominates the light construction market because it is easy to work with, low in cost and extremely adaptable.

However, no longer do we have cheap energy, vast forests, primitive manufacturing and a lack of concern for environmental issues. Today's manufacturing is taking place with computers, plastics, adhesives, engineered wood, modern machinery and a renewed respect for the environment. By keeping some of the best aspects of stick construction and combining these with the newest methods and materials, a hybrid of stick-construction has evolved, and it is called Structural Insulated Panels, or SIPs.

With SIPs, insulation is a forethought, not an afterthought. Most homes built before 1950 had almost no insulation. When energy became more expensive, insulation was added to stick-built structures by stuffing something between the studs. With SIPs, a foam plastic insulating core and engineered wood faces work together to make large rigid panels that are the frame, sheathing, and insulation of a structure. An all-in-one product, SIPs provide huge energy savings of 50% or more, when compared to traditional stick framing.

In the past, factory-built housing was nothing more than a transferring of job site building practices into a factory setting. Workers would cut the lumber and assemble the walls and roof using the same tools and methods as they would have used in the field. This is not the case with SIPs! SIPs utilize a highly sophisticated manufacturing system. SIPs are not just rectangular laminated panels, but panels that have been fully engineered, independently tested, and pre-cut to size and shape to eliminate as much field work as possible.

It is interesting to note that HUD/PATH had a vision in 2002 of what should happen to construction by 2008.

"The vision for Advanced Panelized Construction is to develop common building panels that perform multiple functions and integrate multiple tasks using non-specific material specifications that deliver consistent levels or grades of performance from basic to high performance, and are easy to order, deliver, assemble, and integrate with the building process. Ideally, the building panel achieves lower in-place cost (i.e., materials, labor, and overhead) than the individual pieces and individual tasks it replaces or integrates. The vision applies and extends to small builders, high-volume production builders, and manufactured home producers. It brings progress and contributions to each of the HUD/PATH goals via lower in-place cost, increased energy efficiency and durability, and safer means to construct the building envelope" (PATH Technology Road Map: Advanced Panelized Construction Year One Progress Report, 2002, p. 2).

HUD/PATH's vision is no longer a dream. It is a reality with SIPs.

19th Century

20th Century


Develop architectural plans.


Building plans converted into SIP panels


CNC lamination


CNC cutting and shaping


Delivery of pre-cut panels.

21st Century

CONSTRUCTION EVOLUTION

Before 1980, plywood foam core panels were limited in size to 4'x8' or 4'x10'. In the early 1980s, when Weyerhaeuser introduced 8'x24' sheets of 7/16" thick OSB (Oriented Strand Board), real SIPs were born. Looking back, large panel introduction did not seem revolutionary at the time. It took some time for the small sandwich panel manufacturers to grasp what opportunities had been laid before them and what obstacles had to be overcome to make this a revolutionary change in construction.

One major step in promoting SIPs and making it an industry occurred in 1990 when ten small "sandwich panel" manufacturers gathered to discuss issues involving this new large OSB panel system. It was determined that they had to have another name for the product rather than "sandwich panel". After productive discussion, one of the manufactures, suggested "Structural Insulated Panels". The name stuck and this group moved ahead to form a trade organization, the "Structural Insulated Panel Association" (SIPA). Once this group formed, SIPs became known as the most advanced building system available to the light construction market. Through the work of SIPA, many great organizations and researchers came forward to help refine and develop the SIP building system. With energy saving studies and documentation from Oak Ridge National Laboratory, SIPs were established as the best commercially available method to build an insulated envelope and save on heating and cooling costs.

Today, state-of-the-art SIP manufacturing is accomplished with CNC machinery and custom SIP specific software. This software converts building plans directly to CNC machines which can quickly cut
panels with amazing precision. After the CNC-cut SIPs are delivered to the job site, they can be assembled in hours or days instead of weeks. The time study publishing company, RSMeans, indicates that construction with SIPs can save 55% of erection time compared to stick construction.

SIPs capability to span 20 feet for a roof panel or carry an axial load for a three story building are factors that allow designers to simplify structures with big panels.

Saving heating and cooling energy 50% or more with SIPs is driving the SIP market today. The bright spot on the construction market is SIP construction. Not only has SIP construction held up in a down market but has increased market share.

The vision of Advanced Panelized Construction is now a reality that is changing construction in the 21st century.

Thanks To All Who Have Helped Grow the SIP Industry

It has taken a group effort by a great many people and organizations to make SIPs the industry it is today. With discussion and publication of information about SIPs, it would be a mistake to not credit and thank contributors.

* *This incomplete list does not imply any endorsement for any group or individual but only recognizes their contribution.*

Sam Marts Architects & Planners Ltd. – Sam Marts is a long time specifier of SIPs – www.timbersmart.com
White Oak Timber Frame, Robert Foulkes – Timber framer and educator
Jarzembowski Builders – Jarzembowski is a long time installer and user of SIPs in custom homes
Rockford Construction – Rockford pioneered rapid construction with the use of SIPs in the franchise restaurant construction market – www.rockfordconstruction.com

Structural Insulated Panel Association SIPA – www.sips.org
SIPA Manufacturer Members
SIPA Builder Members
SIPA Design Professional Members
SIPA Supplier Members

SIPA Structural Insulated Panel Association

NTA Inc. – NTA provides testing, inspection, engineering and certification services. NTA has taken SIP engineering far beyond basic load charts by determining SIP engineering properties and developing engineering analysis software for use by professional engineers. NTA is accredited through IAS which is a subsidiary of ICC – www.ntainc.com
BASF – BASF provides chemicals for adhesives, sealants, panel cores and extensive SIP marketing research and assistance – www.basf.com
Ashland Chemical – Ashland provides laminating adhesives developed specifically for SIPs – www.ashland.com
Dow Chemical – Dow provides laminating adhesives and foam sealants developed specifically for SIPs –www.dow.com
Weyerhaeuser –Weyerhaeuser introduced the first 8'x24' OSB which radically changed the SIP industry – www.weyerhaeuser.com
Tolko Industries – Tolko provides 8'x24' OSB to the SIP industry – www.tolko.com
Ainsworth Lumber - Ainsworth provides 8'x24' OSB to the SIP industry – www.ainsworth.ca
Hundegger USA – Hundegger provides state of the art CNC cutting equipment for the SIP industry – www.hundeggerusa.com
Dietrich's – Dietrich's provides CAD software specific to SIPs and compatible with CNC equipment – www.dietrichs.com
Elk Group, Inc. – Elk is a roofing supplier and long time supporter of SIPs
Black Bros. Co. – Black Bros is a long time supplier of roll coating equipment
TruFast, LLC. – Trufast is a leading supplier of engineered fasteners made specifically for SIPs – www.trufast.com
Building Systems Magazine – Building Systems is a long time reporter of advanced alternative methods of construction – www.buildingsystems .com
SJS Components – SJS developed an insulated header that is complementary to SIP construction – www.sjscomponents.com
RAMM Manufacturing – Ramm is a supplier of foam scoops for field trimming of SIPs – www.rammfg.biz
Pulte Homes – Pulte invested in two automated SIP production lines and in the process developed machinery and procedures that helped lay the ground work for modernization in the SIP industry – www.pulte.com
Timber Framers Guild - TFG members use SIPs to enclose their frames – www.tfguild.org
PATH / HUD – PATH/HUD supports high performance building research and therefore SIPs – www.pathnet.org
APA - The Engineered Wood Association – APA provides assistance with marketing resources, the SIPA help desk, and other technical resources – www.apawood.org
EPS Molders Association – EPSMA members produce high quality SIP core material – www.epsmolders.org
Oak Ridge National Laboratory – ORNL has provided scientific reports that illustrate SIP energy performance – www.ornl.gov
Building Science Corporation – BSC with the help of SIPA published a Builder's Guide to SIPs – www.buildingscience.com
Federation of American Scientists – FAS is providing help with seismic testing of SIPs – www.fas.org
United States Green Building Council – USGBC is supporting the SIP industry by recognizing SIPs' inherent energy efficiency and other "green" attributes in their LEED programs – www.usgbc.org
ICC ES Evaluation Service – Recognition of the sandwich panel – www.icc-es.org

TABLE OF CONTENTS :

CONNECTOR SELECTION KEY

Sections are divided into thirteen general categories, identified by tabs along the page's outer edge.

HOW SIPs WORK

STRUCTURAL INSULATED PANELS:
These words define the properties of this innovative building method. SIPs are unique because they combine structure and insulation in one large rigid panel – up to 8' x 24'.

How they work:
SIPs achieve their structural integrity with an "I" beam effect by using rigid sheets of Oriented Strand Board (OSB) as the flanges of the "I" beam and a rigid plastic foam core as the web of the "I" beam. The key to this structure's performance is that the EPS core keeps the OSB skins from buckling by keeping them "in plane".

One material with two benefits:
The rigid plastic foam core of 1#/CF expanded polystyrene (EPS) is the insulation and the web of the "I" beam. The thicker the panel the more load the panel will carry and the greater the insulation value.

Multiple uses for SIPs:
SIPs can be used for floors, walls and roofs.

Factory conditions lead to consistent quality:
The EPS foam core and the OSB facings are rigidly bonded together in the factory under strict quality control standards that are approved by building codes.

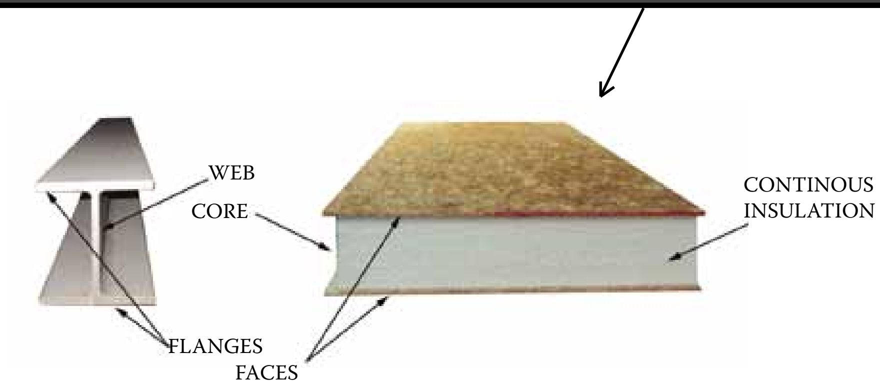
CNC cutting for ease of assembly:
Factory manufacturing does not just stop at the bonding of the OSB to the EPS, it continues on with precision cutting and shaping of the panels to match the specified building envelope.

SIPs are an evolution of stick construction:
Structural insulated panels have evolved as a hybrid of stick-built construction and use dimensional lumber for plates and window/door framing. SIPs are made to work with dimensional lumber; 2 x 4, 2 x 6, 2 x 8, 2 x 10 and 2 x 12. Much of the assembly process is the same as rough framing a house except with SIPs a lot of the steps are eliminated and time is saved. The standard module for SIPs is 8' x 24'. This panel weighs about 800 pounds.

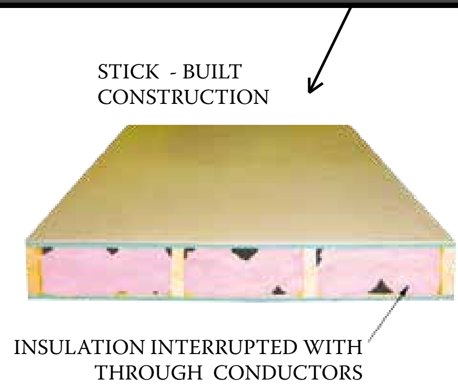
Real SIPs vs small sandwich panels:
Real SIPs use large sheets of OSB; usually 8' x 24'. Large structural sheets are the key to advanced panelized construction. Keeping the panels large is a real advantage to the contractor and structrual designer. The contractor can more rapidly assemble a structure with large panels and fewer parts. With a minimum of joints the building is stronger. Panels can span greater distances than smaller sandwich panels.

A SIP WORKS LIKE AN "I" BEAM

SIP FORETHOUGHT INSULATION



AFTERTHOUGHT INSULATION



Large panels allow long spans:
Although the EPS foam core may have butt joints, the facing OSB sheets must be continuous for structural reasons. Higher walls and longer roof spans are some of the many advantages of SIPs.

SIP erection is very similar to stick construction:
Switching from stick-built to SIP is a rather easy process that requires only a few differences. Many standard carpentry tools are still used when building with SIPs. However, power lifting equipment is required as a SIP can weigh up to 800 pounds. Also, SIPs use special fasteners and foam recessing equipment if field modifications are required.

One important installation difference:
Installing a base plate for rough framing and installing a base plate for SIPs vary only slightly but in a very important way. With SIPs the OSB faces carry the axial load and with stick-construction the studs carry the axial load. In order for the panel face to carry an axial load two plates are sometimes required. When using SIP walls on a concrete slab, a treated sill plate cut to the width of the panel thickness is required to separate the OSB face of the panel from the concrete slab. On top of that treated sill plate is a 2nd untreated bottom plate sized to fit between the OSB faces. The panels OSB face is then attached with nails, screws or staples.

SIPs and fire codes:
The SIP panel OSB is typically clad in the field inside and out. Facing for the inside must meet a 15 minute thermal barrier requirement for most low rise housing applications. To meet this requirement ½" drywall or equivalent qualifies. The exterior surface requires an approved exterior siding applied over an approved building wrap. See page 33 for more information.

SIPs benefits:
SIPs benefit the architect, the builder and the owner. The architect can create more dramatic space with cathedral ceilings; the builder will have work simplified; and the owner will receive a more spacious energy-efficient building.

SIPs are the way of the future:
SIP technology transcends the building market. It does not belong exclusively to the big or small builders. It does not belong to any one shape, size or style of building. SIPs are a product that is adaptable to customized mass production. No longer must a mass builder confine construction to their repetitive structures in huge plots. Large SIP panels can be cut and shaped to various configurations to conform to plans drawn on a computer. Architects, builders, and owners can now have building designs custom made with reduced effort with CNC machine cut SIPs.

SIZE COUNTS
BIG PANELS GO UP FAST AND SPAN THE DISTANCE

Fox Construction (above)- installed 12 Jumbo panels per hour.

SIPS GIVE THE CONTRACTOR A HEAD START
START WITH PRE CUT PANELS INSTEAD OF A STACK OF STICKS

Energy Efficient Building Envelopes

SIPs use the plastic foam core as structure as well as insulation. SIPs use one pound density expanded polystyrene (EPS) foam plastic as the core. EPS foam plastic provides the most structure and insulation for the money.

The insulating core of a structural insulated panel provides continuous insulation. SIPs enable structures to be assembled with minimal framing. The percentage of area in a wall assembly composed of sawn lumber is classified as a wall's "framing factor." The framing factor is a measure of thermal bridging. The more framing, the higher the framing factor and the more energy is lost due to thermal bridging. A typical stick-framed home averages a framing factor ranging from 15 to 25 percent, while a SIP home averages a framing factor of only 3 percent. When the whole-wall R-value is measured, SIP walls outperform stick-framed walls where studs placed 16 or 24 inches on center cause thermal bridging and result in energy loss. Additionally, fiberglass and other insulating materials used in stick-framing are subject to gaps, voids, or compression leading to further degradation in thermal performance.

When working with panels as large as 8' x 24' there are significantly fewer joints that require sealing. SIPs make establishing a whole house air barrier simple and effective.

Studies at the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL) have shown a SIP room to have 90 percent less air leakage than its stick-framed counterpart.

Air leakage in homes is measured by using a blower door test. Using a specially designed fan to pressurize the structure, Home Energy Rating System (HERS) technicians can measure the amount of air leakage in the home and use this information to size HVAC equipment or apply for an ENERGY STAR qualification. SIP-research homes built by ORNL were measured to have infiltration rates as low as 0.03 natural air changes per hour (ACH). Stick-framed homes of similar size in the same subdivision averaged blower door test results ranging from 0.20 to 0.25 . **SIP homes have proven to reach these levels of air tightness consistently enough for the EPA to waive the required blower door test for homes with a complete SIP envelope to receive an ENERGY STAR rating.**

When combined with other high-performance systems, SIP homes can reduce annual energy use by 50 percent or more over the Model Energy Code. SIPs have been instrumental in the creation of many zero-energy buildings that produce as much energy as they consume through photovoltaic cells and a high performance SIP building envelope.

NEAR-ZERO-ENERGY HOUSES

House	Sq. Ft.	% Savings of Model Energy Code (MEC)	Annual Utility Costs
SIPA ZEH1	1060	51.0%	$343
SIPA ZEH2	1060	57.0%	$484
SIPA ZEH3	1060	57.5%	$413
SIPA ZEH4	1200	62.5%	$275
SIPA ZEH5	1232	69.5%	$242

SIPA- Product Guide (Energy Savings from Small Near-Zero-Energy Houses, ORNL, 2002)

In 2002, ORNL teamed up with the Structural Insulated Panel Association (SIPA) and the DOE to create five innovative net-zero energy buildings. These high-performance homes featured structural insulated panel walls and roofs, rooftop solar photovoltaic systems, and other energy efficient technologies that helped the homes approach DOE's goal of net-zero energy use.

These small single-family homes were built in Habitat for Humanity's Harmony Heights subdivision in Lenoir, Tennessee. ORNL performed extensive testing on the performance of these homes and monitored energy usage for the first year of habitation. The air tightness and insulating properties of a SIP building envelope helped cut the annual heating and cooling cost for the first zero-energy home to $0.45 a day. By using SIPs in conjunction with other energy-efficient and affordable features, builders are able to offer net-zero energy homes to North American home buyers.

The importance of saving energy in building construction cannot be over stated in this day where the emphasis is almost all on generating energy. Today in the U.S., residential structures use 21% and commercial structures use 17% of the energy. Heating and cooling energy represent the biggest single factors. Reducing the demand for heating and cooling in residential and commercial buildings by 66% is a simple process and the cost is far less than the cost of generating this amount of energy.

"R" VALUES

"R" VALUE OF PORTERSIP PANELS

Panel Thickness	Panel "R" Value
4 1/2" (11.4 cm)	15.2
6 1/2" (16.5 cm)	24.7
8 1/4" (21.0 cm)	33.0
10 1/4" (26.0 cm)	42.5
12 1/4" (31.1 cm)	52.0

The **whole wall R-value** is a measure of thermal resistance used in the building and construction industry. Under uniform conditions it is the ratio of the temperature difference across an insulator and the heat flux (heat flow per unit area) through it. The bigger the number, the better the building insulation's effectiveness.

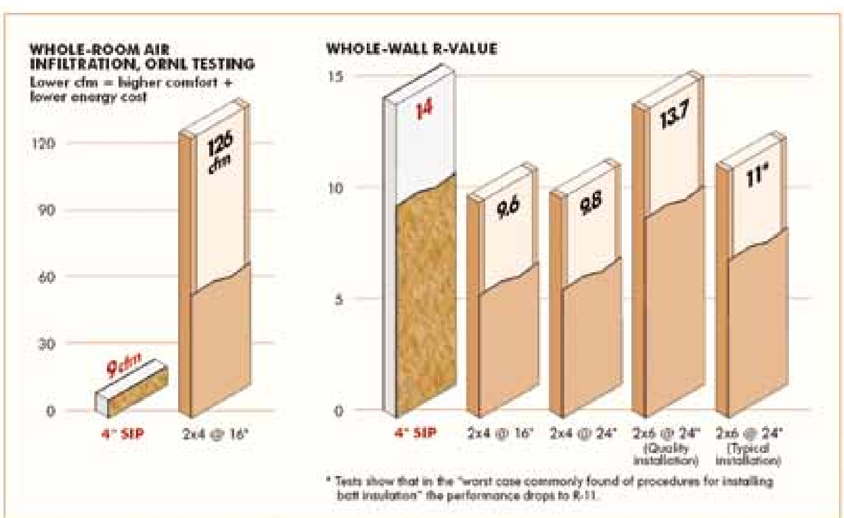
The **R-value of PorterSIPS panels** is the published R-value for the panel only.

Typically, the thicker the panel, the higher the R-value, thus reducing heating and cooling costs.

Utility costs have been proven to go down by as much as 50-80% in a SIP building when compared to a conventional stick-built structure.

ENERGY EFFICIENCY RATINGS/WHOLE WALL "R" VALUE COMPARISONS

System	Wall Type	Insulation	Whole Wall "R" Value
Stick	2x4@16" O.C.	R-11 BATT	9.6
	2x6@24" O.C.	R-19 BATT	13.7
Metal	3 1/2" Metal	R-11 BATT	6.1
SIPS	4 1/2" SIP	3 5/8" EPS	13.9
	6 1/2" SIP	5 5/8" EPS	21.6
	8 1/4" SIP	7 3/8" EPS	28.3
	10 1/4" SIP	9 3/8" EPS	36.0
	12 1/4" SIP	11 3/8" EPS	43.7



SIPA- Product Guide (Christian, Jeff and T.W. Petrie, Heating and Blower Door Tests of the Rooms for the SIPA/Reiker Project. ORNL March 15, 2002)

Minimal Environmental Impact

SIPs USE MATERIALS THAT MAKE MINIMAL ENVIRONMENTAL IMPACT

By weight, Structural Insulated Panels use approximately 89% engineered wood (OSB), 10% EPS foam plastic and less than 1% water activated urethane adhesive.

OSB comes from small, fast-growing trees that are underutilized or are species grown in managed forests. Using the small, fast-growing trees helps to preserve our beautiful old forests with big timber. Also, typical SIP walls use only approximately 12-20% of the dimensional lumber used in the exterior walls of typical stick-built construction. OSB, which is an engineered wood-product, is a renewable, recyclable, biodegradable resource that is easily manufactured in large sheets. Engineered woods like OSB make the best use of forests and have been found to be better for the environment than fiberglass, steel or concrete in terms of energy, emissions and waste.

EPS foam plastic is an example of refining petroleum to make something more useful and permanent than fuel. Both EPS and gasoline are made of carbon and hydrogen that come from crude oil. As we know, burning petroleum as a fuel contributes to global warming, while the use of this material as insulation reduces the demand for fuel – a much better use of this raw material. Also, the amount of petroleum used to make EPS is relatively small. For example, a SIP measuring 8'x 24'x 6 ½" thick will use about 90 pounds of plastic and this is equivalent to only about 14.5 gallons of gasoline.

The amount of energy required to produce EPS foam plastic is much less than that required for fiberglass batting. According to the EPS Molders Association, the energy required to produce EPS is 24 percent less than the energy used to produce equivalent R-value fiberglass insulation.

The adhesive used in bonding the OSB skins of the panel to the EPS core is water activated, contains no solvents and emits no VOCs during curing.

Formaldehyde
Formaldehyde and its possible adverse health effects are commonly in the news. The OSB used in SIPs does not contain the dangerous urea formaldehyde, but does contain a safe chemical called phenol formaldehyde. Also, the levels of formaldehyde released from OSB are extremely small, only about 0.1 parts per million. This level is actually about the same as the level normally found in nature. According to the research that has been done, formaldehyde at this level poses no health risks.
For more, see: www.portersips.com/apaformaldehyde.pdf

When pre-cut to size and shape, SIPs can reduce on-site waste of dimensional lumber and sheathing material. Most SIP waste is kept in the factory where it can be recycled. On-site SIP waste is confined to packaging.

Are SIPs cost-effective?

Building with SIPs offers cost advantages to the builder in terms of speed of construction and reduced labor requirements. Panels are pre-manufactured to exact specifications so they arrive ready to install and fasten together quickly.

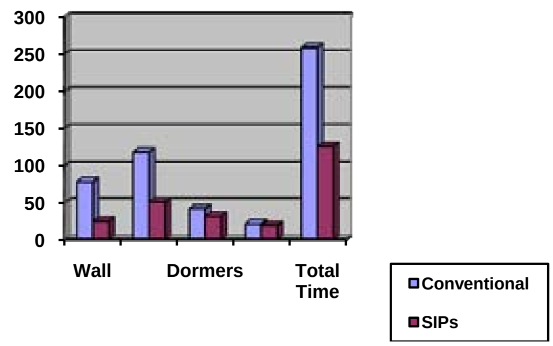
A recent time & motion study conducted by Reed Construction Data RSMeans Business Solutions showed that on one studied project utilizing SIPs reduced installation time by 130 labor hours. When compared to RSMeans labor hours for a conventionally framed home, this labor requirement is equivalent to time savings of approximately 55 percent. The house used for the study was a two-story, three-bedroom, 1,176 –square-foot, cape-style home with three dormers on a 12/12-pitch roof. RSMeans cost data was used to benchmark the time and cost for erecting conventionally-framed stud walls, roofs and dormers using exterior sheathing and fiberglass batt insulation.

Thanks to this speed of construction, SIP projects are dried-in sooner. There are fewer hand-offs between trades so crews are more productive – no more waiting for the insulation group to come in after the framers.

SIP walls are flat and don't warp, expand or contract, so doors and windows go in quickly as designed. All wall intersections are true so cabinets install quickly. It all adds up to reduced field adjustments which yields time saved. Perhaps most importantly, these technologies can help reduce call-backs, keeping crews moving forward to the next project and improving overall productivity.

Chart for Actual installed Time-Comparison (hours)

(Reprinted with permission of BASF)



Component	SIP-Built	2" x 4" Stick-Built
Wall	$1,372 ($0.97/ft²)	$3,331 ($2.37/ft²
Roof	$2,816 ($1.63/ft²)	$4,498 ($2.60/ft²)
Dormer	$1,735 ($2.86/ft²)	$1.765 $2.91/ft²)
Electrical	$870	$979
Total Labor Cost	$6,793	$10,573

Breakdown of labor costs

Component	SIP-Built	2" x 4" Stick-Built
Wall	24.8	78.12
Roof	50.8	117.48
Dormer	31.33	41.87
Electrical	18.76	21.11
Total Labor Hours	125.69	258.58

Breakdown of labor requirements

SIPS are Sustainable

A BASF study of sustainable products was reported as follows:

SIPs help raise the social, economic and environmental responsibility of homes and buildings, making a significant contribution toward true sustainability.

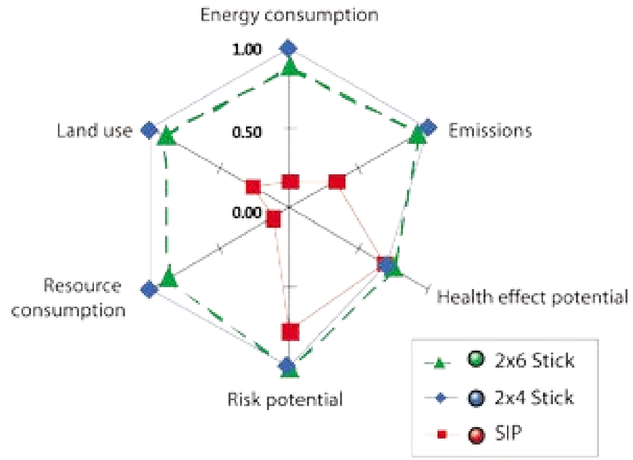
The award-winning BASF Eco-Efficiency Analysis studies alternative solutions to include a total cost determination and the calculation of economic and ecological impact over the entire lifecycle of a product or system. In a recent evaluation of residential insulation systems, the SIP-built structure made with EPS cores and OSB facers was the clear winner over 2x4 stick construction with fiberglass batt insulation and 2x6 stick construction with fiberglass batt insulation.

Key contributors to the performance of SIPs in this study include:

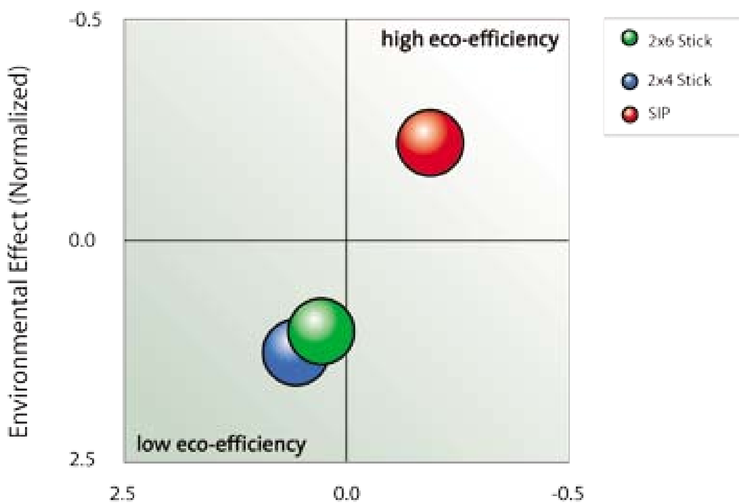
- Reduced heating and cooling loads over lifetime of home
- High R-value
- Low air leakage rate

- Low environmental impact of materials
- Low maintenance requirements
- Lightweight materials reduce transportation fuel use

Overall ecological footprint results by insulation system. 1.0 = worst position (the lower the score, the higher the eco-efficiency)



Eco-efficiency Analysis results for the construction and 60-year use of the walls and roof of 1,100-square-foot, ranch-style, slab-on-grade home, located in the northeastern U.S.



PorterCorp, as well as the majority of SIP manufacturing, have selected EPS as the preferred core material. Other core materials are used successfully, but EPS is the best choice due to it low cost, highest R-value per dollar, and its adaptability for advanced panelized construction.

SIP FOAM DATA COMPARISON:

	EPS Expanded Polystyrene	POLYISO Foam in Place Polyisocyanurate	XPS Extruded Polystyrene IB
Core Density	1# / CF	2# / CF	1.5# / CF
Aged "R" Value @75° F	3.85	5.3	5.0
Foam Cost/CF	EPS is less than ½ the cost of Polyiso or XPS		
Cost/ "R" value	EPS lowest cost for "R" value in place		
Cost/structural value	EPS cost less per structural value		
SIP width availability	8'and 4' wide panels readily available	4' wide Panels Standard	8' and 4' wide panels available
SIP core thickness availability	Any lumber size readily available 3 ½", 5 ½", 7 ¼", 9 ¼", 11 ¼"	Commonly 3 ½" & 5 ½"	Commonly 3 ½" & 5 ½"
Stability & consistent quality	In place quality easier to maintain with EPS than Polyiso		Same as EPS
	EPS is equal or better than Polyiso or XPS retaining "R" Value		
Creep	EPS has less creep than Polyiso		

APPLYING SPRAY FOAM IN THE FIELD:

One afterthought insulation system is field applied polyisofoam. This Product is sprayed between studs and rafters. Foaming in-place like this does not negate the framing factor of heat loss through the studs, which is significant. The cost of just the foam in this system is about the same price as building SIPs and when you add the cost of framing it is not the most efficient method of new construction. However, foam in place polyiso is a good method to insulate and seal an old existing building. For retro insulation of existing buildings from the outside see nail base panels pages 38 & 39.

LEED Points and Certification

Leadership in Energy and Environmental Design (LEED®) provides a rating system for construction that factors in energy use and environmental design. The rating system can be important to builders and owners for tax and grant assistance.

The US Green Building Council certification process, rating system and other data may be obtained as follows:

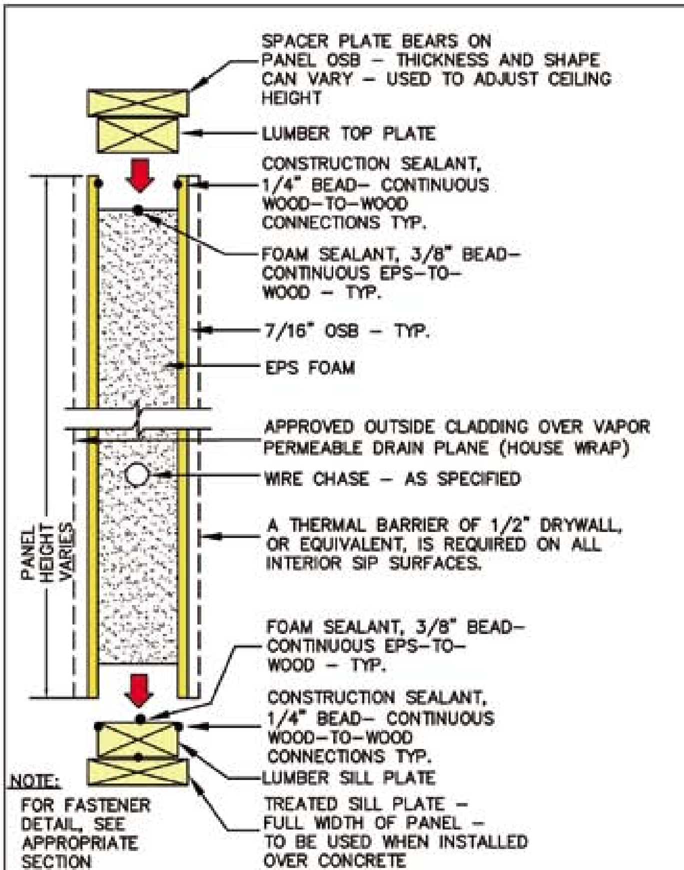
"Certification Process
Project teams interested in obtaining LEED certification for their project must first register online. Registration during early phases of the project will ensure maximum potential for certification. The LEED website, www.leedbuilding.org, contains important details about the certification review process, schedule and fees. The applicant project must satisfactorily document achievement of all the prerequisites and a minimum number of points. See the LEED for New Construction and Homes for the number of points required to achieve LEED for New Construction and Homes rating levels."

The object of LEED points is to encourage and reward good environmental design and construction.

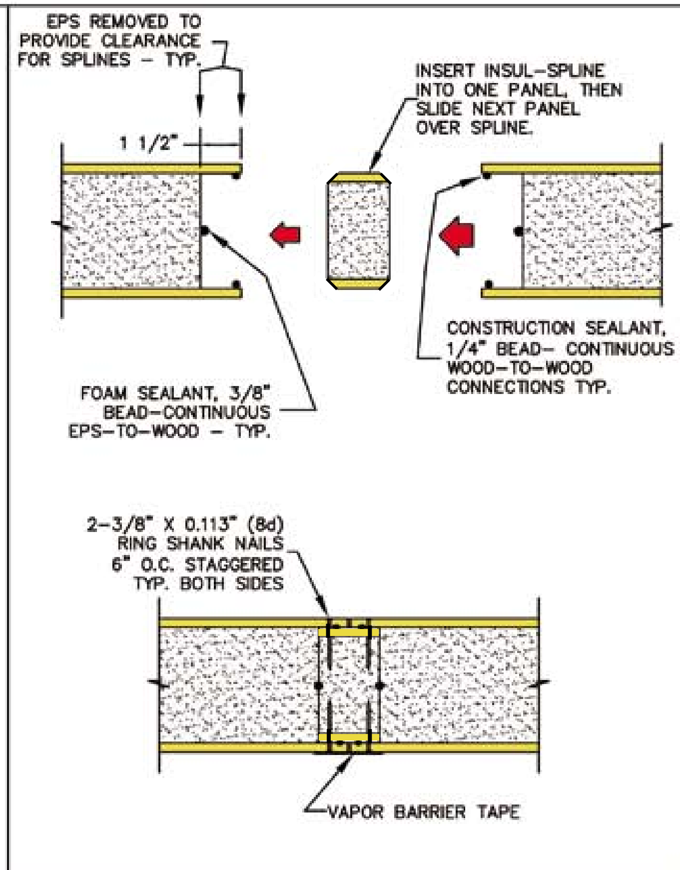
SIP construction is included and can assist in the LEED point system. Construction with SIPs adhering to enclosed construction details and a sufficient wall and roof thickness for higher insulation value will add points.

LEED New Construction and Major Renovations Version 2.2	Points Our Products Can Assist With
Energy and Atmosphere, Prerequisite 2 Minimum Energy Performance	
·Meet the mandatory provisions and prescriptive requirements of ASHRAE/IESNA 90.1-2004.	Required
Energy and Atmosphere, Credit 1 Optimize Energy Performance	
Exceed the minimum requirements for energy performance. Depending on the option pursued up to 10 points possible.	10
Material and Resources, Credit 2.1, 2.2 Construction Waste Management Divert 50% and Credit 2.2 Divert 75% from Disposal	
Reduce amount of construction and demolition waste from disposal in landfills or incinerators.	1 w/ Credit 2.1, 1 w/ Credit 2.2, and 1 Exemplary Performance, Innovation in Design Divert 95%. Total 3 potential points.
Indoor Environmental Quality, Credit 4.1 Low-Emitting Materials Adhesives & Sealants	
The adhesives and sealants that are used on the interior of the building shall comply with South Coast Air Quality Management District (SCAQMD) Rule 1168. "Structural wood member adhesive" must be under 140 g/1 less water.	1
Indoor Environmental Quality, Credit 4.4 Low-Emitting Materials Composite Wood & Agrifiber Products	
Composite wood and laminating adhesives used on the interior of the building shall contain no added urea-formaldehyde resins.	1

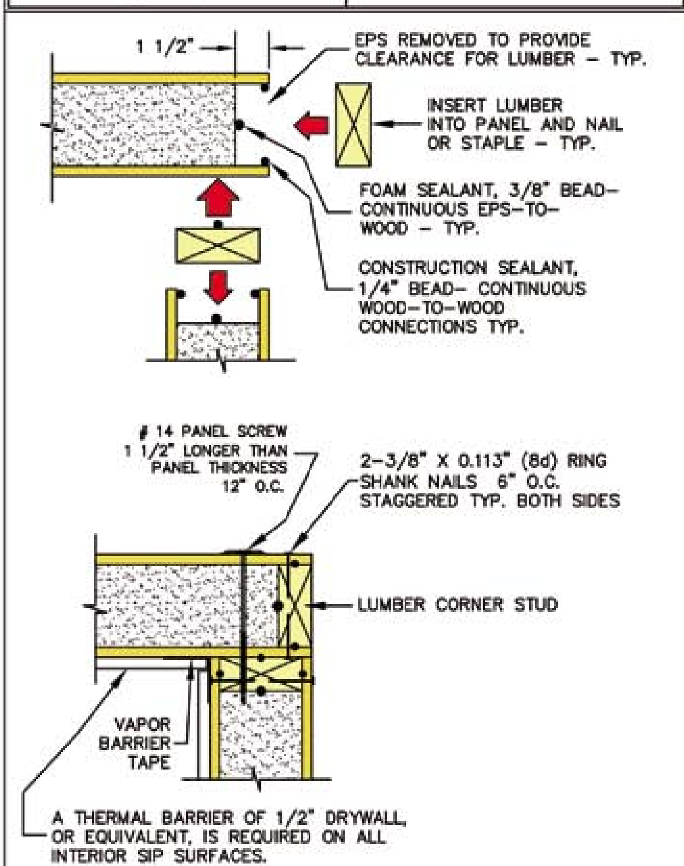
LEED for Homes	Points Our Products Can Assist With
Sustainable Sites, Credit 5 Nontoxic Pest Control	
Credit 5 Pest Control Alternatives Requires design features of the home to minimize need for poison for control of insects, rodents, and other pests. **5b** of credit requires all external cracks, joints, penetrations, edges and entry points be sealed.	1/2 point
Energy and Atmosphere, Credit 1 Optimize Energy Performance	
Prerequisite 1.l Performance of Energy Star for Homes Requires that the performance requirements for Energy Star for Homes are met, including the third-party inspections.	Required
Credit 1.2 Exceptional Energy Performance Exceed the performance of Energy Star for Homes by using the equations that rate the Home Energy Standards (HERS) Index to the applicable number of LEED points.	34 points max
Energy and Atmosphere, Credit 2 Insulation	
Prerequisite 2.1 Basic Insulation a) Install insulation the will meet or exceed the R-value requirements listed in the 2004 International Energy Conservation Code Chapter 4. **b)** Insulation must meet the national Home Energy Rating Standards Grade II specifications.	Required
Credit 2.2 Enhanced Insulation a) Insulation shall exceed the R-value requirements listed in the 2004 International Energy Conservation Code Chapter 4 by at least 5%. **b)** Insulation must meet the National Home Energy Rating Standards Grade I specification.	2 points max
Energy and Atmosphere, Credit 3 Air Infiltration	
Prerequisite 3.1 Reduced Envelope Leakage Meet the air leakage requirements by Climate Zones referenced in the table under this credit in the LEED Rating Guide.	Required
Credit 3.2 Greatly Reduced Envelope Leakage Meet the air leakage requirements by Climate Zones referenced in the table under this credit in the LEED Rating Guide.	2
OR	
Credit 3.3 Minimal Envelope Leakage Meet the air leakage requirements by Climate Zones referenced in the table under this credit in the LEED Rating Guide.	3
Material and Resources, Credit 1 Material-Efficient Framing	
Prerequisite 1.1 Framing Order Waste Factor Keep the estimated waste factor to less 10% or less.	Required
Credit 1.2 Detailed Framing Documents Requires detailed framing plans to be used on job site.	1
Credit 1.3 Detailed Cut List and Lumber Order Meet requirements of 1.2 and prior to construction have a cut list and lumber order that matches up to the framing plans and/or scopes of work.	1
AND/OR	
Credit 1.4 Framing Efficiencies Implement measures from table in Rating System, table includes; SIP walls 1 point, SIP roof 1 point, SIP floors 1 point	3
OR	
Credit 1.5 Off-Site Fabrication Panelized construction	4
Material and Resources, Credit 3 Waste Management	
Prerequisite 3.1 Construction Waste Reduction a) Generate 2.5 pounds or less of the net waste per square foot of the conditioned floor areas. **b)** Divert 25% or more of materials taken from project site from landfills or incinerators.	3



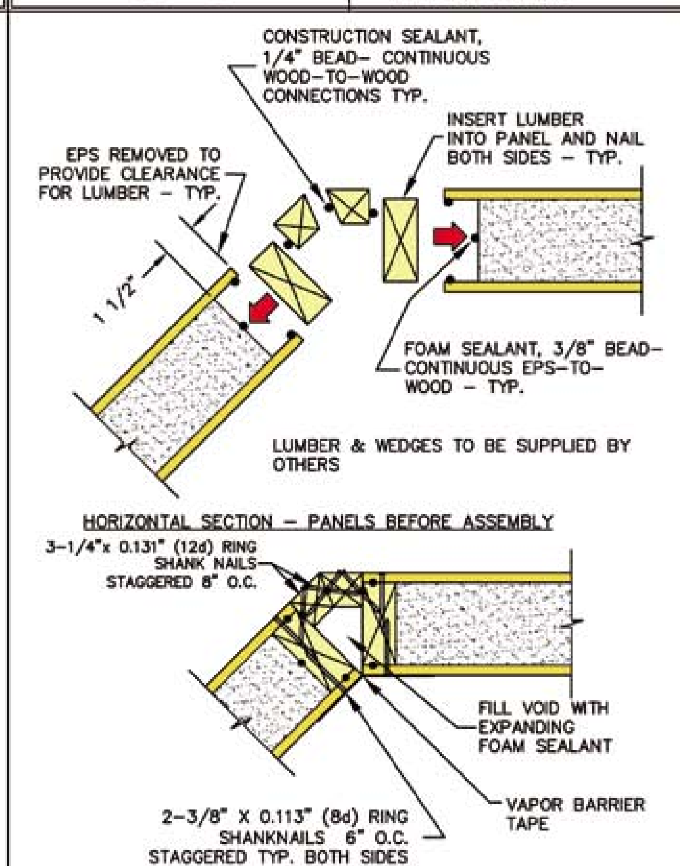
SP–1 | WALL SECTION



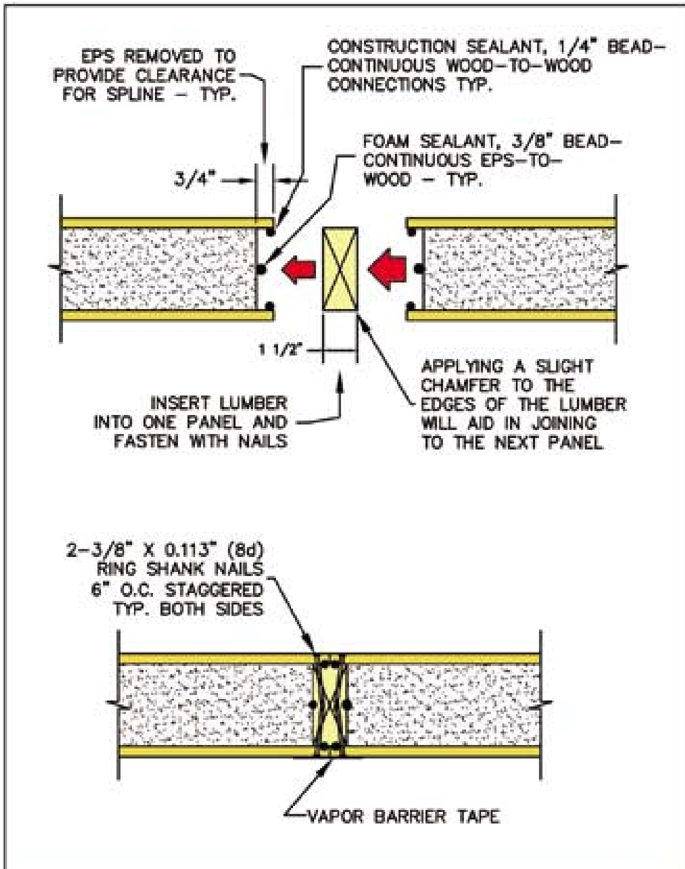
SP–2 | PANEL–TO–PANEL CONNECTION WITH INSUL–SPLINE



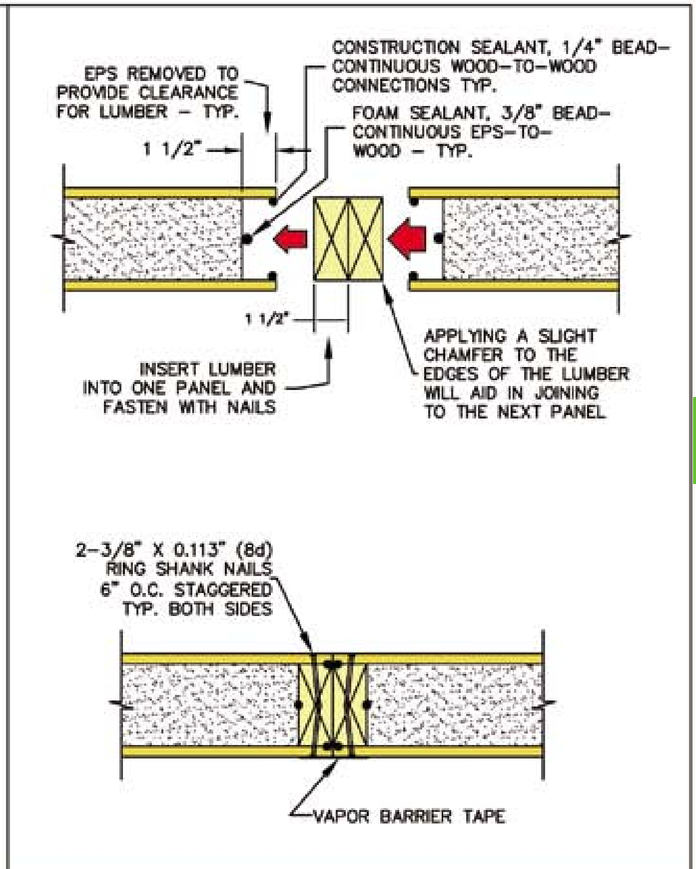
SP–3 | CORNER CONNECTION



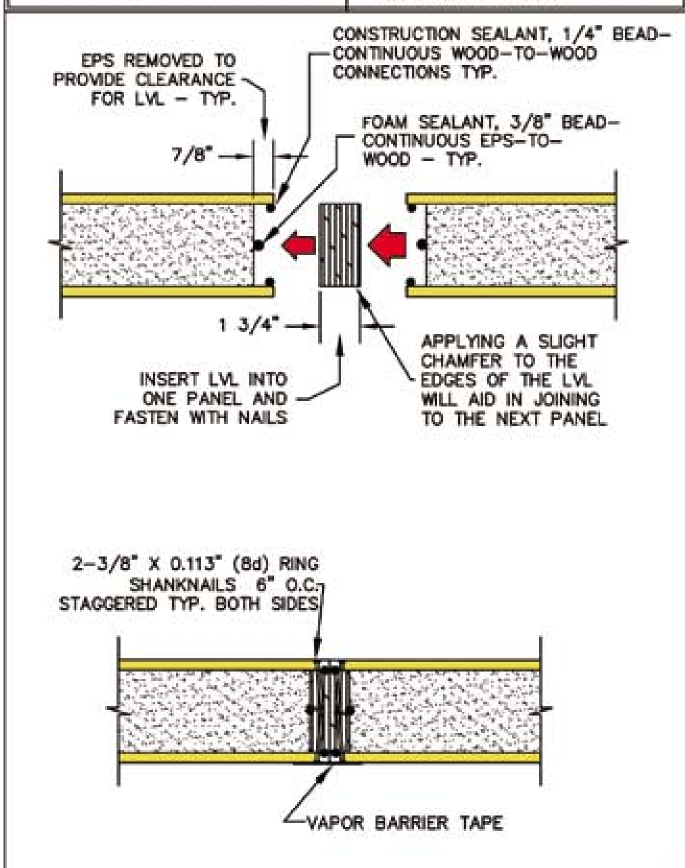
SP–4 | ANGLE CORNER CONNECTION



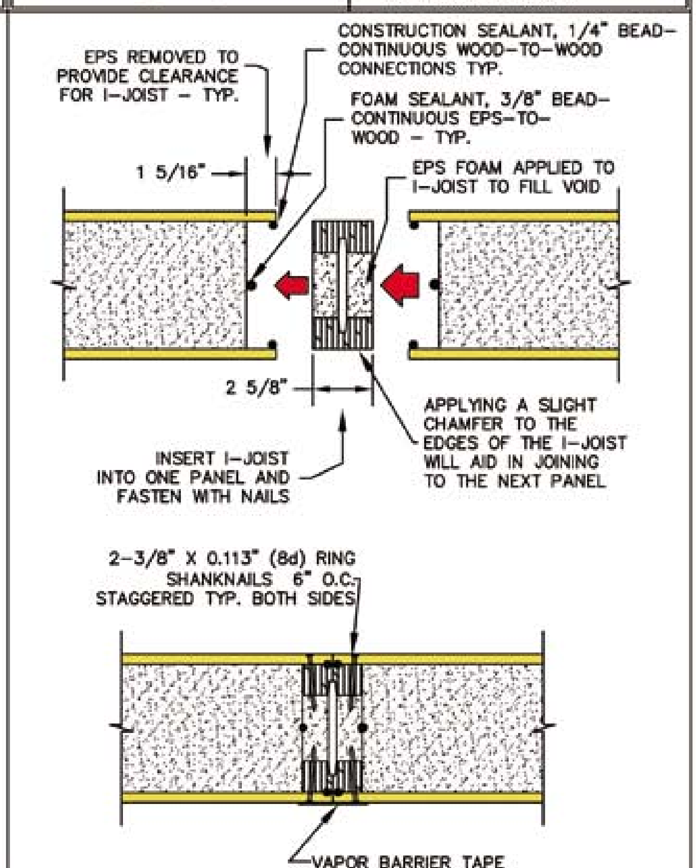
SP–5 PANEL–TO–PANEL CONNECTION WITH SINGLE LUMBER



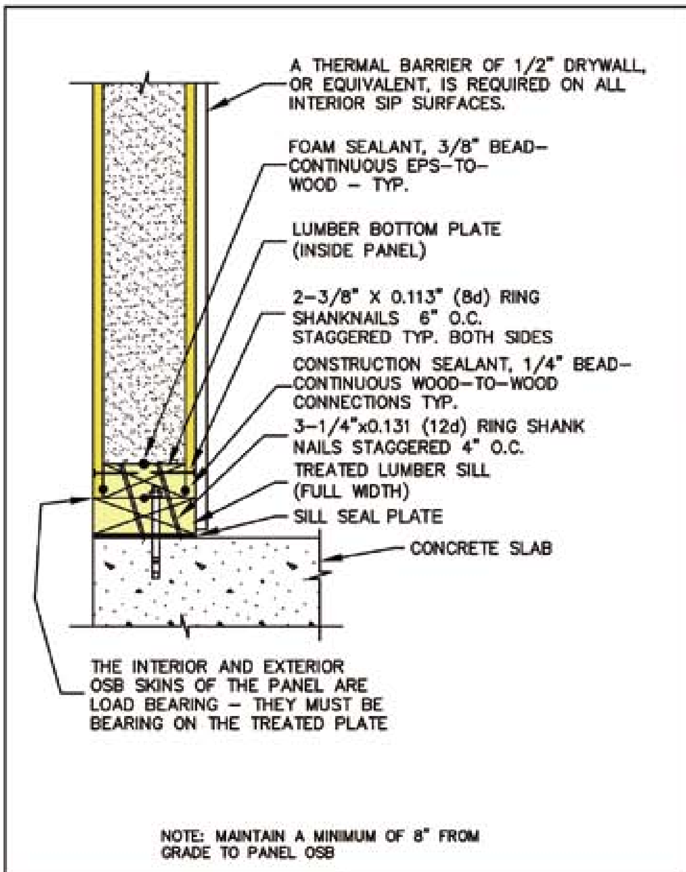
SP–6 PANEL–TO–PANEL CONNECTION WITH DOUBLE LUMBER



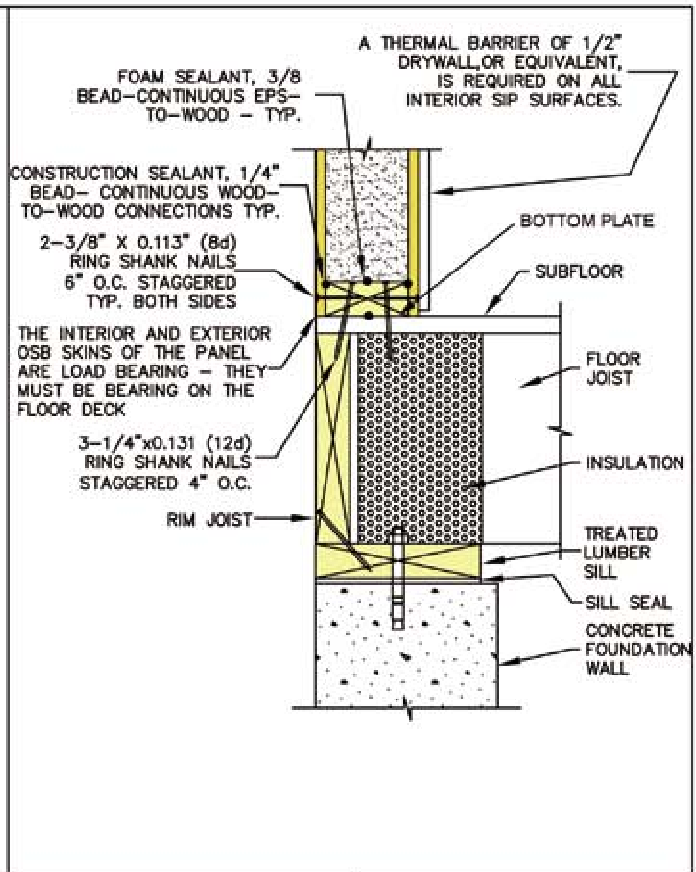
SP–7 PANEL–TO–PANEL CONNECTION WITH LAMINATED VENEER LUMBER



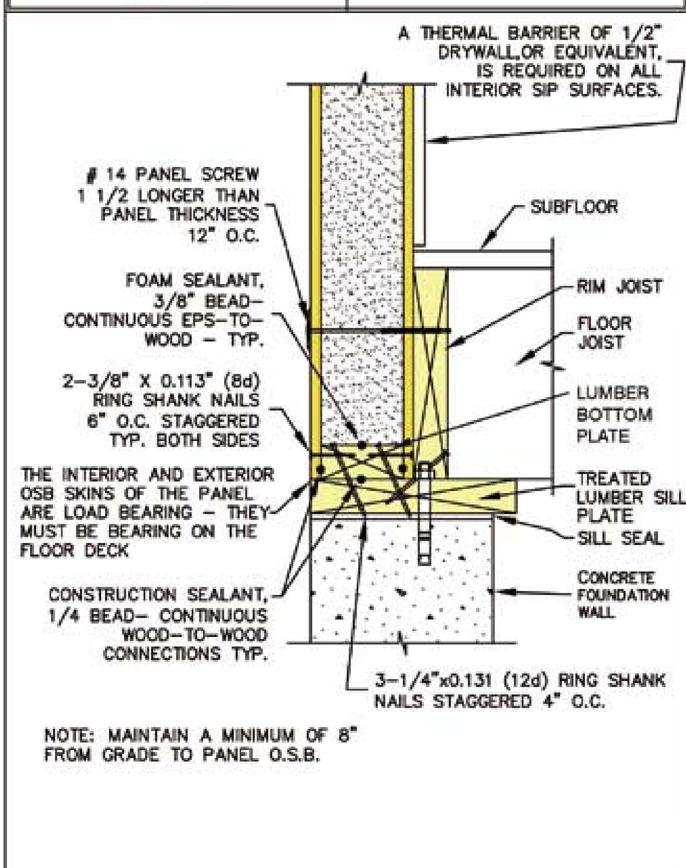
SP–8 PANEL–TO–PANEL CONNECTION WITH I–JOIST



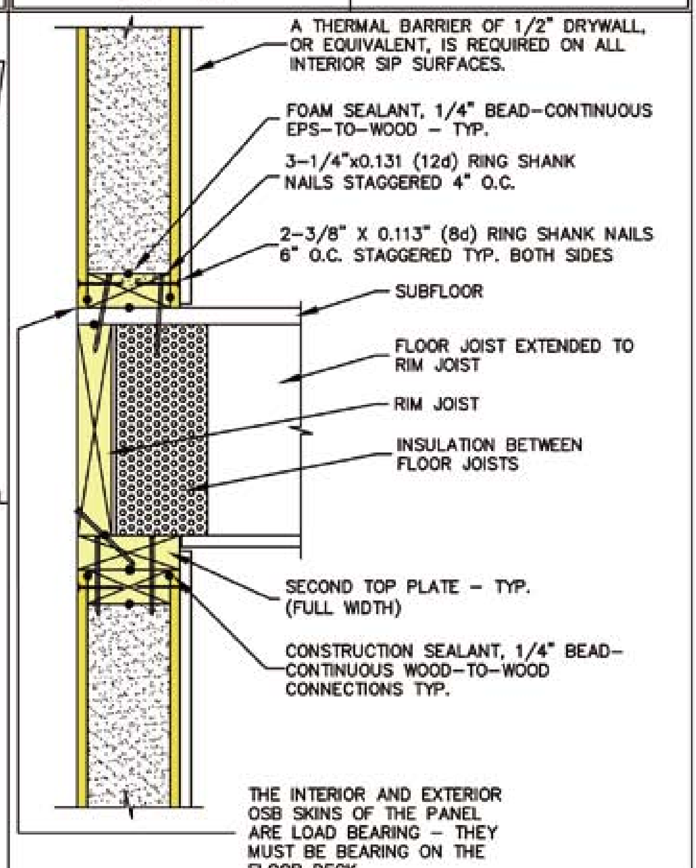
SP–9 PANEL ON SLAB



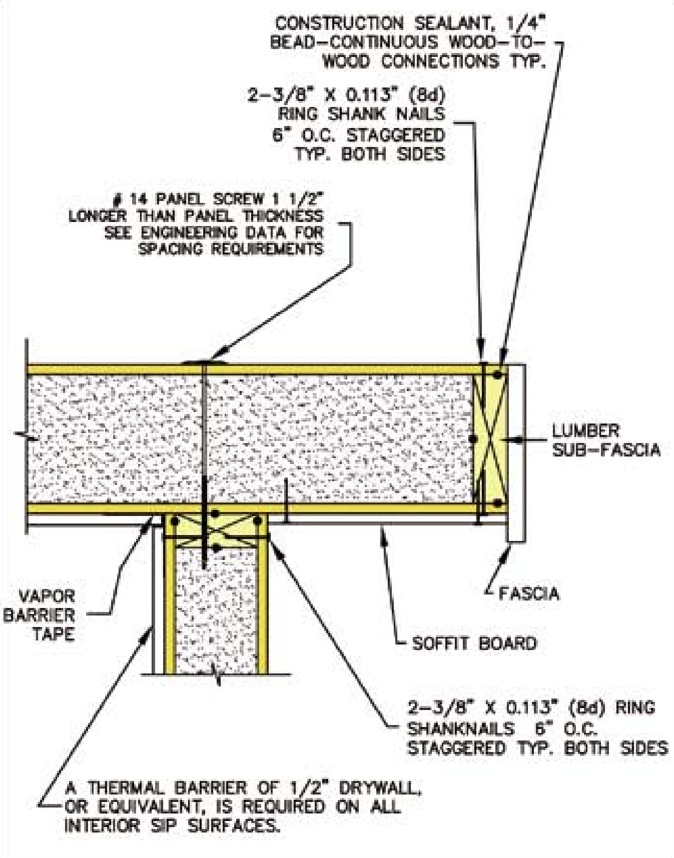
SP–10 PANEL ON SUBFLOOR



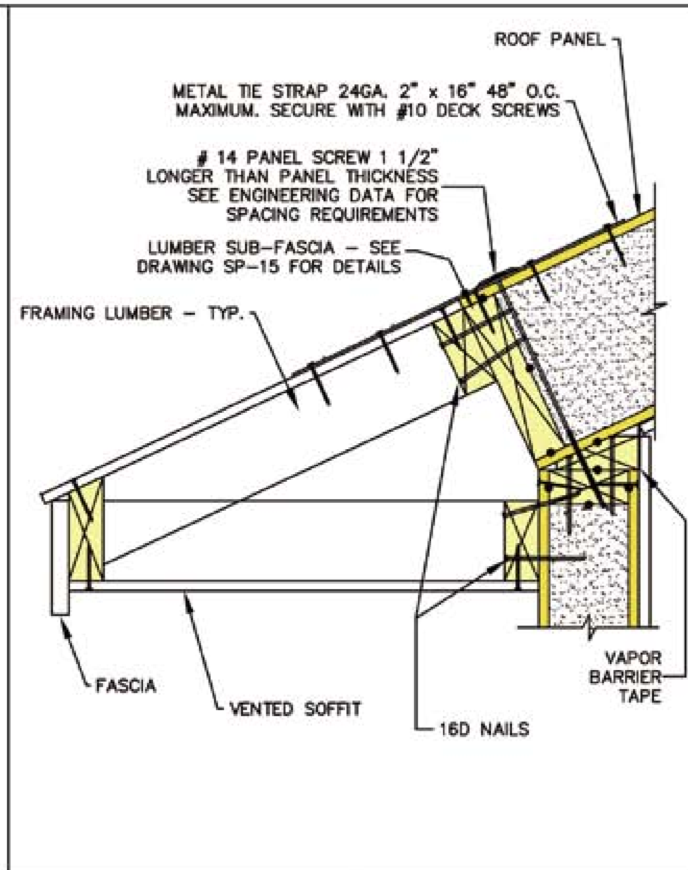
SP–11 PANEL ON SILL PLATE WITH RIM JOIST



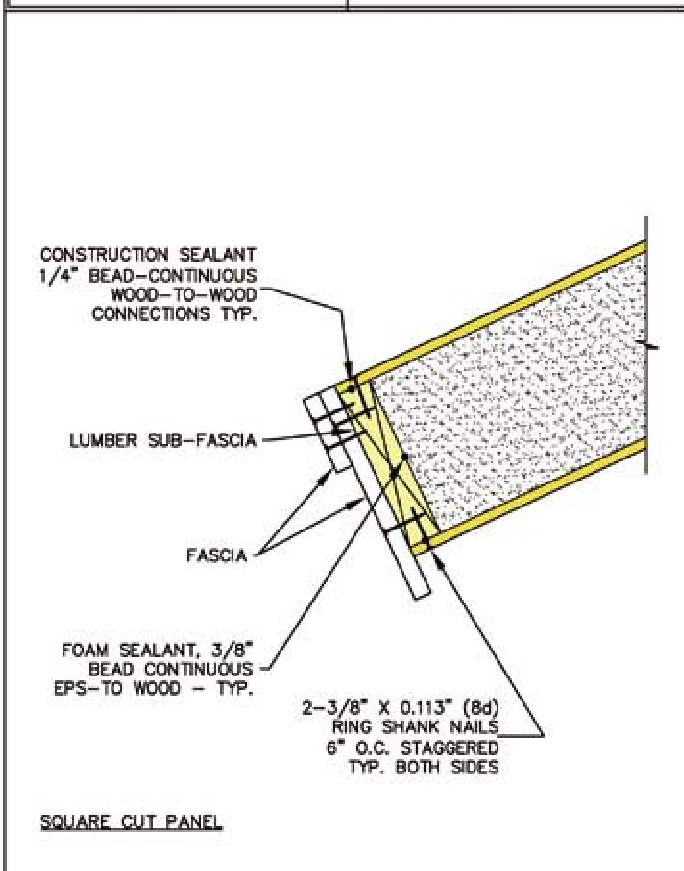
SP–12 BEARING WALL TO FLOOR JOIST – MULTI-STORY



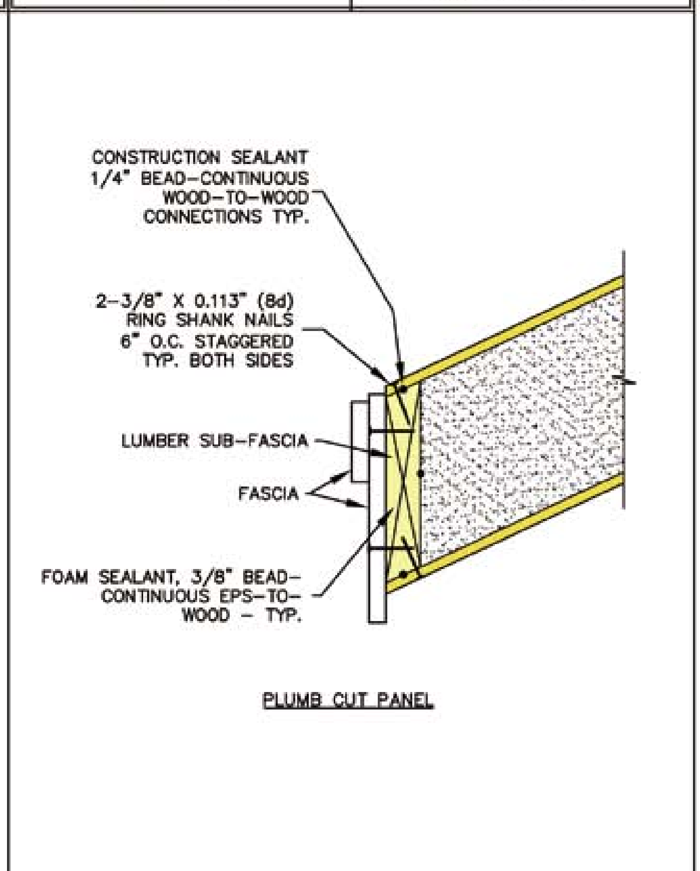
SP-13 | ROOF-TO-WALL CONNECTION GABLE END



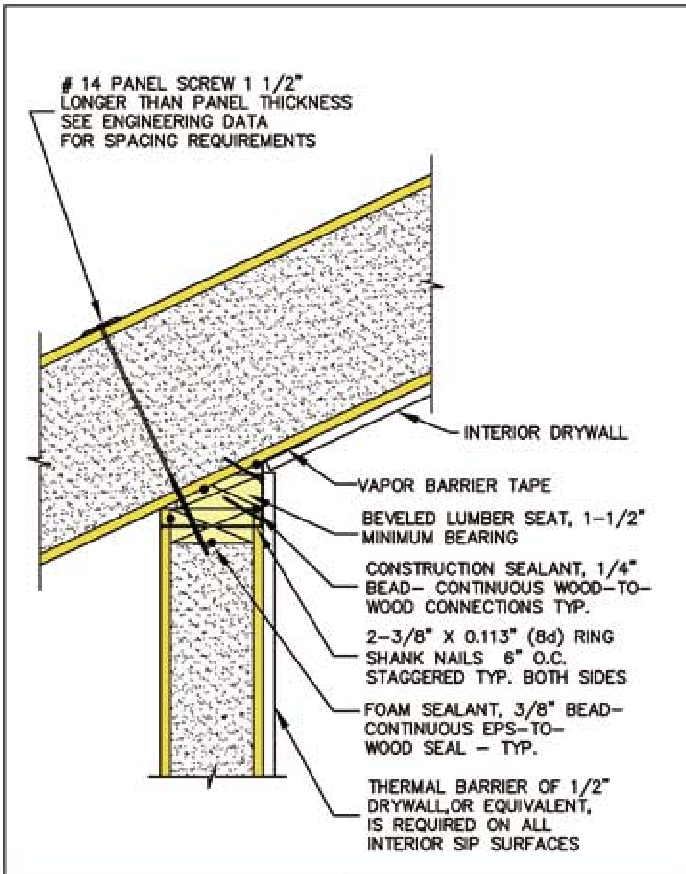
SP-14 | FRAMED ROOF EAVE



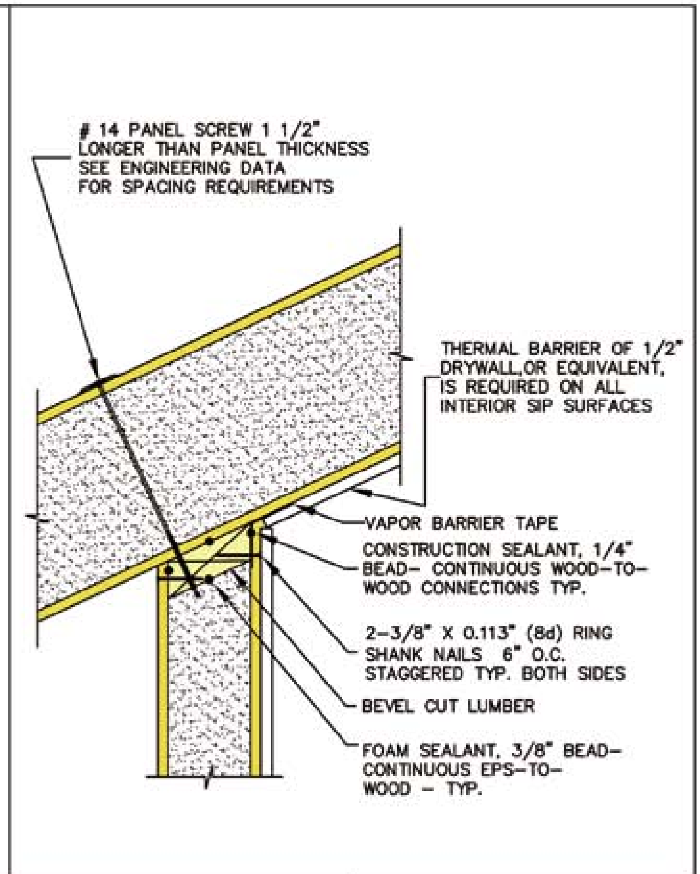
SP-15 | SQUARE CUT ROOF EAVE



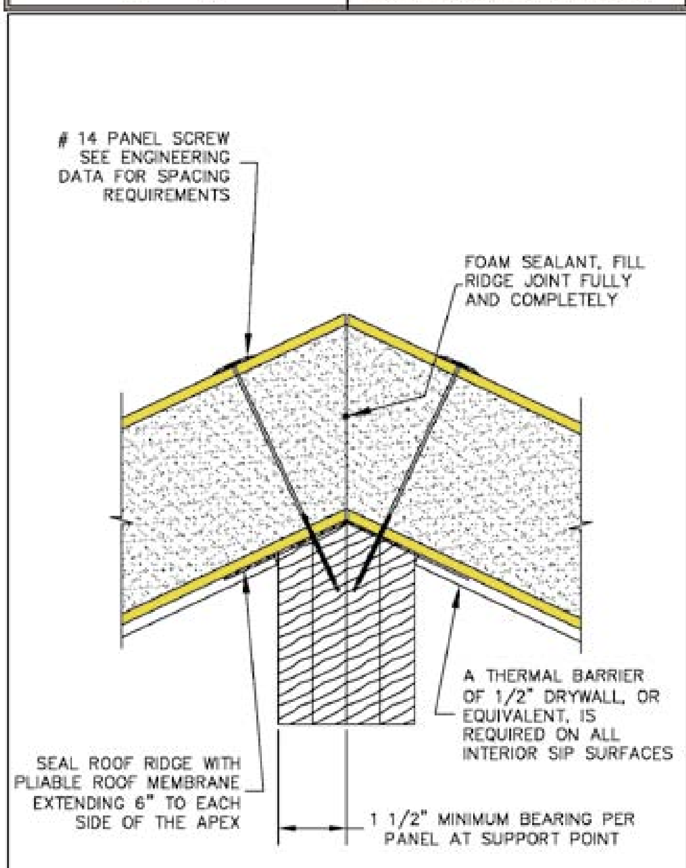
SP-16 | PLUMB CUT ROOF EAVE



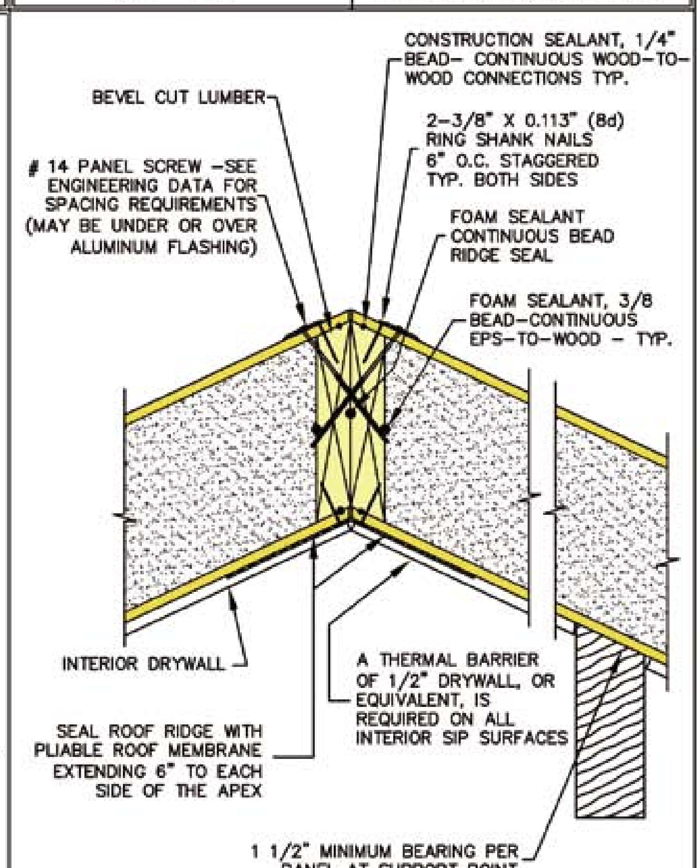
SP–17 ROOF–TO–WALL CONNECTION PITCHED ROOF–BEVELED SEAT



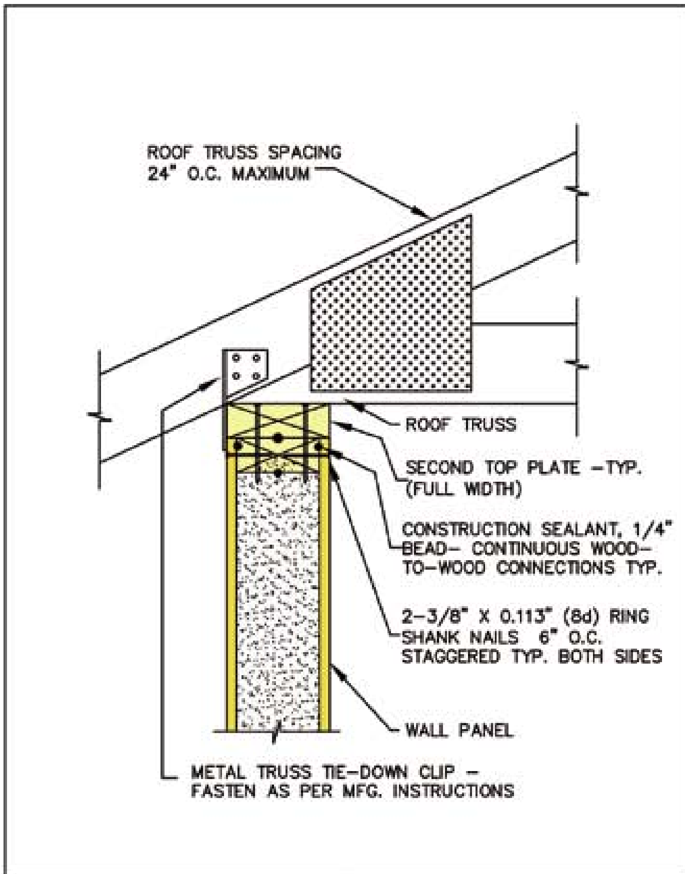
SP–18 ROOF–TO–WALL CONNECTION PITCHED ROOF–CANTED PLATE



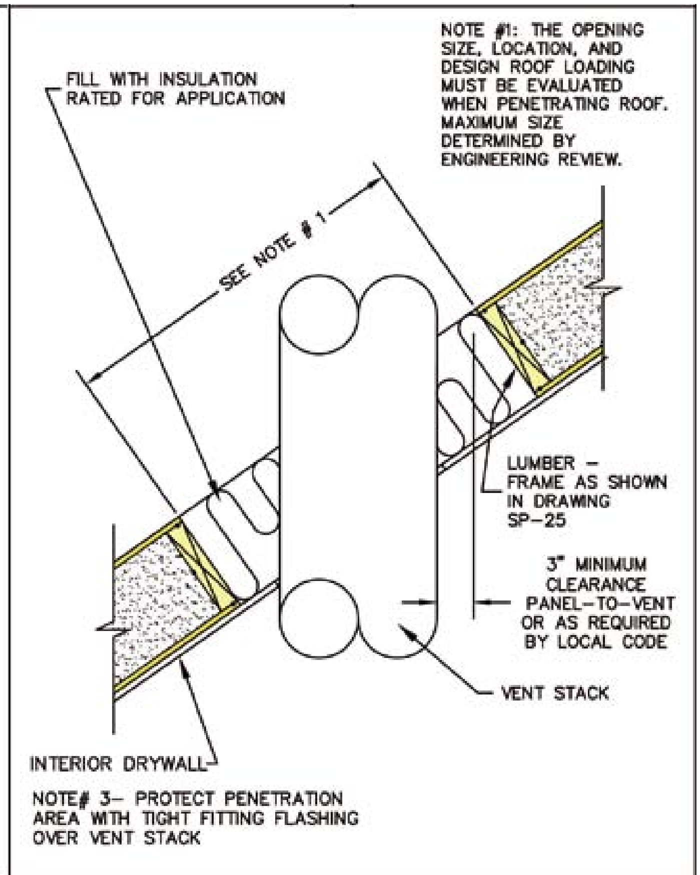
SP–19 ROOF RIDGE CONNECTION WITH SOLID BLOCKING



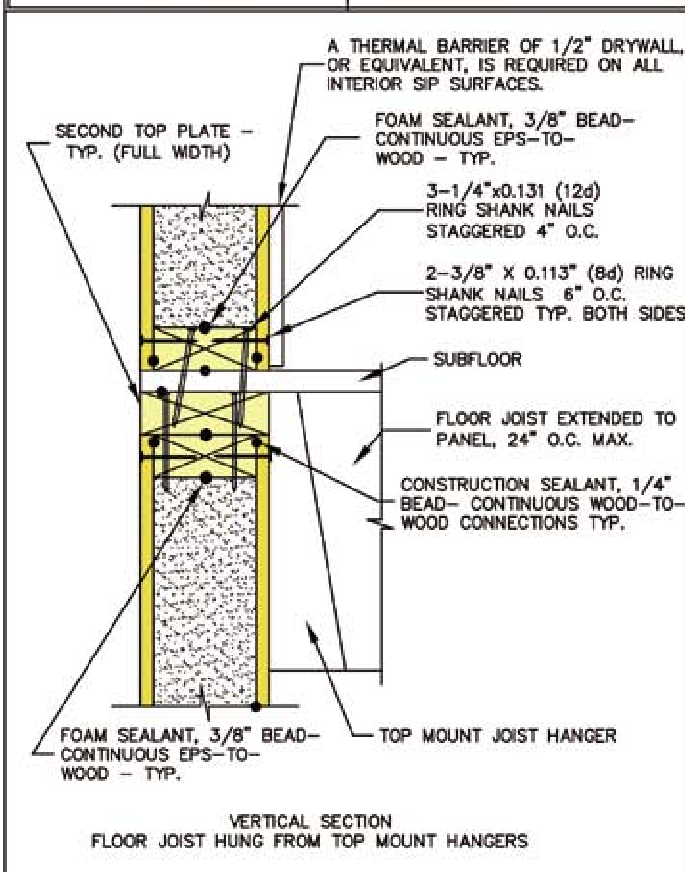
SP–20 CANTILEVER ROOF RIDGE CONNECTION W/SOLID BLOCKING



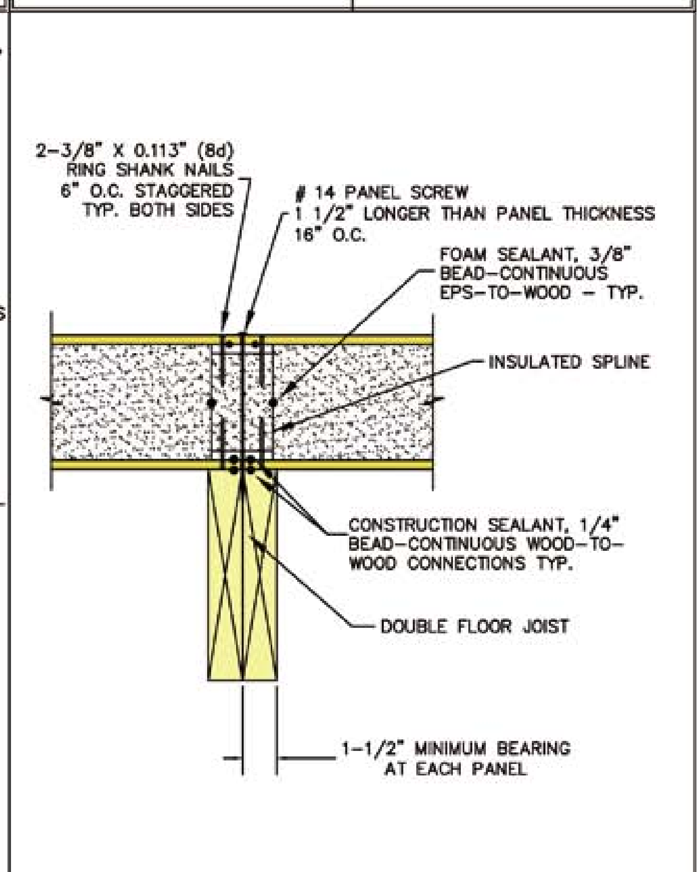
SP-25 | ROOF TRUSS-TO-WALL CONNECTION



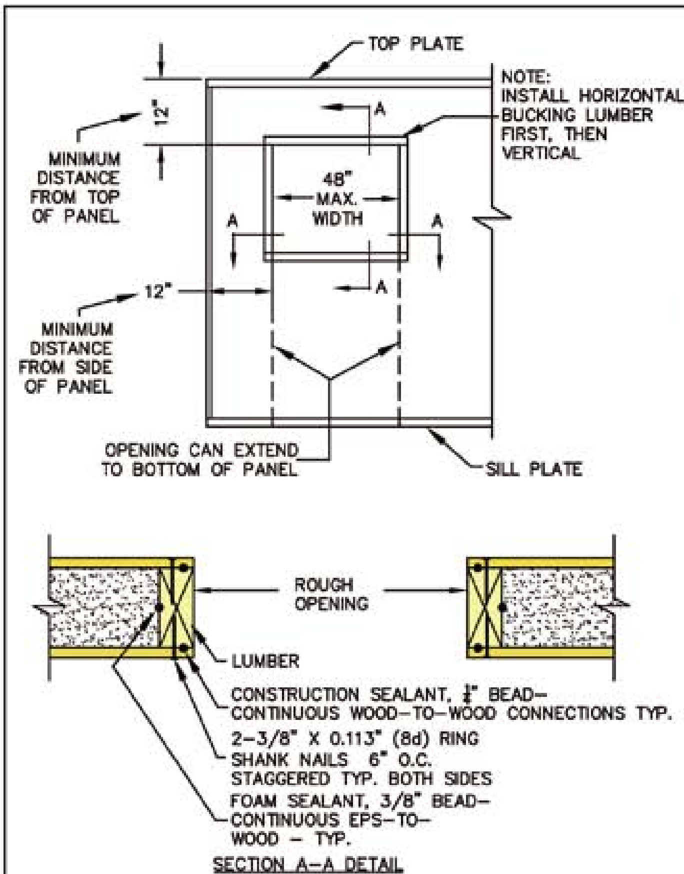
SP-39 | FRAMED ROOF PENETRATION



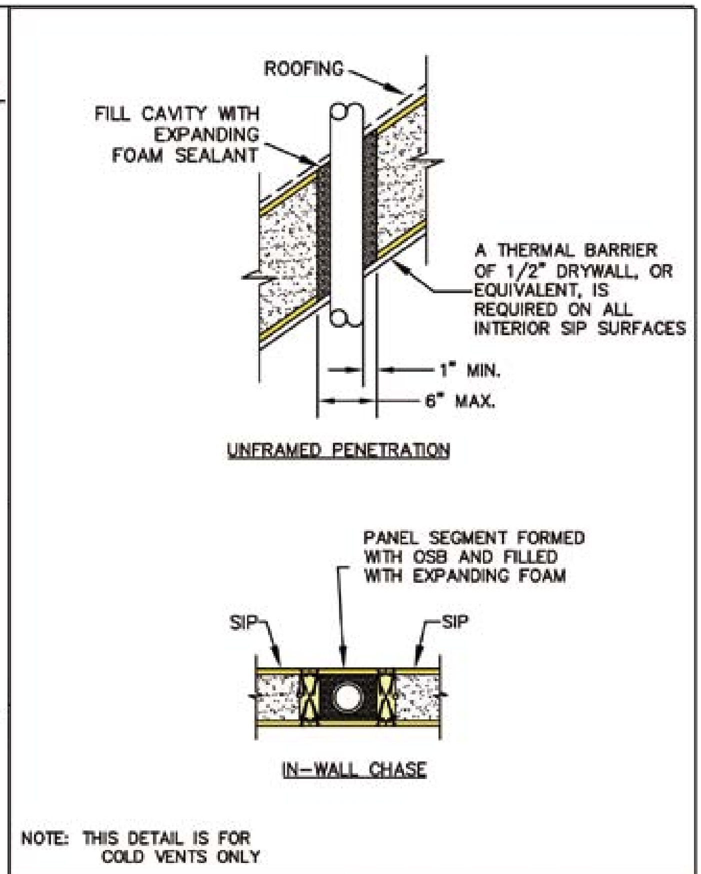
SP-27 | SECOND FLOOR CONNECTION DETAIL-HANGING FLOOR



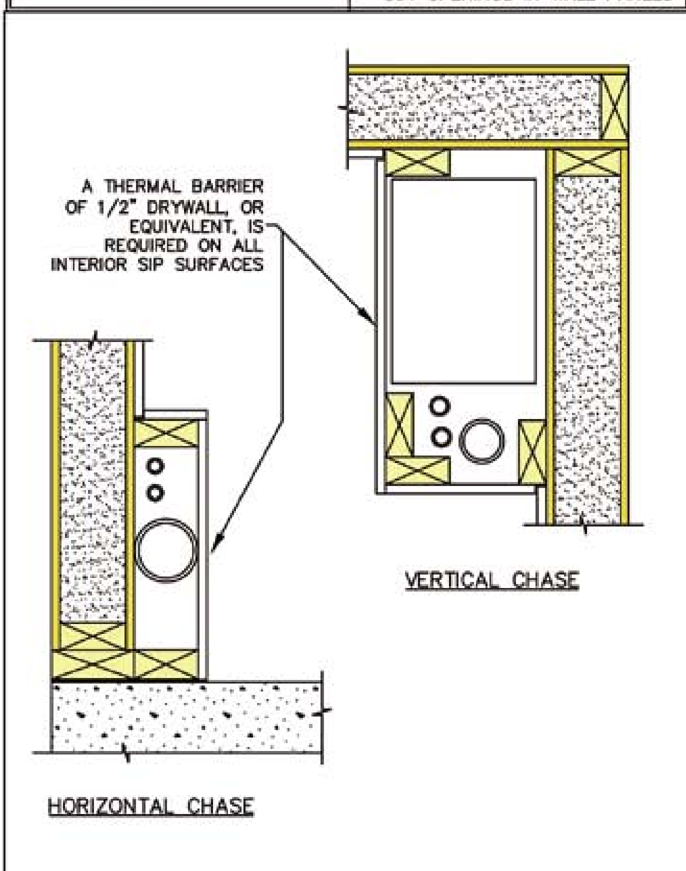
SP-28 | PANEL-TO-PANEL FLOOR JOIST ATTACHMENT



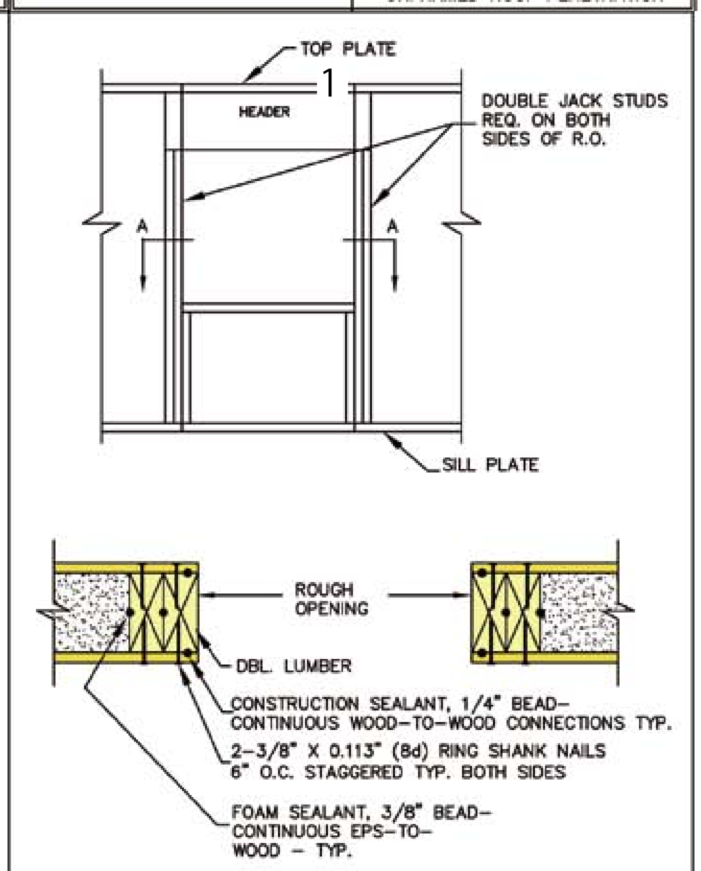
SP–33 — REINFORCEMENT OF FIELD CUT OPENINGS IN WALL PANELS



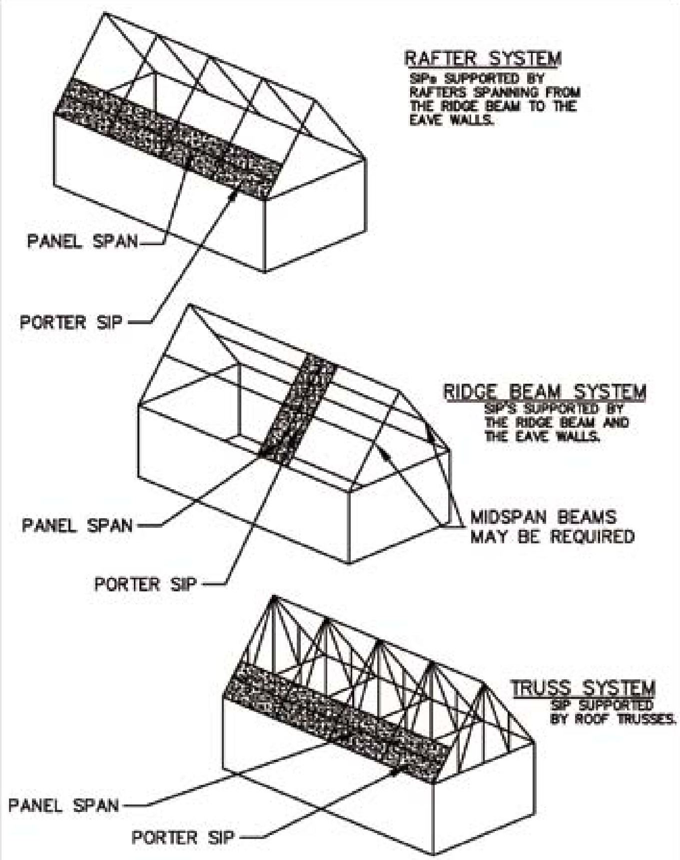
SP–40 — IN–WALL CHASE AND UNFRAMED ROOF PENETRATION



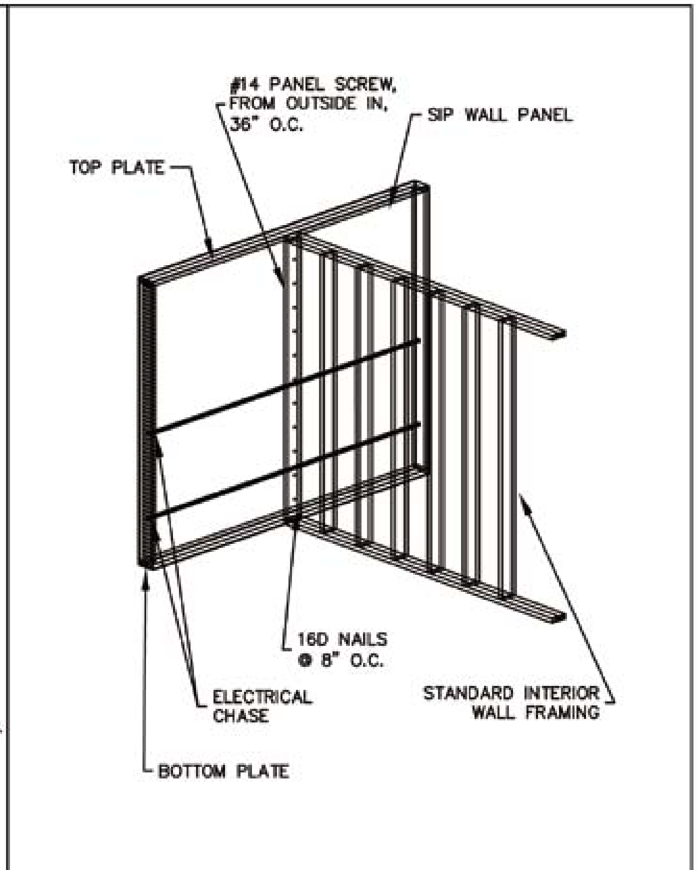
SP–35 — WALL CHASE – EXAMPLES SITE BUILT



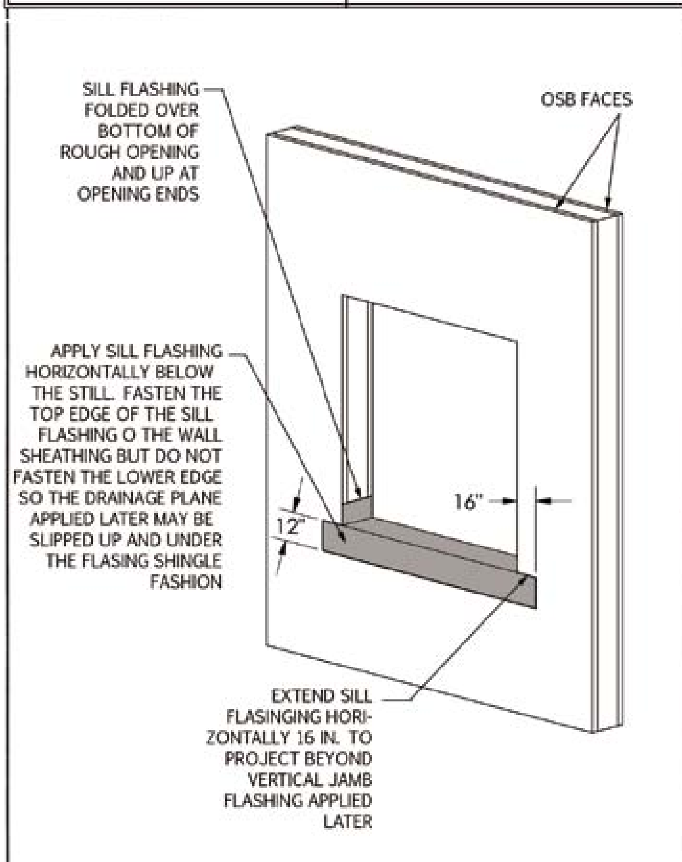
SP–36 — TYPICAL CONSTRUCTION OF ROUGH OPENING INCLUDING HEADER



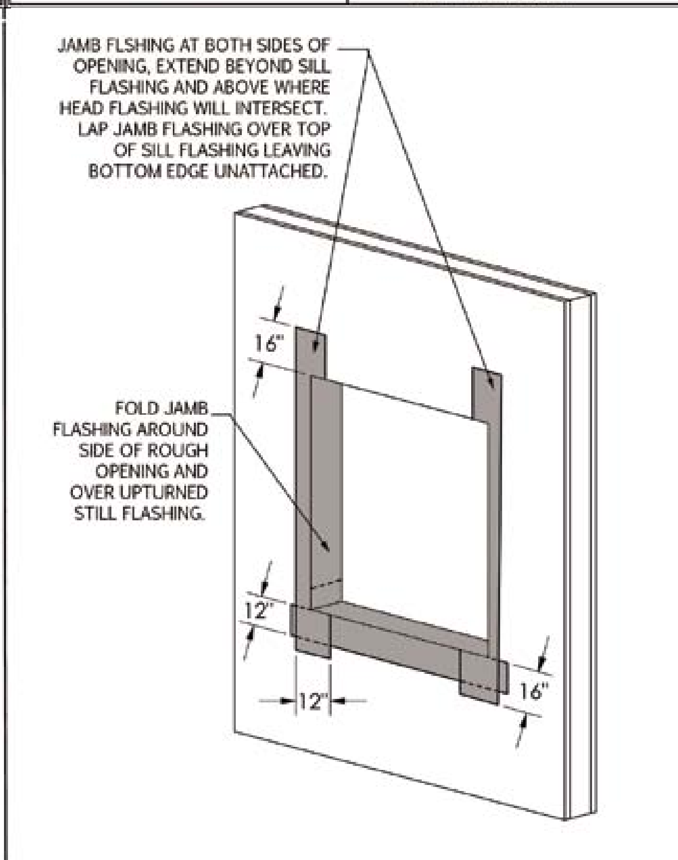
SP-37 | ROOF FRAMING OPTIONS



SP-38 | ISOMETRIC OF INTERIOR WALL CONNECTION



SP-39 | SILL FLASHING



SP-40 | JAMB FLASHING

CSI 06 12 16

Listing Report: **PSC121907-22**

PRODUCT: Structural Insulated Panels (SIPs)
DIVISION: Wood and Plastics (06)
SECTION: Structural Panels (06 12 16)

Report Holder
Structural Insulated Panel Association (SIPA)
PO Box 1699
Gig Harbor, WA 98335

Manufacturing Locations

PorterCorp (NTA Plant #538)
4240 North 136th Avenue
Holland, MI 49424

1. **SUBJECT**
PorterCorp Structural Insulated Panels. Wall and Roof Panels 8 ft. to 20 ft. long, 4-5/8 in. to 12-1/4 in. thick.

2. **SCOPE**
2.1. NTA, Inc. has evaluated the above product(s) for compliance with the applicable sections of the following codes:
2.1.1. 2006, 2009 International Building Code (IBC)
2.1.2. 2006, 2009 International Residential Code (IRC)

2.2. NTA, Inc. has evaluated the above product(s) in accordance with:
2.2.1. NTA IM 014 Structural Insulated Panel Evaluation
2.2.2. NTA IM 036 Quality System Requirements

2.3. NTA, Inc. has evaluated the following properties of the above product(s):
2.3.1. Structural performance under axial, transverse and racking loads.

To obtain the most current NTA Listing Report visit www.ntainc.com/product-certification/.

3. **USES**
3.1. General. *PorterCorp Structural Insulated Panels* are used as structural insulated roof and wall panels capable of resisting transverse, axial and in-plane shear loads.

3.2. Construction Types. *PorterCorp Structural Insulated Panels* shall be considered combustible building elements when determining the Type of Construction in accordance with 2009 IBC Chapter 6. (IM 014 NACU1)

3.3. Fire Resistive Assemblies. *PorterCorp Structural Insulated Panels* shall not be used as part of a fire-rated assembly unless suitable evidence and details are submitted and approved by the authority having jurisdiction. (IM 014 ACU14)

4. **DESCRIPTION**
4.1. General. *PorterCorp Structural Insulated Panels* are factory-assembled, engineered-wood-faced, structural insulated panels (SIPs) with an expanded polystyrene (EPS) foam core. The panels are intended for use as load-bearing or non-load bearing wall and roof panels. Panels are available in 4-5/8 in. through 12-1/4 in. overall thicknesses. The panels are custom made to the specifications for each use and are assembled under factory-controlled conditions. The maximum panel size is 8 ft. wide and up to 20 ft. in length.

4.2. Materials
4.2.1. Facing. The facing consists of two single-ply oriented strand board (OSB) facings a minimum of 7/16 in. thick conforming to 2009 IRC Table 613.3.2 and DOC PS 2-04, Exposure 1, Rated Sheathing with a span index of 24/16. Panels may be manufactured with the facing strength axis oriented in either direction with respect to the direction of SIP bending provided the appropriate strength values are used.

4.2.2. Core. The core material is EPS Foam conforming to the Type I specification defined in ASTM C578. The foam core, up to 11-3/8 in. thickness, has a flame spread rating not exceeding 75 and a smoke-developed rating not exceeding 450 in compliance with 2009 IBC Section 2603.3 Exception 4.

4.2.3. Adhesive. Facing materials are adhered to the core material using a structural adhesive. The adhesive is applied during the lamination process in accordance with the in-plant quality system documentation.

4.2.4. Material Sources. The facing, core and adhesive used in the construction of *PorterCorp Structural Insulated Panels* shall be composed only of materials from approved sources as identified in the in-plant quality system documentation. A list of material suppliers is provided in Table 9.

4.2.5. Splines. *PorterCorp Structural Insulated Panels* are interconnected with surface splines or block splines (Figure 1). Connections using dimensional lumber splines or engineered structural splines are not specifically addressed in this report and must be designed in accordance with accepted engineering practice to meet applicable code requirements. (IM 014 ACU 20)

4.2.5.1. Surface Splines. Surface splines (Figure 1) consist of 3 in. wide by 7/16 in. thick or thicker OSB. At each panel joint, one surface spline is inserted into each of two tight-fitting slots in the core. The slots in the core are located just inside the facing.

4.2.5.2. Block Splines. Block splines (Figure 1) are manufactured in the same manner as the SIP except with an overall thickness that is 1 in. less than the overall thickness of the panel to be joined.

5. DESIGN

5.1. Overall Structural System. The scope of this report is limited to the evaluation of the SIP component. Panel connections and other details related to incorporation of the panel into the overall structural system of a building are beyond the scope of this report. (IM 014 NACU3)

5.2. Design Approval. Where required by the authority having jurisdiction, structures using *PorterCorp Structural Insulated Panels* shall be designed by a registered design professional. Construction documents, including engineering calculations and drawings providing floor plans, window details, door details and connector details, shall be submitted to the code official when application is made for a permit. The individual preparing such documents shall possess the necessary qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken. Approved construction documents shall be available at all times on the jobsite during installation. (IM 014 NACU4)

5.3. Design Loads. Design loads to be resisted by the SIPs shall be as required under the applicable building code. Loads on the panels shall not exceed the loads noted in this report.

5.4. Allowable Loads. Allowable axial, transverse, and racking loads may be calculated using the panel properties provided in Tables 1 and 2 or may be selected from Tables 3 through 7. Maximum and minimum panel heights, spans and thicknesses are limited as provided in Table 2 through 7. Unless otherwise noted, all properties and allowable loads apply to panels joined with surface or block splines. Allowable loads for reinforced panel capacities shall be designed by a registered professional. Calculations demonstrating that the loads applied are less than the allowable loads described in this report shall be submitted to the code official for approval. (IM 014 NACU5) For loading conditions not specifically addressed herein, structural members designed in accordance with accepted engineering practice shall be provided to meet applicable code requirements.

5.5. Concentrated Loads. Axial loads shall be applied to the SIP through continuous members such as structural insulated roof or floor panels or repetitive members such as joists, trusses or rafters spaced at regular intervals of 24 in. on center or less. Such members shall be fastened to a rim board or similar member to distribute the load to the SIP. For other loading conditions, reinforcement shall be provided. This reinforcement shall be designed in accordance with accepted engineering practice. (IM 014 ACU12)

5.6. Eccentric and Side Loads. Axial loads shall be applied concentrically to the top of the SIP. Loads shall not be applied eccentrically or through framing attached to one side of the panel (such as balloon framing) except where additional engineering documentation is provided. (IM 014 ACU13)

5.7. Openings. Openings in panels shall be reinforced with wood or steel designed in accordance with accepted engineering practice to resist all loads applied to the opening as required by the adopted code. Details for door and window openings shall be provided to clarify the manner of supporting axial, transverse and/or racking shear loads at openings. Such details shall be shown on approved design documents and subject to approval by the local authority having jurisdiction. (IM 014 ACU8)

5.8. In-Plane Shear Design. Shear walls utilizing block or surface splines shall be sized to resist all code required wind and seismic loads without exceeding the allowable loads provided in Tables 6 and 7. Shear wall chords, hold-downs and connections to transfer shear forces between the wall and surrounding structure shall be designed in accordance with accepted engineering practice. Allowable strengths for shear walls with structural splines along each panel edge shall be designed in accordance with accepted engineering practice and subject to the limitations for wood sheathed shear walls.

5.8.1. Seismic Design Categories A, B and C. The use of the shear wall configurations in Table 6 is limited to structures in Seismic Design Categories A, B and C. Where SIPs are used to resist seismic forces the following factors shall be used for design: Response Modification Coefficient, R = 2.0; System Overstrength Factor, Ω_0 = 2.5; Deflection Amplification Factor, C_d = 2.0. (IM 014 ACU16) The maximum panel height-to-width ratio shall be 2:1. (IM 014 ACU17)

5.8.2. Seismic Design Categories D, E, and F. The shear wall configurations in Table 7 are permitted in Seismic Design Categories D, E and F. Such walls shall be designed using the seismic design coefficients and limitations provided in ASCE 7-05 for light-framed walls sheathed with wood structural panels rated for shear resistance (SFRS A13). These SIPs shall use the following factors for design: Response Modification Coefficient, R = 6.5; System Overstrength Factor, Ω_0 = 3.0; Deflection Amplification Factor, C_d = 4.0.(IM 014 ACU16) The maximum panel height-to-width ratio shall be 1:1. (IM 014 ACU17)

5.8.3. Adhesives and Sealants. Adhesives and sealants shall not be applied at wood-to-wood or spline-to-facing interfaces in shear walls in Seismic Design Categories D, E and F(IM 014 NACU10). Adhesives and sealants may be applied to wood-to-foam or facing-to-foam interfaces. Flexible SIP tape may be applied over panel joints.

5.9. Horizontal Diaphragms. Horizontal diaphragms shall be sized to resist all code required wind and seismic loads without exceeding the allowable loads provided in Table 8. Diaphragm chords and connections to transfer shear forces between the diaphragm and surrounding structure shall be designed in accordance with accepted engineering practice. The maximum diaphragm length-to-width ratio shall not exceed 3:1. (IM 014 ACU18)

5.10. Combined Loads. Panels subjected to any combination of transverse, axial or in-plane shear loads shall be analyzed utilizing a straight line interaction in accordance with *NTA IM014 TIP 01 SIP Design Guide*.

6. INSTALLATION

6.1. General. *PorterCorp Structural Insulated Panels* shall be fabricated, identified and erected in accordance with this report, the approved construction documents and the applicable code. In the event of a conflict between the manufacturer's published installation instructions and this report, this report shall govern. Approved construction documents shall be available at all times on the jobsite during installation. (IM 014 NACU7)

6.2. Splines. *PorterCorp Structural Insulated Panels* are interconnected at the panel edges through the use of a spline. The spline type may be of any configuration listed in Section 4.2.5 as required by the specific design. The spline shall be secured in place with not less than 0.131 in. x 2-1/2 in. nails, spaced 6 in. on center on both sides of the panel, or an approved equivalent fastener. All joints shall be sealed in accordance with the SIP manufacturer's installation instructions. Alternate spline connections may be required for panels subjected to in-plane racking forces. Such panels shall be interconnected exactly as required in Table 6 or 7 or as directed by the designer.

6.3. Plates. The top and bottom plates of the panels shall be dimensional or engineered lumber sized to match the core thickness of the panel. The plates shall be secured using not less than 0.131 in. x 2-1/2 in. nails, spaced 6 in. on center on both sides of the panel, or an approved equivalent fastener.

A second plate composed of 1-1/8 in. minimum thickness dimensional or engineered lumber with a specific gravity of 0.42 that is cut to the full thickness of the panel shall be secured to the first top plate using 0.131 in. x 3 in. nails or an approved equivalent fastener.

6.4. Cutting and Notching. No field cutting or routing of the panels shall be permitted except as shown on approved drawings. (IM 014 NACU6)

6.5. Protection from Decay. SIPs that rest on exterior foundation walls shall not be located within 8 in. of exposed earth. SIPs supported by concrete or masonry that is in direct contact with earth shall be protected from the concrete or masonry by a moisture barrier. (IM 014 ACU6)

6.6. Protection from Termites. In areas subject to damage from termites, SIPs shall be protected from termites using an approved method. Panels shall not be installed below grade or in contact with earth. (IM 014 ACU7)

6.7. Heat-Producing Fixtures. Heat-producing fixtures shall not be installed in the panels unless protected by a method approved by the code official or documented in test reports. This limitation shall not be interpreted to prohibit heat-producing elements with suitable protection. (IM 014 NACU9)

6.8. Voids and Holes

6.8.1 Voids in Core. In lieu of openings designed in accordance with section 5.7, the following voids are permitted. Voids may be provided in the panel core during fabrication at predetermined locations only. Voids parallel to the panel span shall be limited to a single 1 in. maximum diameter hole. Such voids shall be spaced a minimum of 4 ft. on center measured perpendicular to the panel span. Two 1/2 in. diameter holes may be substituted for the single 1 in. hole provided they are maintained parallel and within 2 in. of each other. (IM 014 ACU11)

Voids perpendicular to the panel span shall be limited to a single 1 in. maximum diameter hole placed not closer than 16 in. from the support. Additional voids in the same direction shall be spaced not less than 28 in. on center.

6.8.2 Holes in Panels. Holes may be placed in panels during fabrication at predetermined locations only. Holes shall be limited to 4 in. x 4 in. square. The minimum distance between holes shall not be less than 4 ft. on center measured perpendicular to the panel span and 24 in. on center measured parallel to the panel span. Not more than three holes shall be permitted in a single line parallel to the panel span. The holes may intersect voids permitted elsewhere in this report. (IM 014 ACU15)

6.9. Panel Cladding

6.9.1 Roof Covering. The roof covering, underlayment and flashing shall comply with the applicable code(s). All roofing materials must be installed in accordance with the manufacturer's installation instructions. The use of roof coverings requiring the application of heat during installation shall be reviewed and approved by a registered design professional.

6.9.2 Exterior Wall Covering. Panels shall be covered on the exterior by a water-resistive barrier as required by the applicable code. The water-resistive barrier shall be attached with flashing in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer. (IM 014 ACU9) The exterior facing of the SIP wall shall be covered with weather protection as required by the adopted building code or other approved materials. (IM 014 ACU10)

6.9.3 Interior Finish. The SIP foam plastic core shall be separated from the interior of the building by an approved thermal barrier of 1/2 in. gypsum wallboard or equivalent thermal barrier where required by 2009 IBC Section 2603.4.

7. CONDITIONS OF USE

PorterCorp Structural Insulated Panels as described in this report comply with the codes listed in Section 2.0, subject to the following conditions:

7.1. Installation complies with this report and the approved construction documents.

7.2. This report applies only to the panel thicknesses specifically listed herein. (IM 014 ACU3)

7.3. In-use panel heights/spans shall not exceed the values listed herein. Extrapolation beyond the values listed herein is not permitted. (IM 014 ACU2)

7.4. The panels are manufactured in the production facilities noted in this report. (IM 014 NACU8)

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8. EVIDENCE SUBMITTED

NTA, Inc. has examined the following evidence to evaluate this product:

8.1. Review of each manufacturing facility's quality system documentation for conformance to NTA IM 036.

8.2. Qualification test data in accordance with NTA IM 14 *Standard Evaluation Plan 01* (IM 014 SEP 01).

8.3. Periodic quality system audits of the production facilities.

8.4. Periodic testing in accordance with NTA IM 014.

Evaluation evidence and data are on file with NTA, Inc. NTA, Inc. is accredited by the International Accreditation Service (IAS) as follows:

ISO17020 Inspection Agency (AA-682)
ISO17025 Testing Laboratory (TL-259)
ISO Guide 65 Product Certification Agency (PCA-102)

The scope of accreditation related to testing, inspection or product certification pertain only to the test methods and/or standard referenced therein. Design parameters and the application of building code requirements, such as special inspection, have not been reviewed by IAS and are not covered in the accreditation. Product evaluations are performed under the direct supervision of Professional Engineers licensed in all jurisdictions within the United States as required by the building code and state engineering board rules.

9. FINDINGS

All products referenced herein are manufactured under an in-plant quality assurance program to insure that the production quality meets or exceeds the requirements of the codes noted herein and the criteria as established by NTA, Inc. Furthermore, panels must comply with the conditions of this report.

This report is subject to annual renewal.

10. IDENTIFICATION

Each eligible panel shall be permanently marked to provide the following information:

a) The NTA, Inc. listing mark, shown below
b) NTA's Listing No. SIPA120908-10
c) In-plant quality assurance stamp
d) Identifier for production facility
e) Project or batch number.

NTA ® LISTED
PSC121907-22

This listing report is intended to indicate that NTA Inc. has evaluated product described and has found it to be eligible for labeling. Product not labeled as specified herein is not covered by this report. NTA Inc. makes no warranty, either expressed or implied, regarding the product covered by this report.

Table 1: Basic Properties[1, 2]

Property	Weak-Axis Bending	Strong-Axis Bending
Allowable Tensile Stress, F_t (psi)	245	495
Allowable Compressive Stress, F_c (psi)	340	580
Elastic Modulus (Bending), E_b (psi)	738900	658800
Shear Modulus, *G* (psi)	270	405
Allowable Core Shear Stress, F_v (psi)	4.5	5.0
Core Compressive Modulus, E_c (psi)	360	360
Reference Depth, h_o (in.)	4.625	4.625
Shear Depth Factor Exponent, m	0.84	0.86

[1] All properties are based on a minimum panel width of 24 in.
[2] Refer to *NTA IM14 TIP 01 SIP Design Guide* for details on engineered design using basic panel properties.

Table 2: Section Properties

Panel Thickness, *h* (in.)	Core Thickness, *c* (in.)	Dead Weight, w_d (psf)	Facing Area, A_f (in.^{2}/ft)	Shear Area, A_v (in.^{2}/ft)	Moment of Inertia, *I* (in.^{4}/ft)	Section Modulus, *S* (in.^{3}/ft)	Radius of Gyration, r (in.)	Centroid-to-Facing Dist., y_c (in.)
4.625	3.75	3.2	10.5	50.3	46.0	19.9	2.09	2.31
6.50	5.625	3.3	10.5	72.8	96.5	29.7	3.03	3.25
8.25	7.375	3.5	10.5	93.8	160.2	38.8	3.91	4.13
10.25	9.375	3.6	10.5	117.8	252.7	49.3	--	--
12.25	11.375	3.8	10.5	141.8	366.3	59.8	--	--

Block Spline   Surface Spline

Figure 1: SIP Spline Types

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Table 3: Allowable Uniform Transverse Loads[1, 4]

Panel Length (ft)	4-5/8 inch Thick SIP			6-1/2 inch Thick SIP		
	Deflection Limit[2]			Deflection Limit[2]		
	L/180	L/240	L/360	L/180	L/240	L/360
8 WAB[3]	50.8	40.9	27.3	73.8	64.7	43.1
8	68.8	51.6	34.4	80.6	80.6	56.6
10	45.1	33.8	22.5	62.0	57.9	38.6
12	30.8	23.1	15.4	50.4	40.9	27.3
14	21.7	16.3	--	39.6	29.7	19.8
16	--	--	--	29.4	22.1	14.7
18	--	--	--	22.4	16.8	--

See Table 4 for notes.

Table 4: Allowable Uniform Transverse Loads (continued)[1, 4]

Panel Length (ft)	8-1/4 inch Thick SIP			10-1/4 inch Thick SIP			12-1/4 inch Thick SIP		
	Deflection Limit[2]			Deflection Limit[2]			Deflection Limit[2]		
	L/180	L/240	L/360	L/180	L/240	L/360	L/180	L/240	L/360
8 WAB[3]	81.4	81.4	58.3	89.9	89.9	75.9	98.6	98.6	93.6
8	88.5	88.5	78.4	97.3	97.3	97.3	106.4	106.4	106.4
10	67.4	67.4	54.8	73.1	73.1	73.1	78.8	78.8	78.8
12	54.4	54.4	39.6	58.6	58.6	54.6	62.5	62.5	62.5
14	45.6	43.9	29.3	48.8	48.8	41.1	51.9	51.9	51.9
16	39.3	33.2	22.1	41.9	41.9	31.5	44.3	44.3	41.7
18	34.1	25.6	17.1	36.7	36.7	24.6	38.7	38.7	32.9
20	26.7	20.0	13.4	32.6	29.2	19.5	34.3	34.3	26.3

[1] Table values assume a simply supported panel with 1.5 in. of continuous bearing on facing at supports (C_v = 1.0) with solid wood plates at bearing locations. Values do not include the dead weight of the panel. For wall panel capacities utilizing a zero bearing configuration, shown in Figure 2, multiply the allowable uniform load shown by C_v = 0.4.
[2] Deflection limit shall be selected by building designer based on the serviceability requirements of the structure and the requirements of adopted building code. Values are based on loads of short duration only and do not consider the effects of creep.
[3] Tabulated values are based on the strong-axis of the facing material oriented parallel to the direction of panel bending. WAB indicates weak-axis bending of the facing material; the strong-axis of the facing material is oriented perpendicular to the direction of panel bending.
[4] Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load.

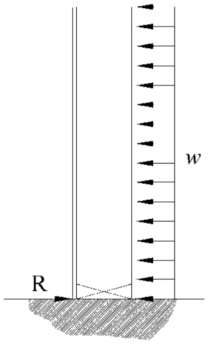

Figure 2: Zero Bearing Support

This listing report is intended to indicate that NTA Inc. has evaluated product described and has found it to be eligible for labeling. Product not labeled as specified herein is not covered by this report. NTA Inc. makes no warranty, either expressed or implied, regarding the product covered by this report.

Table 5: Allowable Axial Loads (plf)[1,2,3,4]

Lateral Brace Spacing (ft)	Panel Thickness		
	4-5/8 inch	6-1/2 inch	8-1/4 inch
8 WAB[5]	2320	2470	2530
8	3630	4070	4240
10	3260	3890	4130
12	2810	3660	4000
14	--	3390	3830
16	--	3090	3640
18	--	2790	3430
20	--	--	3190

1. Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load.
2. All values are for normal duration and may not be increased for other durations.
3. Axial loads shall be applied concentrically to the top of the panel through repetitive members spaced not more than 24 in. on center. Such members shall be fastened to a rim board or similar member to distribute along the top of the SIP.
4. The ends of both facings must bear on the supporting foundation or structure to achieve the tabulated axial loads.
5. Tabulated values are based on the strong-axis of the facing material oriented parallel to the direction of panel bending. WAB indicates weak-axis bending of the facing material; the strong-axis of the facing material is oriented perpendicular to the direction of panel bending.

Table 6: Allowable In-Plane Shear Strength (Pounds per Foot) for SIP Shear Walls (Wind and Seismic Loads in Seismic Design Categories A, B and C)[1,3]

Spline Type[4]	Nominal SIP Thickness (in.)	Minimum Facing Connections[3,5]			Shear Strength (plf)
		Chord[3]	Plate[3]	Spline[4]	
Block or Surface Spline	4.625	0.131"x 2-1/2" nails, 6" oc	0.131"x 2-1/2" nails, 6" oc	0.131"x 2-1/2" nails, 6" oc	380
	6.625	0.131"x 2-1/2" nails, 6" oc	0.131"x 2-1/2" nails, 6" oc	0.131"x 2-1/2" nails, 6" oc	380
	8.375	0.131"x 2-1/2" nails, 6" oc	0.131"x 2-1/2" nails, 6" oc	0.131"x 2-1/2" nails, 6" oc	400

See Table 7 for notes.

Table 7: Allowable In-Plane Shear Strength (Pounds per Foot) for SIP Shear Walls (Wind and Seismic Loads in Seismic Design Categories D, E and F)[2,3]

Spline Type[4]	Nominal SIP Thickness (in.)	Minimum Facing Connections[3,5]			Shear Strength (plf)
		Chord[3]	Plate[3]	Spline[4]	
Block or Surface Spline	6.5	0.131"x 2-1/2" nails, 3" oc (3/8" edge distance)	0.131"x 2-1/2" nails, 3" oc (3/8" edge distance)	0.131"x 2-1/2" nails, 3" oc (23/32" thick, 3" wide spline)	900

[1] Maximum shear wall dimensions ratio shall not exceed 2:1 (height: width) for resisting wind or seismic loads.
[2] Maximum shear wall dimension ratio shall not exceed 1:1 (height: width) for resisting wind or seismic loads.
[3] Chords, hold downs and connections to other structural elements must be designed by a registered design professional in accordance with accepted engineering practice.
[4] Spline type at interior panel-to-panel joints only. Solid chord members are required at each end of each shear wall segment.
[5] Required connections must be made on each side of the panel. Dimensional or engineered lumber shall have an equivalent specific gravity of 0.42 or greater.

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Table 8: Allowable In-Plane Shear Strength (Pounds per Foot) for Horizontal Diaphragms Subjected to Wind or Seismic Loading

Nominal SIP Thickness (in.)	Minimum Connections			Shear Strength (plf)	Max. Aspect Ratio
	Block Spline[1] (Figure 3a)	Boundary[2] (Figure 3b)			
		Support	Spline		
8.25	0.131" x 2-1/2" nails, 6" oc 7/16" x 3" x 7-3/8" OSB Surface Spline	10" Length, 0.190" shank diameter, 0.255" thread o.d., 2.750" thread length 0.625" head diameter SIP Screw 6" oc	0.131" x 2-1/2" nails, 6" oc	265	3:1
	0.131" x 2-1/2" nails, 4" oc 7/16" x 3" x 7-3/8" OSB Surface Spline	10" Length, 0.190" shank diameter, 0.255" thread o.d., 2.750" thread length 0.625" head diameter SIP Screw 4" oc	0.131" x 2-1/2" nails, 4" oc	330	3:1
	0.131" x 2-1/2" nails, 2" oc staggered 3/8" (Figure 3c) 7/16" x 3" x 7-3/8" OSB Surface Spline	10" Length, 0.190" shank diameter, 0.255" thread o.d., 2.750" thread length 0.625" head diameter SIP Screw 3" oc	0.131" x 2-1/2" nails, 2" oc staggered 3/8" (Figure 3c)	575	3:1

[1]Top spline or block spline only at interior panel-to-panel joints. Specified fasteners are required on both sides of panel joint through the top surface only, as shown in Figure 3a.
[2] Boundary spline shall be solid lumber 1.5 in. wide minimum and have a specific gravity of 0.42 or greater. Specified fasteners are required through both facings as shown in Figure 3b.

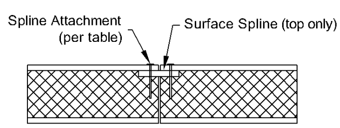


Figure 3a: Surface Spline

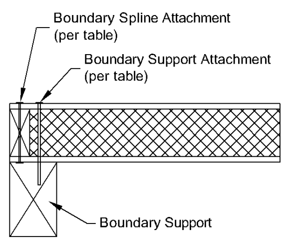


Figure 3b: Boundary

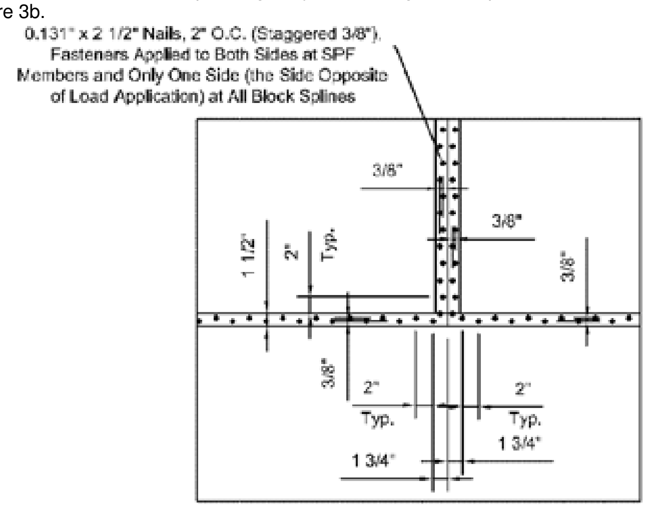


Figure 3c: Boundary Spline

Figure 3: Diaphragm Connection Types

Table 9: Component Material Sources

Facing	Core	Adhesive
Ainsworth Group of Companies Suite 3194 Bentall 4 1055 Dunsmuir Street Vancouver BC, Canada V7X 1L3	ACH Corporation Plant U-37 - Fond du Lac, WI	Ashland Specialty Chemical Company 5200 Blazer Parkway Dublin, OH 43017
Georgia-Pacific 9918 Buford Bridge Road Fairfax, SC 29827	Atlas EPS, A Division of Atlas Roofing Corporation 8240 Byron Center Road SW Byron Center, MI 49315	Foam Supplies, Inc. 4387 N. Rider Trail Earth City, MO 63045
Huber Engineered Woods 1000 Chaney Lane Crystal Hill, VA 24539	Iowa EPS Products, Inc. 5554 N.E. 16th Street Des Moines, IA 50313	Rohm and Haas Company 5005 Barnard Mill Road Ringwood, IL 60072
Louisiana-Pacific Corporation Sagola, MI Sales and Marketing by: Affiliated Resources, Inc. River Forum 1 4380 SW Macadam Avenue, Suite 200 Portland, OR 97239	Northwest Foam Products, Inc. 2390 Rostron Circle Twin Falls, ID 83301	
Tolko Industries, Ltd. 3203 30th Avenue Vernon BC, Canada V1T 6M1	OPCO, Inc. P.O. Box 101 Latrobe, PA 15650	
	Plymouth Foam 1 Southern Gateway Drive Gnadenhutten, OH 44629	
	Polar Industries, Inc. 32 Gramar Avenue Prospect, CT 06712	
	Powerfoam Insulation 550 Murray Street/Highway 287 Midlothian, TX 76065	

SIP HEADERS:

Simply A Better Window & Door Header!

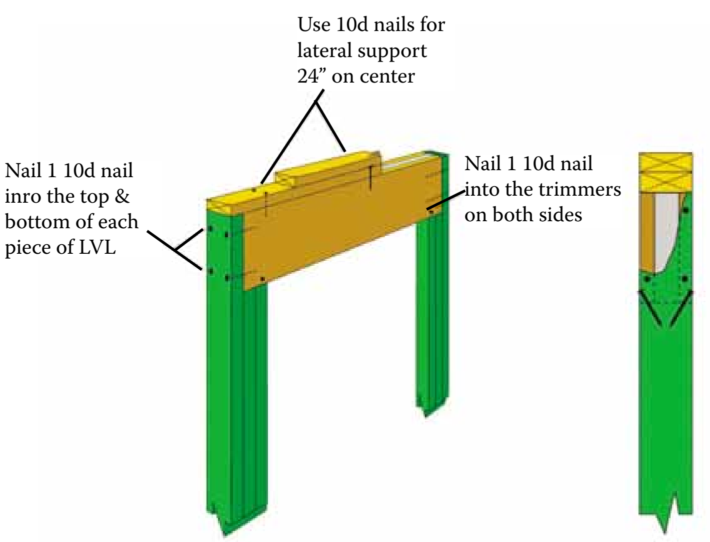
- 3 ½" width for 2x4 construction
- 5 ½" with for 2x6 construction
- Available Depths 9 ¼" & 11 ¼"
- Value engineered for commercial jobs.
- Custom depths available (call for details)
- Full Thermal Break (Foam Core Construction)
  3 ½" ExpressHeader = R7.75
  5 ½" ExpressHeader = R16
- Right size every time.
- No cupping, twisting, or bowing.
- Less call backs for drywall problems.
- Available in lengths up to 16' (Precision End Trim Offered)
- Bonded with exterior code listed structural adhesive

5 ½" Construction Description:

1 ¼" LVL (Laminated Veneer Lumber)
3" of Expanded Polystyrene (EPS)
1 ¼" LVL (Laminated Veneer Lumber)

3 ½" Construction Description:

1 ¼" LVL (Laminated Veneer Lumber)
1" of Expanded Polystyrene (EPS)
1 ¼" LVL (Laminated Veneer Lumber)



ROOF LOAD

ExpressHeader Allowable Uniform Roof Loads 115%

Size	Span	2'	2-6"	3'	3-6"	4'	5'	6'	7'	8'	9'	10'	11'	12'
3 1/2 x 9 1/4	LL	2807	2245	1870	1602	2034	1626	1354	1160	1007	749	544	408	313
	TL	2807	2245	1870	1602	2034	1626	1354	1160	1007	795	643	530	419
3 1/2 x 11 1/4	LL	2806	2244	1869	1601	2473	1977	1647	1411	1234	1096	915	737	566
	TL	2806	2244	1869	1601	2473	1977	1647	1411	1234	1096	945	755	634
5 1/2 x 9 1/4	LL	2807	2245	1870	1602	2034	1626	1354	1160	1007	749	544	408	313
	TL	2807	2245	1870	1602	2034	1626	1354	1160	1007	795	643	530	419
5 1/2 x 11 1/4	LL	2806	2244	1869	1601	2473	1977	1647	1411	1234	1096	915	737	566
	TL	2806	2244	1869	1601	2473	1977	1647	1411	1234	1096	915	755	634

Minimum bearing 1 ½", one trimmer at the ends.
Spans 4' and over require 3" bearing, two trimmers at the ends.
Uniform loads per lineal foot. Deflection L/240 live load, L/180 total load.

Refer to local codes for floor and roof design load criteria.

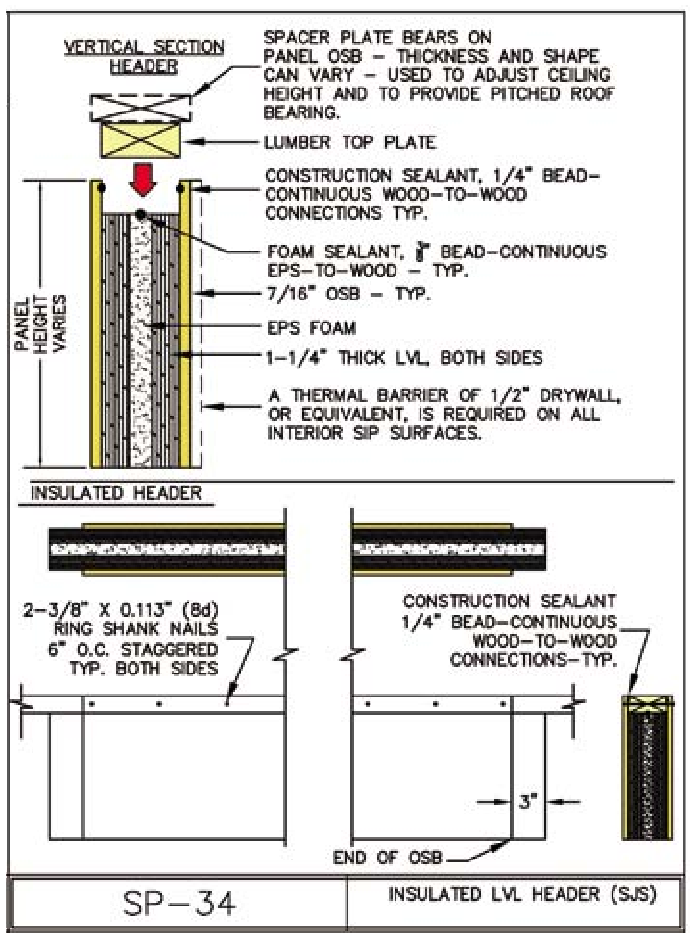
FLOOR LOAD

ExpressHeader Allowable Uniform Roof Loads 100%

Size	Span	2'	2-6"	3'	3-6"	4'	5'	6'	7'	8'	9'	10'	11'	12'
3 1/2 x 9 1/4	LL	2807	2245	1870	1602	1768	1413	1177	1008	710	497	361	270	207
	TL	2807	2245	1870	1602	1768	1413	1177	1008	875	690	544	408	313
3 1/2 x 11 1/4	LL	2806	2244	1869	1601	2150	1719	1431	1226	1072	898	653	489	375
	TL	2806	2244	1869	1601	2150	1719	1431	1226	1072	952	795	656	550
5 1/2 x 9 1/4	LL	2807	2245	1870	1602	1768	1413	1177	1008	710	497	361	270	207
	TL	2807	2245	1870	1602	1768	1413	1177	1008	875	690	544	408	313
5 1/2 x 11 1/4	LL	2806	2244	1869	1601	2150	1719	1431	1226	1072	898	653	489	375
	TL	2806	2244	1869	1601	2150	1719	1431	1226	1072	952	795	656	550

Minimum bearing 1 ½", one trimmer at the ends.
Spans 4' and over require 3" bearing, two trimmers at the ends.
Uniform loads per lineal foot. Deflection L/360 live load, L/240 total load.

Refer to local codes for floor and roof design load criteria.



15 Minute Thermal Barrier

The International Building Codes (IBC and IRC) specify that SIPs shall only be used on buildings of combustible construction. (Type V)

The IBC and IRC building codes further state that any foam plastic insulation shall be separated from the interior of the building by an approved 15 minute thermal barrier consisting of ½" of gypsum wall board or an equivalent thermal barrier. Since the core of a SIP is a foam plastic, the inside of a wall or roof panel will need to be covered by a 15 minute thermal barrier.

The APA has reported that 23/32" western species plywood or OSB will meet the 15 minute thermal barrier. This report additionally states that, according to IBC section 2603.4.1.5, 15/32" plywood or OSB prescriptively meet this thermal barrier requirement for roof assemblies.

Beside gypsum wall board, plywood and OSB, other materials such as T&G decking may meet the 15 minute thermal barrier requirement. However, before proceeding, consult your local building code or inspector. While decisions made within one code jurisdiction may be considered as a precedent for others, the final decision on materials not specifically listed in the code, are usually made on a case-by-case basis within each jurisdiction.

See Section 2603 of the IBC "Foam Plastic Insulation" for more detailed information.

ONLINE CERTIFICATIONS DIRECTORY

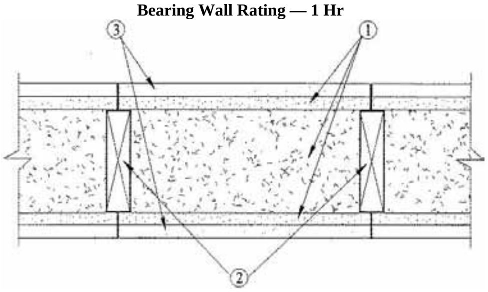
OCD Home Quick Guide Contact Us UL.com

BXUV.U532
Fire Resistance Ratings - ANSI/UL 263

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Listed or Classified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered as Classified, Listed, or Recognized.

Fire Resistance Ratings - ANSI/UL 263
See General Information for Fire Resistance Ratings - ANSI/UL 263
Design No. U532
August 08, 2001
Bearing Wall Rating — 1 Hr



1. **Building Units* —** Composite panels consisting of a nom. 5-1/2 in. thick polystyrene foamed plastic core faced on both surfaces with min. 7/16 in. thick oriented strand board. Building Units* loaded to a max of 1800 lb. per linear foot which is 60 percent of recommended axial design load.

PORTER CORP — Type Porter Structural Insulated Panels.

2. **Studs and Bearing Plates —** Nom. 2 by 6 in. thick No. 2 lumber installed in Building Units* (Item 1) in pre-cut channels. End stud and bearing plate secured to the oriented strand board with 1-5/8 in. long ring shank nails spaced 12 in. OC along the edges on both faces.

3. **Gypsum Board* —** 5/8 in. thick, 4 ft. wide, applied vertically installed with 1-5/8 in. long high/low bugle-head steel screws spaced 8 in. OC along the edges and 12 in. OC in the field. Vertical joints over vertical joints of Building Units* (Item 1). Gypsum Board joints covered with joint tape and joint compound. Screwheads covered with joint compound.

CANADIAN GYPSUM COMPANY — Type C.
UNITED STATES GYPSUM CO — Type C.
USG MEXICO S A DE C V — Type C.

*Bearing the UL Classification Mark

Last Updated on 2001-08-08

Questions? Notice of Disclaimer Page Top

SIP FASTENERS:

TRUFAST SIP Fasteners are specifically engineered for attaching structural insulate panels (sips) and nail base panels to wood and metal framing. Featuring large, pancake head style with 6-lobe drive, TRUFAST SIP Fasteners drive quickly and smoothly, and draw panels securely without the need of a washer. Only TRUFAST offers three fastener styles for use in wood, corrugated steel and steel members without pre-drilling! Contact your panel manufacturer or distributor and ask to test drive a TRUFAST SIP Fastener, and see why they're the #1 fastener in the SIP industry.

Length in.	(mm)	SIPTP Part #	SIPLD Part #	Pkg. Qty.
2	(51)	SIPTP-2000	NA	500/Pail
2-1/2	(64)	SIPTP-2500	NA	500/Pail
3	(76)	SIPTP-3000	SIPLD-3000	500/Pail
3-1/2	(89)	SIPTP-3500	SIPLD-3500	500/Pail
4	(102)	SIPTP-4000	SIPLD-4000	500/Pail
4-1/2	(114)	SIPTP-4500	SIPLD-4500	500/Pail
5	(127)	SIPTP-5000	SIPLD-5000	500/Pail
5-1/2	(140)	SIPTP-5500	SIPLD-5500	500/Pail
6	(152)	SIPTP-6000	SIPLD-6000	500/Pail
6-1/2	(165)	SIPTP-6500	SIPLD-6500	500/Pail
7	(178)	SIPTP-7000	SIPLD-7000	500/Pail
7-1/2	(191)	SIPTP-7500	SIPLD-7500	500/Pail
8	(203)	SIPTP-8000	SIPLD-8000	500/Pail
8-1/2	(216)	NA	SIPLD-8500	250/Pail
9	(229)	SIPTP-9000	SIPLD-9000	250/Pail
10	(254)	SIPTP-10000	SIPLD-10000	250/Pail
11	(279)	SIPTP-11000	SIPLD-11000	250/Pail
12	(305)	SIPTP-12000	SIPLD-12000	250/Pail
13	(330)	SIPTP-13000	SIPLD-13000	250/Box
14	(356)	SIPTP-14000	SIPLD-14000	250/Box
15	(381)	SIPTP-15000	SIPLD-15000	250/Box
16	(406)	SIPTP-16000	SIPLD-16000	250/Box
18	(483)	SIPTP-18000	SIPLD-18000	250/Box

NOTE: Two T-30 Driver Bits included in each package

Length in.	(mm)	SIPHD Part #	Pkg. Qty.
6	(152)	SIPHD-6000	500/Pail
8	(203)	SIPHD-8000	250/Pail
9-3/4	(248)	SIPHD-9750	250/Pail
11-3/4	(298)	SIPHD-11750	250/Pail
13-3/4	(349)	SIPHD-13750	250/Box

NOTE: Two T-30 Driver Bits included in each package

Withdrawal Values in Wood*

Specific Gravity	0.67	0.55	0.50	0.46	0.43	0.36	0.31
SIPTP & SIPLD:	1429	1173	1067	981	917	768	661

*Values are in lb/in. of thread penetration

Withdrawal Values in Steel

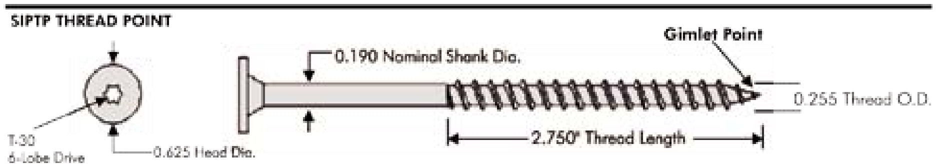
Type B Corrugated	22 ga	20 ga	18 ga		
SIPLD:	510 lbf	645 lbf	920 lbf		
Structural Steel	16 ga	13 ga	12 ga	3/16"	1/4"
SIPHD:	770 lbf	1130 lbf	1690 lbf	3100 lbf	4500 lbf

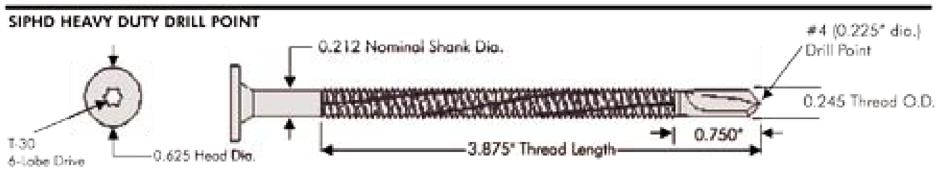
Lateral Load Resistance

Fastener	Main Member	Side Member	Load (lbf.)
SIPTP	SPF 2x4	SIP Panel	943
SIPLD	22 ga. Corrugated Steel	Nail Base	411
SIPLD	7/16" OSB	Nail Base	112
SIPHD	1/8" Structural Steel	SIP Panel	929

T-30 Driver Bit

NOTE: Two T-30 Driver Bits included in each package





PERFORMANCE DATA

Fastener	Tensile Strength	Shear Strength	Head Pull-Thru Values 7/16" OSB	SIP Panel
SIPTP	3380 lbf.	2900 lbf.	545 lbf.	630 lbf.
SIPLD	3380 lbf.	2900 lbf.	545 lbf.	630 lbf.
SIPHD	6000 lbf.	3400 lbf.	545 lbf.	630 lbf.

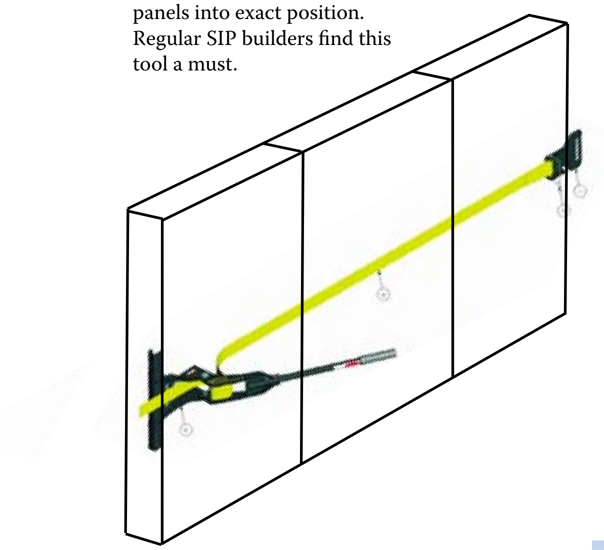
PRODUCT FEATURES

- Case hardened and tempered for easy installation and long term durability.
- Large diameter, low profile pancake head provides excellent pull-through resistance without the need for a washer while eliminating "telegraphing" on shingles, metal panels and other roof surface materials.
- 6-Lobe internal drive offers excellent bit engagement during installation, especially in high torque applications.
- Widest selection of fastener lengths in the industry for proper sizing to panel thickness.
- Choice of 3 thread/point styles for job-matched performance in either wood or steel substrates.

PRODUCT SPECIFICATIONS

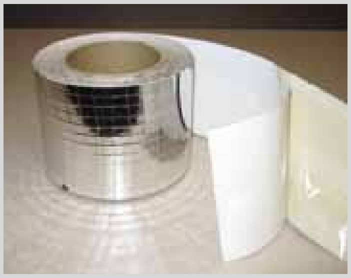
Material:	Case hardened and tempered carbon steel
Head Style/Drive:	Pancake Head with T-30 Internal Drive
Head Diameter:	0.625"
Nominal Shank Diameter:	SIPTP and SIPLD: 0.190" SIPHD: 0.212"
Thread Length:	SIPTP* and SIPLD: 2.750" SIPHD: 3.875" * 3" and longer fasteners; 2" and 2-1/2" fasteners are full thread
Overall Lengths:	SIPTP: 2" thru 18" SIPLD: 3" thru 18" SIPHD: 6" thru 13-3/4"
Point:	SIPTP: Gimlet Thread SIPLD: #2 (0.135" dia.) Drill Point SIPHD: #4 (0.225" dia.) Drill Point
Coating:	Epoxy e-coat (black) Passes more than 15 cycles (Kesternich) in accordance with DIN 50012

Panel Puller
With panels weighing 800 pounds, the panel puller is helpful to slide large panels together on base plates or slide up roof panels into exact position.
Regular SIP builders find this tool a must.

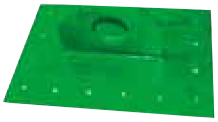


Foam Scoop
Use the foam scoop to recess the EPS foam for edge blocking, plates, jack studs etc. Cross bar adjusts so recess is controlled to 1 1/2", 3", 4 1/2" or as needed. Scoops are available in 3 1/2", 5 1/2", 7", 9" and 11" wide for various panel thickness.

SIP Screws and Washer Plates
Used to fasten SIPs to each other and to other framing members. See construction details.



Vapor Barrier Tape
Is used to seal all SIP roof joints. This tape should always be installed on the warm side of the panel.



Lifting Plates
Pick up large panels by attaching lifting plates with screws to the top OSB surface. Use #10 coarse thread deck screws (16) per plate.

Foam Sealant
For all wood to foam connections or to fill any small gaps.

Gap Filler Foam
Sealant for filling any large gaps.

Prazi Kit
Attach a chain saw to your worm drive circular saw and cut thick SIPs. Compound or straight cuts can be made with the adjustable saw base plate.

Construction Adhesive
is used for all wood to wood connections and must always be compatible with EPS foam.

Panel sizes:
The standard 8' x 24' SIP size is determined by availability of "jumbo" OSB. Some mills make OSB in a continuous process while others use a batch process. Either way, 8' x24' OSB has become the SIP industry standard. The cost of a SIP project is partially dictated by the number of 8' x 24' sheets that are required. A job using numerous 8' x 13' panels will be much more expensive than one using 8' x 12' panels. In most cases, it is much easier to make complete utilization of panels on walls than on roofs since smaller panels are easier to use for walls than roofs.

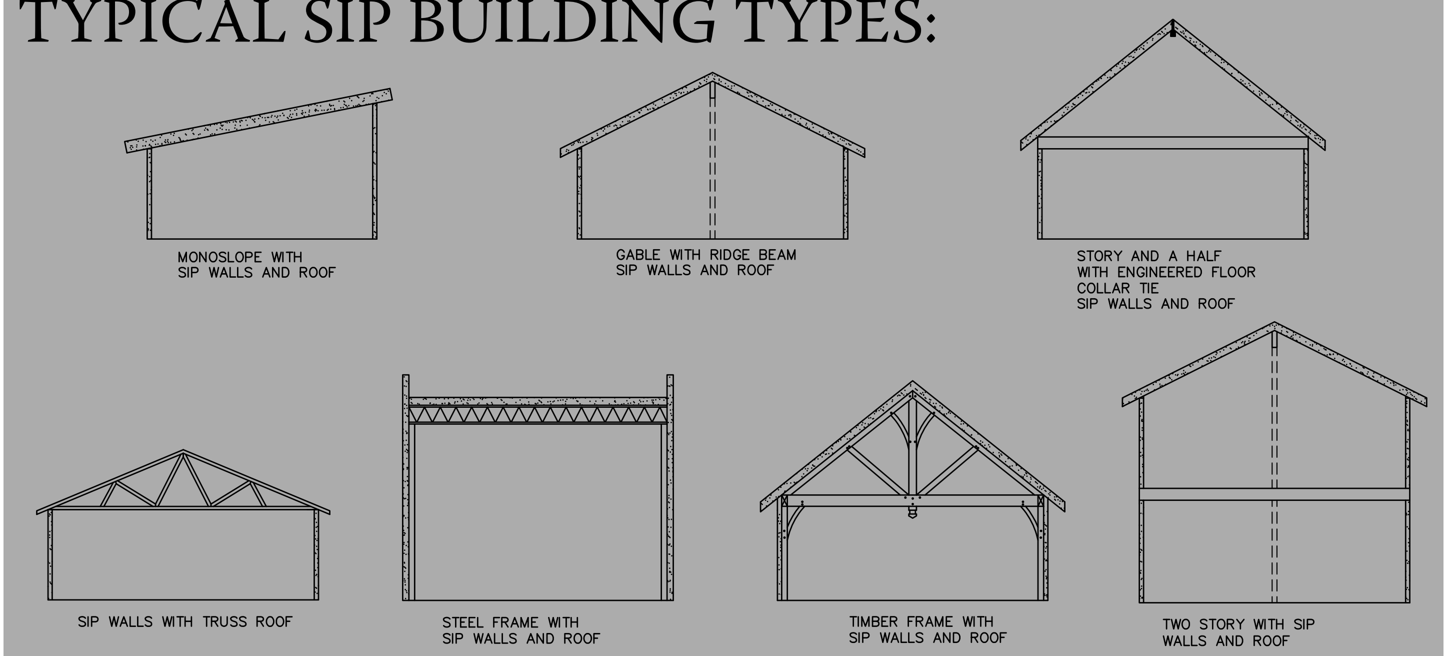
SIP walls:
Eight-foot-high wall panels can be up to 24' long in a single piece and typically will utilize almost 100% of the available 8'x24' material. When walls need to be taller than 8', the direction of the panels will be turned 90° - in this scenario, there will be a spline joint every 8', but the panels can be up to 24' tall. In residential SIP construction today, 8' x 9' or 8' x 10' panels are very commonly used to achieve 9'-or 10'-tall walls.

Roof panels and cathedral ceilings:
SIPs make cathedral ceilings easy and energy efficient. Compared with rafters, they are extremely cost effective and create great space. Cathedral ceilings add instant height to a room and often negate the need for 9' and 10' wall panels. When planning to use SIPs in roof construction, keep in mind that a roof panel must span from one bearing support to another. Bearing support members can be ridge beams, bearing walls, rafters or trusses. If the design calls for hips or valleys, remember that these edges usually need to be supported with valley beams or hip rafters. If the design of the building calls for horizontal ceilings, SIPs can be used as a ceiling panel, or SIPs can be installed at the roof line, and the horizontal ceiling can be constructed with ceiling joists. Using roof panels in a building with a pitched roof and an unnecessary horizontal ceiling does not best take advantage of SIPs inherent benefits.

SIP floor panels:
SIPs should not be used for interior floor systems; they are not as cost effective and accessible as conventional engineered wood truss or I joist systems. The easy access available in conventional engineered floor systems for plumbing, HVAC, and primary electrical is very important while thermal insulation between floors typically is not. SIP floors are best used whenever a floor needs to be insulated: over an unheated crawl-space, for a room that is elevated, or over any other unheated space. SIP floor systems frequently use engineered wood splines to increase the stiffness, see PorterCorp for details.

Monocoque construction:
The least expensive way to build a well insulated enclosure is monocoque construction with SIPs. Buildings up to 20 feet wide with flat or shed roofs are ideal for this system. Buildings up to 40 feet wide can use a semi-monocoque construction with only columns and a ridge beam down the center.

TYPICAL SIP BUILDING TYPES:



CNC cut panels:
Producing special shapes and compound cut panels now seems like common work. With SIP specific, three-dimensional CAD software, and 5-axis-capable CNC machinery, panels now fit much more precisely than ever before. Complicated dormers with gables, hips, and valley cuts can now be supplied as easily as smaller rectangular panels used to be. Special shapes like round-top windows can be accomplished with accuracy. Relying on skilled framing carpenters is, well, less reliable than it used to be. With CNC-cut SIPs, the complicated cutting is done reliably and correctly in the factory.

Avoiding Interior Load Bearing Walls:
Using large SIPs with post and beam construction can eliminate load bearing walls. Without load bearing walls the interior space can become more flexible as conditions change.

FAST FOOD - FAST CONSTRUCTION - 28 DAYS
BY ROCKFORD CONSTRUCTION

SIP building details:
SIP juncture details have evolved and have been refined greatly over the last 15 years. These details result in a highly sealed enclosure. Preventing moisture and vapor penetration at junctures is extremely important. The resulting building envelope should require downsized heating and cooling systems. This tight envelope may also require an air-to-air heat exchanger to reduce the humidity, and possibly an entirely revised HVAC system.

AIA/CES Learning units:
PorterCorp offers a 1 credit AIA/CES accredited presentation on SIPs. This course was produced by the Structural Insulated Panel Association (SIPA). Please contact PorterCorp for more information or to schedule a presentation.

OPTIONAL SERVICES AND FINISHES:

- **"Ready to assemble" packages – panels are delivered with lumber and splines installed**
- **T&G installed on the inside of wall or roof panels**
- **Various plywood products installed as the final interior or exterior finish** (limited sizes available)
- **Moisture resistant gypsum board installed over OSB**
- **Pre-finished aluminum laminated over OSB**
- **Fiberglass reinforced plastic laminated over OSB**
- **Custom lamination**

NAIL BASE: Standards

Nail base insulated panels are single-faced panels of Oriented Strand Board (OSB) bonded to Expanded Polystyrene foam (EPS). Nail base insulated panels are applied over structural roof decks to add insulation and to provide a base for nailed roofing. Shingles, slate, metal roofing, tile and membranes can be applied per manufacturer's recommendation over nail base.

Insulation Values
"R" values at 40°F.

Panel O.A. Thickness	"R" Value
2"	7.3
4"	15.7
6"	24.0
7-3/4"	31.3
9-3/4"	39.6
11-3/4"	48.0

Custom Thickness Nail Base
For a variety of reasons, sometimes special thickness panels are required. This is important on projects where fastener penetration is limited in the building structure. Most fasteners are made in ½" length increments. By customizing the insulation thickness, the amount of fastener penetration can be controlled.

Standard Sizes
Typically, nail base is supplied as 4'x8' panels with the foam thickness the same as nominal lumber sizes. Nominal foam thicknesses of 1-1/2", 3-1/2", 5-1/2", 7-1/4", 9-1/4"and 11-1/4" are available. The edges of nail base are square cut. Nail base panels are available as large as 4' x 24'.

Fire Ratings
The EPS foam plastic has been tested and approved for roof insulation in numerous applications. It must, however, be shielded from the inside with an approved 15 minute thermal barrier for the application. See IBC 2603 for more details.

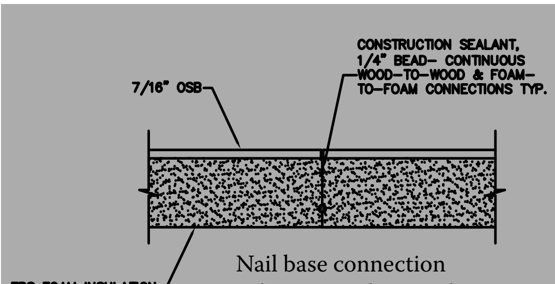
In many cases, the roof deck may be an acceptable thermal barrier. General residential applications will require a thermal barrier of ½" gypsum wall board or equivalent. When installed on the ceiling, other equivalent thermal barriers include 1x T&G or 15/32" plywood.

Square Edge
Square edge nail base provides an easy way to insulate new or existing buildings. For good thermal performance all joints should be sealed with construction sealant.

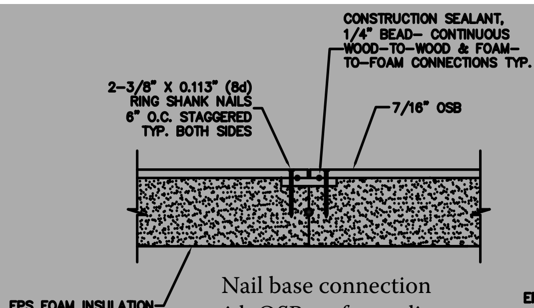
Spline Edge
The OSB top surface may be tied together as one surface by attaching each sheet of OSB to the adjacent sheet of OSB with surface splines. Surface splines of 7/16" x 3" OSB are inserted into a groove cut in the foam behind the OSB face. Splines are nailed with 8d nails, 6" O.C. This option is required on many classified roof decks and most membrane roofs.

Ship Lap Edge
Panel edges are ship lapped in 1" so the panels will have an offset at the juncture. This system is a simple system of reducing air leakage.

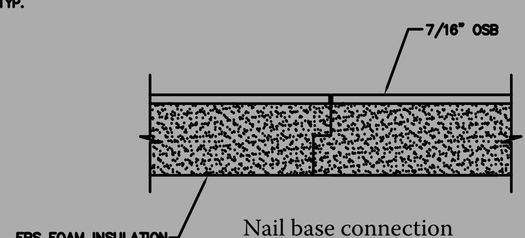
Double Layer Insulation
A double layer of insulation is applied with nail base on the top and foam board-stock on the bottom. The nail base is attached with fasteners all the way through both layers to the structure below.



Nail base connection with square edges and construction sealant



Nail base connection with OSB surface spline



Nail base connection with ship-lap edge

Application

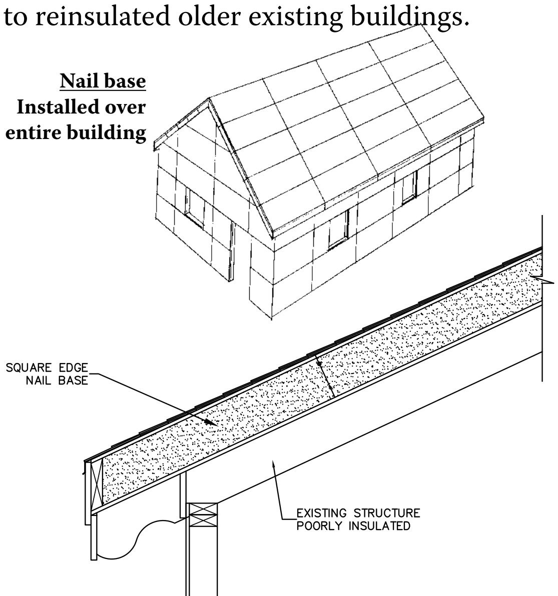
Nail base normally requires continuous edge blocking around the perimeter of the roof. Standard dimensional lumber is used for edge blocking. The foam is field recessed to fit over the lumber.

In cold climate regions, a vapor retarder must be installed between the EPS foam insulation and the existing building exterior.

Attachment of nail base is with long, large-head screws through the panel to the roof deck. As little as eight (8) fasteners are sufficient to hold the panel in normal applications. For high wind, high snow loads, or very steep pitches, contact the factory for advice on fastening. Nail base roof panels should be staggered in a brick overlapping pattern for the best results.

Nail base is not a finished exterior surface and must be covered by an exterior cladding. The appropriate roofing underlayment such as building felt, and a wall drainage plain such as house wrap are required. Nail base can be used on walls as well as roofs, particularly to reinsulated older existing buildings.

Nail base
Installed over
entire building



RE–ROOFING OF EXISTING

Specification

The top facing shall be 7/16" thick Exposure 1 rated oriented strand board.

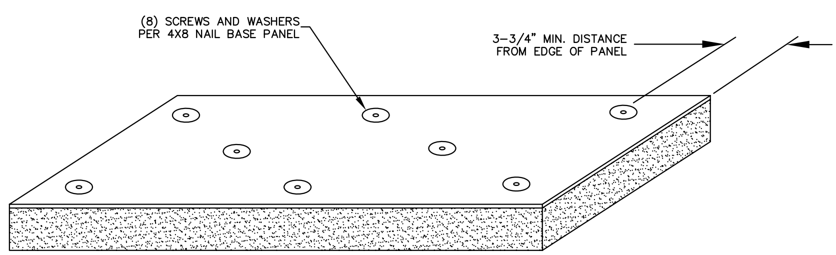
The insulation shall be expanded polystyrene foam, shall be nominal one pound density, and shall meet ASTM C578. Optional EPS with recycled content is also available.

The EPS and OSB shall be bonded with an exteriorrated code-listed adhesive. Attachment will be with a minimum of (8) #14 SIP screws per panel with and 3" washer plate for 4'x8' panels. Screws shall penetrate a minimum of 1" into the sub-structure. Extra fastening may be required in areas with high loads. Contact PorterCorp for more details.

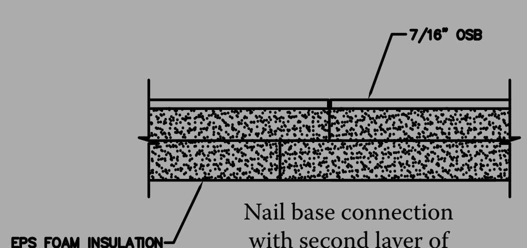
A thermal barrier roof deck as required per building codes shall be in place prior to application of nail base panels.

Standard thickness of the nail base panels will be 2", 4", 6", 7-3/4", 9-3/4" or 11-3/4".

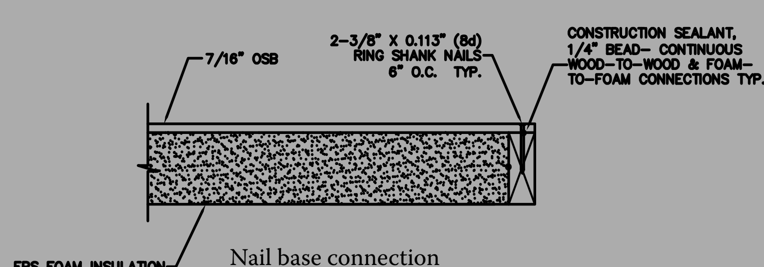
The roof decking and the nail base panels are to be dry prior to and during installation. Installed nail base panels are also to remain dry prior to and during application of finish roofing materials.



4' X 8' NAIL BASE PANEL



Nail base connection with second layer of foam insulation board



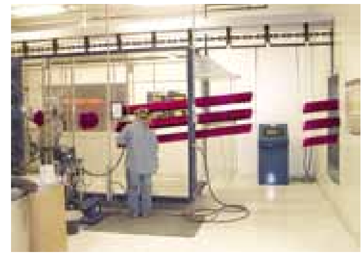
Nail base connection at sub-fascia

Adapt is the name Porter has chosen for their frame and panel building system. This system can be adapted to many different building styles and site conditions. Adapt frames typically use structural tubular steel for columns and glulam timber with steel connectors for roof trusses however we design each building depending on the customer's specification or requirement.

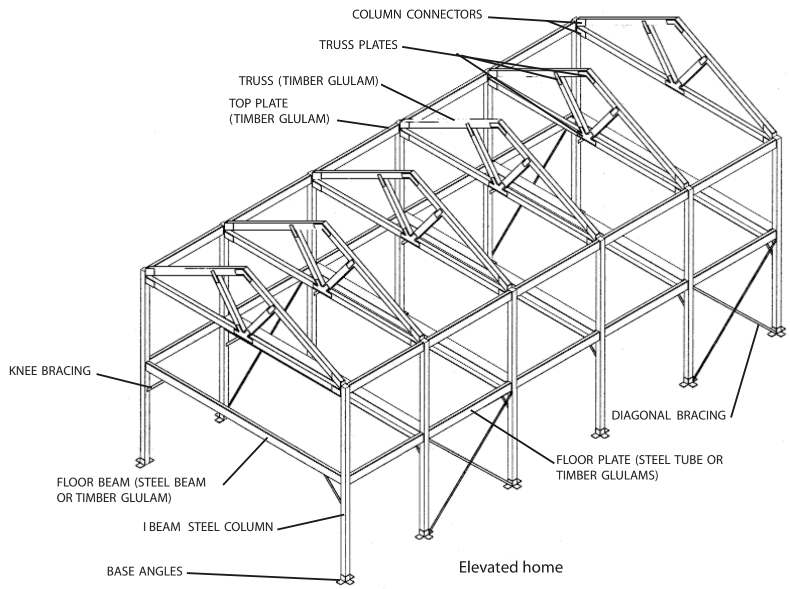
In 1975 PorterCorp developed an all steel frame for a hexagon house. The frame was immediately accepted as a better way to build park shelters. This tubular-steel frame was a very clean-looking design with hidden fasteners and it could be erected easily by park departments. Given the trade name, Poligon, this framing system developed into the leading shelter, gazebo and pavilion line of buildings for park and recreation construction.

Today, in the Poligon line, there are 270 different standard frames that can be enclosed. These frames range from small square shelters, to 86' diameter pavilions. Shapes included square, rectangle, hexagon, octagon and dodecagon. See www.poligon.com for details and photos.

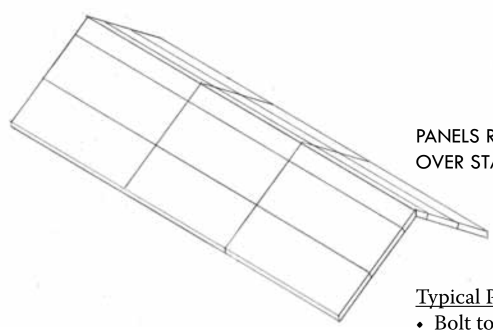
STEEL TUBE-CUTTING LASER



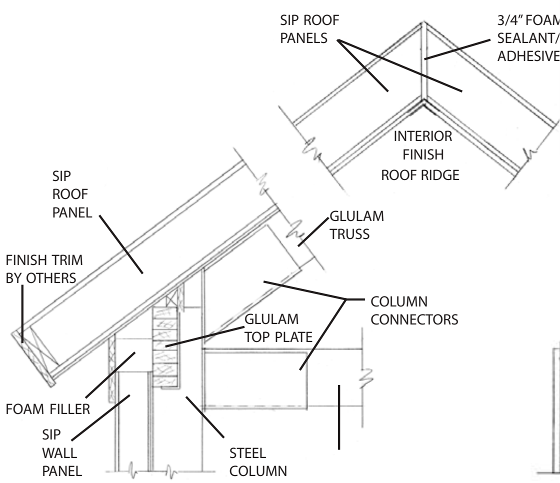
POWDER COATING LINE

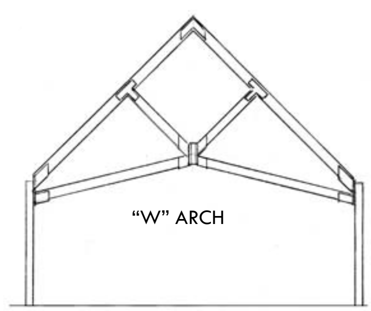


Elevated home



PANELS RUNNING LATERALLY OVER STANDARD BENTS





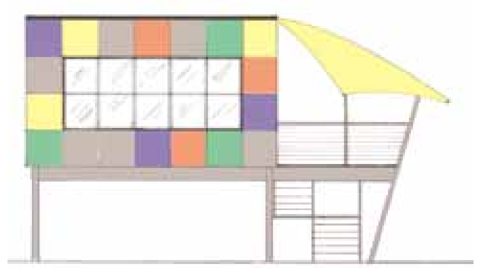
Typical Package Component Inclusions

- Bolt together powder coated steel frame
- Pre-cut glulam roof beams
- Structural Insulated Panels for exterior walls, floor and roof
- SIP insulated splines
- SIP screws for fastening the panels to the frame
- Expanding foam sealant for SIP joints
- Touch-up paint for steel components
- Frame and panel installation drawings
- Horizontal and vertical wire chases in wall panels
- SIPs cut to length and angle
- Pre-cutting of window and door openings per the customer's rough opening schedule

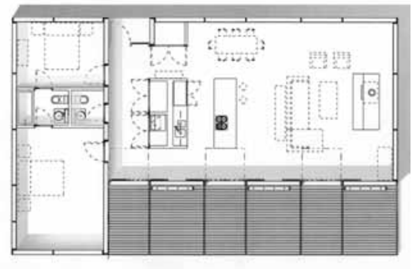
Special frames for coastal areas that require elevation and wind resistant structures have been developed. These special frames combine "I" beam columns, tubular-steel floor beams and perimeter beams and wood glulams to solve a number of problems associated with building near coastal areas. The "I" beam was chosen for a column because it has no hidden access for termites and all areas are accessible for paint maintenance. The tubular- steel beams were used for lateral structural junctures, and the glulams were used for interior exposure and for easy attachment of SIPs with long SIP screws.

Adapt frames are: easy and fast to assemble, designed for high wind loads, easily elevated in flood prone areas, and energy-efficient with SIPs for the floor, walls and roof. Adapt frames also lend themselves to open floor plans since there are no interior load-bearing walls.

Adapt buildings are most often custom-designed for dramatic sites and demandin conditions.

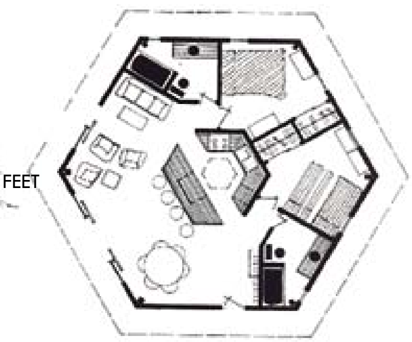


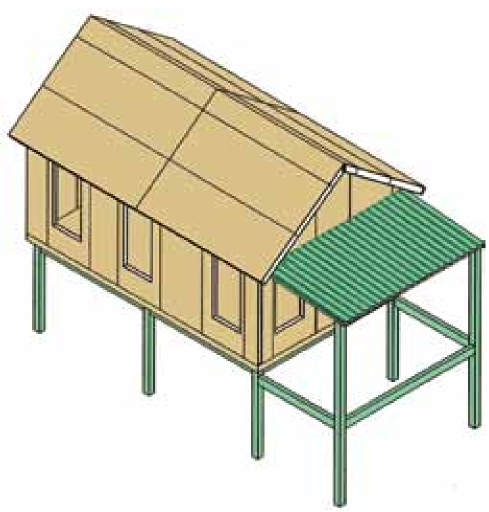
SIDE DECK WITH FABRIC SHADE COVER



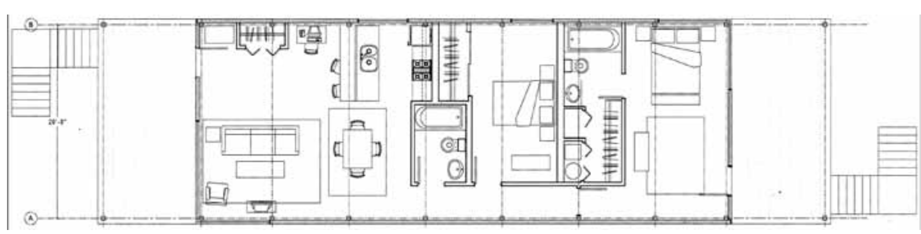
DEVELOPED FROM A 28' HEXAGON, 541 SQUARE FEET

DEVELOPED FROM A 36' HEXAGON, 822 SQUARE FEET





FRONT PORCH WITH METAL ROOF



LIMITATIONS :

Moisture management
Since SIPs are a hybrid of wood stick-built construction, the single greatest concern with SIPs is potential damage from water exposure. In this regard, SIPs should be treated similarly to wood-frame construction where OSB is used as an exterior sheathing. Like any wood product when exposed to moisture, OSB is susceptible to mold, rot and mildew. The moisture can come from inside the structure as humidity or outside the structure as rain, mist or condensation. To eliminate these problems, the OSB must be kept dry.

Outside: To keep the outside of the SIPs dry a few strategies must be employed. A drain plain, such as 30# building felt, should be installed behind any siding or roofing. All penetrations must be properly flashed. Any time wood, or fiber-cement siding is used over the OSB, it must be back and end-primed. In addition to these precautions, some climates may require use of a vent space between the siding or roofing and the exterior OSB skin of the SIP.

Inside: Controlling moisture from the inside of the structure is just as important. To keep the OSB dry, the following strategies must be employed. During construction, care must be taken to thoroughly seal all panel joints. This is done with expanding-foam sealant, mastic type construction sealant, and vapor barrier tape designed to adhere to OSB. Exhaust fans must be used in any higher humidity area such as kitchens and bathrooms. Also, using an Energy Recovery Ventilator or Heat Recovery Ventilator is recommended. These units expel moist and stale air and bring in fresh air and in cool climates they keep interior humidity from becoming higher than outdoor humidity.

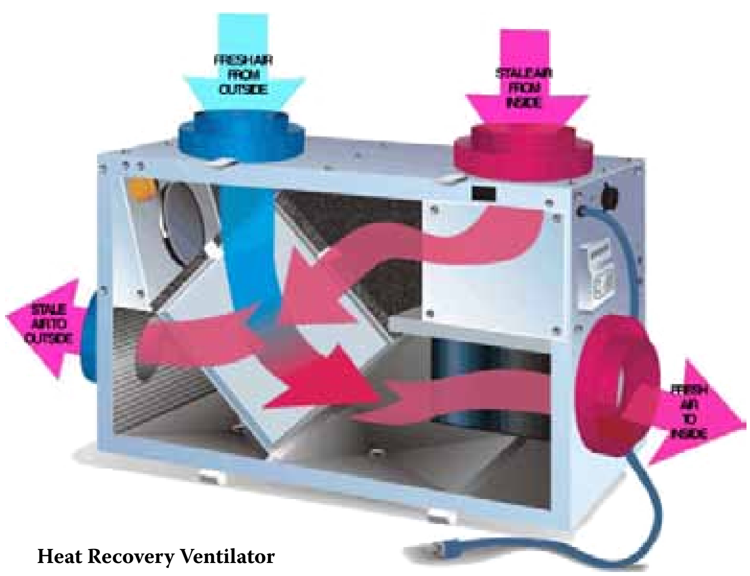
Foundation juncture
SIPs are never to be installed in direct contact with concrete; they should always be separated from concrete by a capillary break like poly sill seal and a pressure treated lumber sill plate that extends to the outside face of the SIP.

HVAC sizing
Since SIP buildings are very well insulated and are very tight, HVAC systems are commonly oversized. When the HVAC system is too big, it tends to run for shorts periods, or "short cycle". Short cycling causes a number of problems.

If an air conditioner short cycles, it will not effectively reduce humidity, it will not run long enough to get to peak efficiency, and it will often switch off the thermostat before the entire house is cool because it will create a wave of cool air. Also, oversized systems tend to be noisier, and require more maintenance.

Some similar problems can occur if the heating system is oversized. Again, the system will short cycle and the heat exchanger will not get up to efficient temperature, it will be noisier, and it will "trick" the thermostat into shutting off early with a wave of warm air, making the building less comfortable.

To eliminate these problems, make sure that the HVAC system is designed by a qualified HVAC engineer.



Heat Recovery Ventilator

Half-log siding applied over SIPs

Pest management
Any building type is susceptible to pest infestation and SIP construction is no different. Some suggestions are:

- Have a pest control specialist treat the site before construction
- Do not bury scrap wood during backfilling; seal or screen any possible entry points
- Store any firewood away from the building
- Keep food in well sealed containers, fix any moisture problems
- Keep trees trimmed so they don't hang over or touch the building
- Do not plant shrubberies within 3' of the exterior of the building
- Keep exhaust and HVAC system filters clean and keep floors free of food particles

Adjacent exterior decks
One very common area to find rot in any wood frame building is where an exterior deck meets the wall of a structure. These areas are penetrated with fasteners, are difficult to seal, and are subject to water falling from the roof and then splashing up off the deck onto the walls of the building. The best solution for this problem is to build the deck to be free-standing and not attached to the building at all. Also, keep a 1"-wide space between the building and the deck to allow for drying and drainage. Keeping the deck surface one step lower than the surface of the interior of the building is also a good idea. This keeps snow or water from migrating under a door, and reduces other possible water entry problems.

Timber frame and log construction
Timber frame and log buildings tend to expand and contract with moisture, sometimes in dramatic amounts. Some of the details shown in this book may need to be modified when SIPs are installed over log walls, or over a timber frame. There are books about timber frame construction that show good details dealing with this issue. See www.tfguild.org; this website is a good resource for timber framers.

Consult a building science expert
Building science techniques are used to improve air quality, improve energy efficiency, and prevent damage from moisture. Different climates, conditions and designs require different details and methods. This catalog does not cover all conditions. Please consult these additional resources with any building science questions:

Building Science Corporation – www.buildingscience.com

The Engineered Wood Association – www.apawood.org

Environmental Protection Agency – www.epa.gov

US Green Building Council – www.usgbc.org

Building Green – www.buildinggreen.com

PATH – www.pathnet.org

Receiving SIPs
SIPs are often delivered via tractor and full-length trailer. Because of the size and weight of the truck, an improved roadway surface with sufficient overhead clearance (approx. 13') is required. A turn-around area may also be required under certain circumstances. The off-loading of the panels is the responsibility of the owner/contractor.

Panels are stacked and bundled according to size. These bundles can be wide and unwieldy. Because of their length, height, weight, and width, the common forklift truck or tractor with a forklift option is sometimes not adequate for unloading a truck. For many shipments, a large capacity forklift with 5' or longer forks or fork extensions will be necessary to safely unload. When notified of the shipment of the delivery, the SIP installer should be available and prepared for the arrival of the truck. Most trucking companies will charge an additional hourly fee if unloading exceeds two hours.

The Bill-of-Materials and Bill-of-Lading are part of the shipment documentation. As material is unloaded, check to confirm the delivery of all items on the itemized Bill-of-Materials. If panels or other material on the Bill-of-Materials are not included in the shipment, or have been damaged during shipment, note those items on the Bill-of-Lading and notify your PorterCorp sales representative immediately. Signing the Bill-of-Lading without notes indicates that all materials listed have been received in full and in good condition.

Suggested Tool List
- Pneumatic nailer
- T-30 Torx head bit
- Heavy duty cordless or corded drill, or impact driver
- "Foam scoop" adjustable electric foam cutter
- Panel puller
- 12" drill bit (3/16", ¼")
- RotoZIP
- Electric hand planer
- Steel lifting plates
- Beam saw (optional)
- Circular saw
- Hand saw

WARNING:
The EPS core of the panel can be destroyed by most solvents and petroleum based products. Use only water-based construction sealants and EPS compatible expanding foam.

Onsite SIP Construction Training
Many times, the most cost effective way to install panels is to have an experienced SIP erector train the chosen installation crew. PorterCorp offers onsite training from staff members or from highly experienced subcontractors. The price for this service will vary depending on the locations and project specifics. This onsite training service typically includes instruction on best practices, hands-on training on techniques that speed assembly, and answering questions. The onsite trainer could also be called on to assist with plan review, suggest specific construction details, and give advice on safety. Contact PorterCorp for a list of options. Please note, it is the responsibility of the installation crew, not the onsite trainer, to complete the SIP installation.

Storing SIPs
Once panels are unloaded, use blocking to keep panels elevated and flat. Panels will be delivered wrapped in heat shrink plastic. If for any reason the panels are not wrapped when they arrive, tarp them to protect them from precipitation and keep panels elevated above standing water. Keep OSB spline material and 2nd top plate material dry and flat. Dimensional lumber to be used for sills, plates, and splines should also be kept flat and dry. Wet lumber will swell and become difficult to insert into panel recesses. If necessary, store construction sealant and expanding foam in a heated enclosure to keep it above the minimum storage and working temperature
(50 degrees F).


SIPs ARE SHRINK WRAPPED FOR WEATHER PROTECTION


SIP PANEL TAG WITH TAG NOTING CODE LISTING

Additional SIPs Accessories
- Dimensional lumber for bracing, splines, sill, top plates, door & window bucks.
- 2-3/8" x 0.113" (8d) ring shank nails
- 3-1/4" x 0.131" (12d) ring shank nails
- Panel screws (1-1/2" longer than panel thickness) for fastening panel-to-panel, and panel-to-plates, etc.
- 3" galvanized washer plates for use under panel screws.
- Construction sealant, EPS compatible for wood-to-wood sealing.
- Expanding foam sealant for filling voids and sealing to EPS.
- 3' lengths of nylon strap for wall panel lifting.
- Steel lifting plates with screws for roof panel lifting.

The Insulated Spline Connection
The preferred method for in-plane connections of panels is the insulated spline joint. This method is easy to install and maintains insulation through the joint.

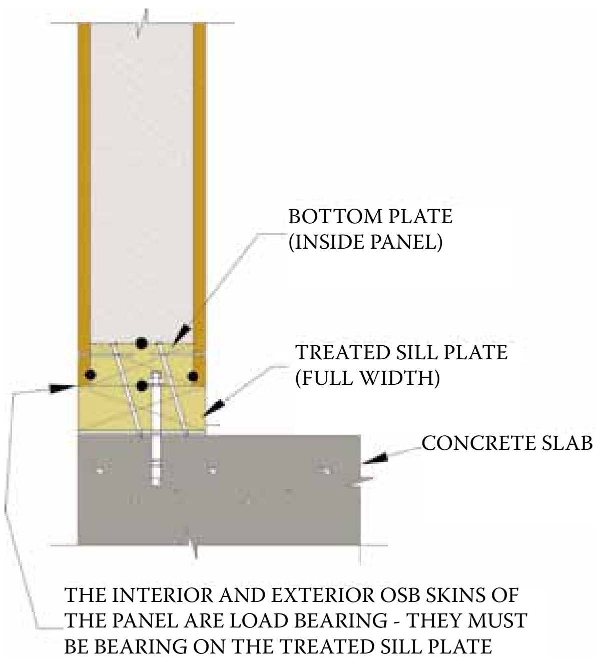
Insulated splines are supplied 8' long and will need to be cut to length as required for each connection. The cut spline length is slightly less than the distance between the top and bottom plates. For example, for a panel that is 96" tall, with the typical top and bottom plates, which are 1-1/2" thick each, the spline should be cut at 92-7/8". After the splines are cut to length, apply construction sealant to the inside edge of both OSB skins on both panels. Apply a continuous bead of foam sealant on the EPS edges. Insert the splines into the previously installed panel. Locate any horizontal wire chases and verify the wire chase in the spline matches the height of the wire chase in the panel. In some cases you may be required to drill a horizontal electrical chase hole through the spline. Then, apply a continuous bead of expanding foam sealant along the EPS edge of the panel to be installed and a continuous bead of construction sealant along the top of the sill plate under the panel to be installed. Nail both sides of the panel to the splines 6" on center staggered. See detail SP-2.

Frequently it will be necessary to install secondary top plates to achieve a specific wall height, or to spread the load to the skins of the panel, or both. Typically, this material will be supplied as part of the SIP package since it is of a unique dimension. This top plate is always sized to be as wide as the overall thickness of the panel. When installing the second top plate, apply a bead of construction sealant between the first top plate and the second top plate. Finally, fasten the second top plate

SIPs Numbering and Orientation
The panels will arrive on the jobsite individually marked and labeled. Each panel number will correspond to a panel number in the drawings that will accompany the panel delivery. These drawings are referred to as the "Install Pack". This will typically be in a large manila envelope. When panels are manufactured they are numbered to indicate the panel location in the building. The sequence-of-assembly typically will correspond to the number sequence on the panel. Please note that while some panels may appear to be out of order, the numbers will always correlate to the drawings. Panels will always be numbered in a left-to-right sequence as viewed from the outside.

Wall panels will contain black lines demonstrating the location of wire chases. These lines will be located on the interior side of the panel. Roof panels will have one rough side and one smooth side. The rough side of the roof panels will always face upward. Remembering these tips will help eliminate confusion about panel orientation.

Treated Sill Plate
(Full width and supporting the skins of the panel)
When building with SIPs, it is imperative that the load bearing OSB skins of the panel not be in direct contact with the concrete foundation. Any concrete adjacent to any SIPs first needs a pressure treat "sill" plate attached to it. This treated sill does not have to be dimensional lumber – it could be treated plywood. However, this material must be pressure treated and it must be installed over a capillary break like poly sill seal. Attachment of the treated sill plate and bottom plate to the foundation needs to be done in accordance with local codes and engineering specifications. It is a good idea to use anchor bolts long enough to go through both the treated sill and the bottom plates when attaching to the foundation. In addition, always maintain a minimum of 8" distance between the soil and panel. See detail SP-9.



Detail SP-9

Bottom Plates
(inserted into the bottom of the panel)

The bottom plate is the dimensional lumber which attaches the wall panels to the floor. This piece fits into the recessed edge at the bottom of the panel. When building directly onto a concrete slab, or concrete wall, a treated sill below the bottom plate is required; when building on a wood floor platform, the bottom plate sits on top of the subfloor and is fastened directly to the floor joists., through the sub-floor material. **The OSB skins of a SIP wall are the load bearing components. As such, it is imperative that the edges of both OSB skins must be in full contact with treated sill or floor platform. A common mistake is to install the bottom plate all the way to the outside of the floor – this is a problem since the outside OSB skin would not be bearing on anything.**

Position the bottom plate 7/16” in from the edge of the treated sill or the floor platform. This will allow the outside, as well as the inside, OSB skin of the panel to bear on the floor as needed. Fasten the bottom plate with 12D nails. Where possible, drive the nails into the floor joists below the subfloor. To install two corner panels, please make sure to leave at least 7/16” gap between the two adjoining bottom plates– this will allow room for the OSB skin of the panel to pass between the bottom plates. See details SP-9,10,11.

Installing Wall Panels

Prior to installing the first wall panel, determine which corner to use as a starting point. Find the first of two panels that make up this corner. Next, install the corner stud into the end of this first corner panel. Then, find the adjacent corner panel and install the corner stud in the appropriate end of this panel as well. Use construction sealant as noted on the drawing and nail the end studs into position. See detail SP-3.

When appropriate, measure to locate the vertical electrical chase locations on the bottom plate and drill wire chase size holes.

Apply a continuous bead of foam sealant to the top of the sill plate and continuous beads of construction sealant along the upper edge of each side of the bottom plate. Lift the panel onto the bottom plate, then adjust its location, level, and brace. To double check that the panel is oriented correctly, make sure that the horizontal wire chases are located at the bottom of the panel when installed. Locate the adjacent corner panel; note its dimensions and the location (s) of electrical chases.

When required, drill holes in the bottom plate at wire chase locations. Use SIP screws to attach panel corners together up the vertical edge of the overlapping panel into the adjacent panel. See detail SP-3. Before attaching the first two panels to the bottom plate, double check for plumb and level both panels with a bubble level. Use construction sealant on all wood-to-wood connections and expanding foam sealant on all wood-to-foam connections. When both panels are in place, nail the interior and exterior OSB skins to the bottom plate using 8d nails, 6” O.C. Typically corner SIP screws are placed 12” O.C., but make sure to double check the fastener schedule for all fastener spacing. Continue installing wall panels by following construction details and working in sequence around the building. If any fastening is missed during the installation process, make sure to go back and complete all fastening requirements.

Trimming the Last Panel of a Run

Dimensional variations in concrete and other framing may require that some panels are trimmed. To do this, temporarily install the final panel in the run, level and brace. Then temporarily install the first panel of the new intersecting run, positioning the panel so that it is abutting the last panel. Plumb both panels and mark the intersection line of the two panels on the appropriate panel. Remove both panels, trim and recess.

Installing Roof Panels

When installing roof panels it will benefit the installer to do as much prep work as possible while the panels are still on the ground. This includes installing sub-fascia, splines, SIP screws, or blocking in any openings in the roof. For pitched roof, always apply temporary roof cleats to the panels before lifting them into position. Please make sure to follow the supplied construction details when installing insulated splines, sub-fascia, etc. When applicable, multiple panels can be assembled on the ground together and lifted as an assembly.

When lifting any panel, make sure the method of lifting can safely handle the weight of the assembly being lifted. Typically, the panels weigh about 4 lbs/SQF. Steel lifting plates by PorterCorp can be used to hoist the panels from the ground to where they will be installed on the roof.

The lifting plate is a steel plate that is anchored to the outside face of the OSB with multiple #10 coarse thread deck screws and provides a solid point to attach straps. Use two plates for any panel larger than 4'x8'. When lifting multiple pre-assembled larger panels, use at least 2 lift plates per large panel.
Pay close attention to squaring up the first panel on any roof plane to ensure that, as adjacent panels are installed, the roof will remain true and square.

It is important with the roof panels that the panel connections are well sealed to prevent any air leakage as this may cause long-term problems with the integrity of the panels, not to mention loss of efficiency of the panel system. Construction details provided with each job show how to best seal the SIP assembly. Construction sealant, single and two component foam, and vapor barrier tape are typical methods of sealing SIP joints.

After roof panels are installed, make sure that all panels are fastened to the beams, trusses, and bearing walls of the structure. Usually, roof panels are fastened 12" on center with SIP screws and washers. Also, make sure all panel-to-panel joints are fastened as required on both the inside and outside (see fastener schedule on accompanying installation drawings or engineering specs for exact fastener spacing).

When the roof panels are completely installed, fastened, and any gaps are filled with expanding foam sealant, roofing should be applied as soon as possible. It is a good idea, and strongly recommended, to apply roofing felt onto the roof panels the same day the panels are installed.

Rigging and Lifting Roof Panels

The most common method of lifting roof panels is to use lifting plates (see page 35). They can be attached and detached from the top side of the panel. Using a wrap-around sling on panels can damage the SIP edges if not blocked, is difficult to release, and is not recommended. Through bolting with eye bolts, though safe and effective, requires access to the bottom side for attaching and detaching. Always use at least two points for lifting and always hang the panels at an angle that matches the roof slope.

Large panels, assembled on the ground, then lifted.

Field-Cutting of SIPs

Historically, SIPs have been fabricated in the field. As the SIP industry has matured, SIP manufacturers have become much better at designing and cutting SIP packages to meet the needs of the customer. While PorterSIPs is particularly well equipped to engineer, design and cut SIPs accurately, panels can still be cut in the field.

If field-cutting of panels is necessary, it can be done using tools commonly available to the builder. A circular saw, reciprocating saw, and hand saws can perform all cuts required in an installation.

Large panel rigged at roof angle, when lifted.

WALL PANEL LIFTING LOOPS BEING INSTALLED

1

2

3

4

Safety Points

- Know the capacity of your lifting equipment.
  8'x24' SIPs weigh about 800 lbs.
  Assembled sections of roof panels, or dormers can weigh much more.
- Know the capacity of lifting plates and/or eye bolts. Lifting plates from PorterCorp are rated at 400lbs each. All holes must be filled with #10 course thread deck screw. DO NOT OVERDRIVE THESE SCREWS.
- Use more than one lifting point for large panels.
- Keep lifting points as perpendicular to the face of the panel as possible. This is done to avoid a "stress angle" at the lifting plate.
- Use tag lines to control the lifted panel.
- Be aware of changing weather conditions.
- Use nylon strap loop technique to lift wall panels.
- Wear hard hats and fall-protection harnesses.
- Use temporary roof cleats for higher pitch roofs.
- Be aware of crew experience. Do not try operations that are beyond the skill of the crew.

Installing Headers & Field-Cut Openings
Headers are generally sized and designed during the panel submittal drawing process. Header design load charts and other technical information can be read about on page 32 of this catalog. Field cut openings may be made in wall panels as noted in detail SP-33.

The maximum width for a field-cut opening is determined by the loads on the walls, the size of the opening, and the height of the header above the opening. Please contact PorterCorp for advice when field-cutting openings. If a point load is being carried by the wall above the opening, the span of the header panel will be reduced. If there is a question regarding the load-carrying capacity of a field cut panel, an engineering analysis should be conducted. Roof cutouts will be necessary to install vent stacks, chimneys, and other penetrations. Small penetrations of 6" or less can be made without 2x blocking, providing they are well sealed. Insulate any voids between objects and EPS with expanding foam. See detail SP-40.

Protecting SIPs from Interior Humidity
Vapor barriers-While not normally needed in moderate climates and normal conditions, vapor barriers are needed in rooms with higher than normal inside humidity. Rooms containing hot tubs and swimming pools will require additional vapor barrier protection and dehumidification. Consult local building codes for specific vapor barrier requirements.

A vapor barrier shall be installed at the interior of the ridge juncture of the panels. A pliable roof membrane, such as a self-adhesive rubber laminate material or other vapor barrier can be used for this seal. There should be no wrinkles or voids that allow air to enter the ridge juncture. See detail SP-19. A heat recovery ventilator or HRV is recommended for any SIP building.

The builder must also seal around all openings in the SIP parting of the building. The sealing of SIP homes is important for two reasons:

1. Thermal efficiency - it is one of the major advantages of SIP construction. By sealing all panel junctures to eliminate unwanted air infiltration, heating, cooling, and air exchange can be precisely controlled and energy demands reduced.
2. Air leakage - humid air can and will leak into any possible voids ("dead air" spaces) adjacent to panel OSB skins. The presence of humid air and dropping temperatures can result in condensation.

To achieve the maximum long-term value that SIP buildings can provide, the builder must use construction sealant and expanding foam sealant throughout the building process. Connections and junctures, as well as gaps around doors, windows, corners, and other penetrations must all be thoroughly sealed. Experience has indicated that thermal and vapor sealing at roof ridges and valleys is particularly important and warrants extra attention. It is recommended that roof ridges be filled with expanding foam sealant to fill the ridge juncture. See detail SP-21. Also, when electrical work is complete, all electrical boxes and wire chases should be sealed. See detail SP-32. For sealing wood-to-wood connections, use the provided construction sealant. For sealing wood-to-foam connections, use the provided expanding foam sealant as recommended.

Site Built Plumbing Chase
To protect plumbing from freezing temperatures, it is advisable to enclose runs in an interior chase. For example, see detail SP-35. Do not run plumbing in exterior walls.

HVAC Notes
In the event plumbing or HVAC ductwork is to be run along a SIP wall, a chase can be built that will both conceal and protect the run. See detail SP-35. Wherever possible, ductwork should be routed through the stick built (interior) sections of the home.

Overview

In general, SIP construction is easier when things are planned ahead of time. Wiring in SIPs is no different. When electrical installation in SIPs is a forethought, not an afterthought, it will be much faster and easier.

Start out by understanding where the 1” diameter factory installed wire chases are, where to field drill chases and when to do the drilling. Then, during panel assembly, the plates, and possibly the splines, will need to be drilled. When this drilling is done properly, the electrician should be able to wire a SIP building in about the same time as a stick-built building.

Factory installed wire chases

In the wall panels, horizontal chases are included at the 16” level (for outlets) and at the 44” level (for switches and counter height outlets). Vertical chases, which are located 4’ O.C., allow wire to run vertically though the wall panels to access switch locations and at other locations as needed to provide vertical wiring options for the electrician. (All wire chases are marked with a 1” wide ink mark.) PorterCorp typically installs wire chases per this standard, but wire chases can be installed to exactly match an electrical plan, for an additional charge. Exactly matching an electrical plan is done at the time the panel layout drawings are made, so PorterCorp would need a detailed electrical plan at that time for this to be feasible.

In roof panels, wire chases are NOT installed as a standard but can be installed upon request. (Adding wire chases to roof panels will be done at a small additional charge.) When a building has a cathedral ceiling with a SIP roof, having wire chases installed in the panels will make wiring for lighting, fans, etc easier. Wiring can be run from an interior wall or can be run along an exposed overhead beam.

Field installed chases and holes

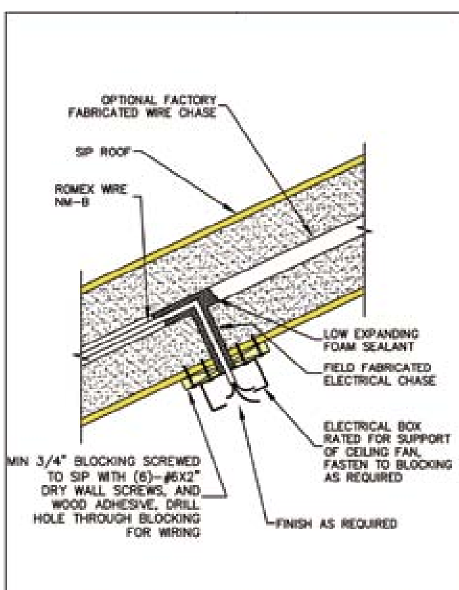
As structural panels are installed, the SIP installer will need to drill the sill and top plates, and any lumber connecting splines, to provide open chase ways for the electrician. If this step is skipped during panel installation, it is possible to cut and drill for access to the chases afterward, but it is much easier and faster to do this drilling during installation.

When the electrician comes to the building site, they will review the electrical plan and wire run options to determine which chases to use. Most SIP buildings will still have stick-framed interior walls and conventional floor systems, which give additional flexibility in wiring. Wiring is simplified if major horizontal wire runs take place in the floor systems, using horizontal chases for local runs only.

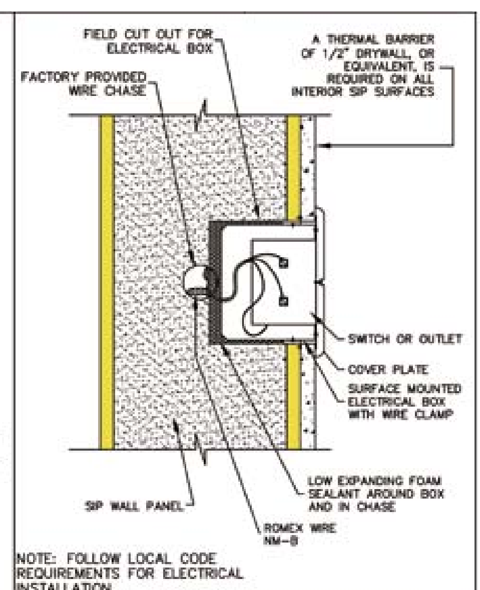
When horizontal wire circuits must continue from one wall to another intersecting wall, the electrician can use a vertical chase to go up and over, then back down into the intersecting wall, or the electrician could cut a notch in the corner at the height of the wire chase then use this notch to pull the wire around the corner and into the intersecting wall. See detail SP-29.

Wire installation

The recommended sequence for wiring is to first locate outlet, switch, and other box locations and mark them on the interior OSB. (Boxes should be offset from the wire chase location so the box will not block the chase following installation.) Typically the electrician will use a tool like a RotoZIP and a template to cut the OSB for the electrical boxes. After the openings are cut, the electrician will use a putty knife to pry out the OSB and the EPS necessary to accommodate the box. Care should be taken in not removing too much of the EPS insulation. The electrician will then fold over the end of the wire and push or pull the wire through the chases as required for the circuits. Finally, the ends of the pulled wire will be inserted into the boxes and the boxes will be mounted using surface type fasteners. See detail SP-32.



SP-31 CEILING FAN ATTACHMENT



SP-32 BOX FOR SWITCH OR OUTLET

After rough wiring is complete and the electrical boxes are mounted to the OSB, carefully seal around the box using expanding foam sealant. Also, use expanding foam sealant to seal both used and unused chases at the top and bottom of the panels and wherever chase openings are accessible.

Other options for wire access

When no pre-cut panel chase is available, there are various other options. A 1"-wide slot may be cut in the interior OSB skin into which wire can be placed. Because the OSB is structural, there are limits to the slot length and location. A slot should not extend all the way to the edge of the panel, but should stop 6" short of the panel edge. A vertical slot should be not longer than 48" and a horizontal slot should be not longer than 12" in each panel. Wire should be placed deep enough (see your local electrical code) into the EPS to be out of reach of any drywall screws. Once wire has been placed in the slot, expanding foam sealant should be applied to fill the opening. If there is any question about reducing the structural integrity of the panel, please consult a structural engineer or PorterCorp.

Commercial flush mounted chases such as WireMold can be used.

Conduit which conforms to local code restrictions can be used

Important notes

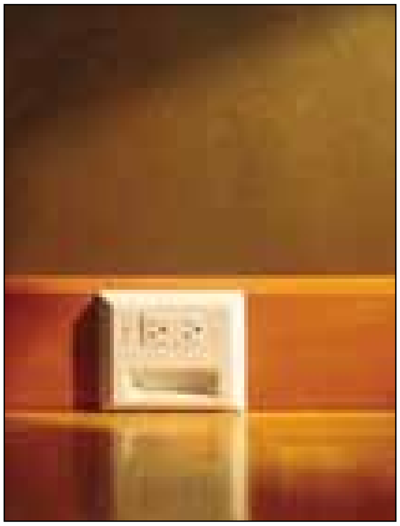
Standard "Romex" type wire, labeled as NM-B, of sufficient wire gauge size as required for the anticipated maximum amperage loading, is recommended for use in SIPs.

Installing recessed lighting or "can" lights in a SIP roof is NOT recommended. Contact PorterCorp for more details and options. For ceiling fan mounting option see detail SP-31.

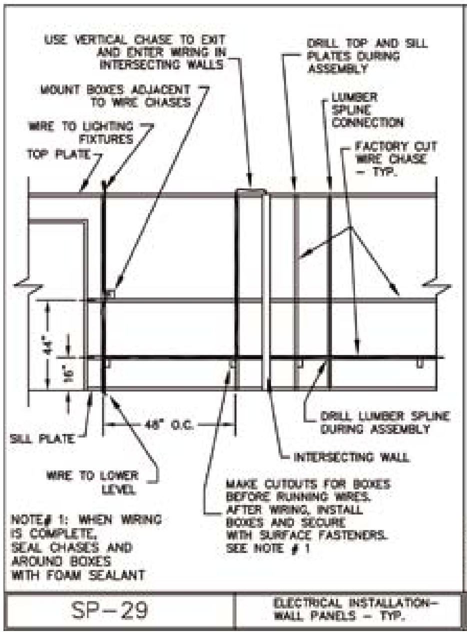
Consult with local codes to see if any additional restrictions apply.

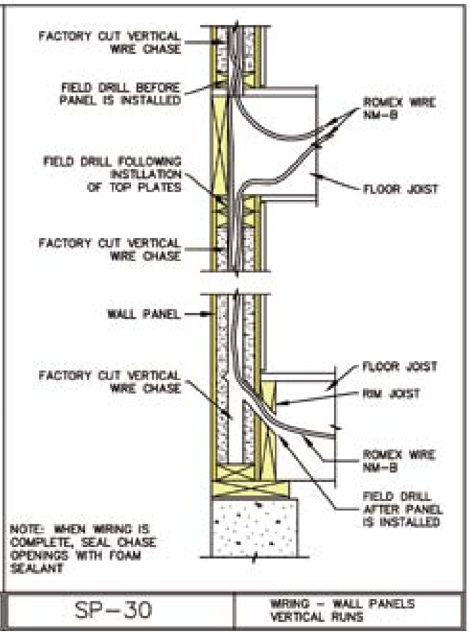
ELECTRICAL OUTLET BOX

ROTO TOOL



BASE MOLDING ELECTRICAL SYSTEM





Installation Guide

Tax Credits, Energy Efficient Loans, Energy Star, Cost Comparison

Tax Credits
In 2005, the federal government enacted the Energy Policy Act. In 2008, the tax credits in this act were extended. This act provides financial incentives for people building energy-efficient structures. Using SIPs can qualify a builder or contractor for a $2000 tax credit for a residential building, or up to $1.80/SF for a commercial building.

To qualify for the residential tax credit, the building needs to achieve a 50% energy savings as described in the International Energy Conservation Code (IECC). This code requires that at least one fifth of the energy savings must occur as a result of air tightness and increased R-value on the insulation. Of course, SIPs are the easiest and least expensive way to achieve these goals.

Commercial contractors can qualify for the $1.80/SF tax credit if the new or existing commercial building can show a 50% improvement in energy efficiency in the areas of heating, cooling, water heating, and interior energy cost as detailed in ASHRAE 90.1-2001.

For more details, see www.energystar.gov/index.cfm?c=products.pr_tax_credits

For other energy efficiency incentives available in your area, see www.dsireusa.org

Energy Star
Builders can use the Energy Star label as a way of marketing their buildings. For a building to qualify for Energy Star, it must be tested using the Home Energy Rating System (HERS) index. The HERS index determines the energy efficiency of a home via an objective and standardized test. This testing is done by a certified HERS rater with an onsite home inspection.

For information about local HERS raters in your area, see www.natresnet.org/directory/raters.aspx

In the HERS index, there is a Thermal Bypass Checklist. This checklist requires the HERS rater to visually check that insulation and air barriers are continuous and properly installed. The nature of SIP construction makes it almost automatic that these requirements will be met.

As a result of SIP buildings' reputation for inherent air-tightness, and the years of testing that back up the reputation, Energy Star has eliminated the requirement for a blower door test. With SIP construction, the blower door test is replaced with a visual inspection form. Now, it is easier and cheaper to achieve the Energy Star rating with SIPs compared to other building systems.

Energy Efficient Loans
Some banks offer special loans for energy-efficient buildings. While these loans do not offer better interest rates, they do offer lower requirements regarding debt-to-income ratios. The goal of programs like these is to encourage home buyers to invest in energy-saving technologies. It is recognized that these technologies will likely cost more initially, but will save on utility bills during the lifetime of the structure. Since the home owner will be spending less each month on utility costs, a larger mortgage may be affordable. SIP construction is an example of one technology that would help a building qualify for this type of loan. Like the Energy Star program, these programs are based on proving that the home is more energy-efficient through the HERS testing.

For more information, see
www.fha.com/energy_efficient.cfm

Savings on Fuel Bills

The construction cost of stick-building verses SIPs may vary with the design, the contractor and material suppliers. Sometimes, stick-built and SIP construction come out to about the same costs. More commonly, SIP construction can cost slightly more than stick-built construction. This cost difference is usually minor compared to the long-term difference in energy bills. It is frequently reported that SIP houses have energy bills half of those in stick-built structures.

Here is a hypothetical example of possible savings with SIPs:

Approximate additional installed cost for a 2,000 sq. ft. SIP house compared with stick construction ………………………………..$2,000

Estimated current monthly energy savings ……..……………………………..$100

Approximate current annual energy savings …..……………………………… $1,200

Estimated increase in energy cost per year ………………………………...5%

YEAR	EXPECTED ANNUAL SAVINGS	CUMULATIVE ENERGY SAVINGS
1	$1,200	$1,200
2	$1,260	$2,460
5	$1,459	$6,631
10	$1,862	$15,093
15	$2,376	$25,894
20	$3,032	$39,679

PorterSIPS Limited Warranty and Conditions for Code Listed Panels

Limited Warranty
PorterCorp building panels are factory-laminated sandwich panels with oriented strand board (OSB) face materials and an expanded polystyrene (EPS) core. The panels are roof, bearing wall, non-bearing wall, and floor panels used as the structural frame and facing of buildings for resisting transverse, axial and racking shear loads per NTA Code Report PSC121907-22. The limitations of these panels are described in PorterCorp code reports. SIPs must be installed per PorterCorp's Installation Guide. It is expressly understood that PorterCorp's liability be limited to replacement of nonconforming material supplied by PorterCorp at time of delivery.

When properly maintained and installed, PorterCorp warrants the bonding of panels (lamination of skins to core material) for a period of 20 years (excluding custom and non-code-listed panels.) PorterCorp must be contacted immediately if any signs of delamination are present. Core sampling may be necessary to determine proper cause of delamination, and will be forwarded to an independent testing facility. If core test results show PorterCorp is at fault, PorterCorp will cover the costs of the testing. If core test results show that delamination was not caused by PorterCorp the owner shall be responsible for costs incurred by testing.

Conditions
- SIPS must be stored properly before and during installation. Proper pre-installation storage includes setting the panels on blocks to keep from standing water or condensation. In addition, proper covering or tarping to protect SIP panels from rain, snow, hail and etc. will be necessary.
- SIPs must be installed according to installation instructions and within the limits of the code listing.
- Roof panels must be covered with a #30 felt or equal immediately upon installation. Roofing system must be appropriate for site conditions and pitch of roof.
- Appropriate fastening and sealant materials required for installation must be used.
- Relative humidity inside the enclosure must not exceed 40% except when proper precautions are taken by Architect, owner, and/or customer.
- Skids of shingles must not be placed on SIP roof creating a high point load.
- Vapor barriers must be installed under all valleys and ridges. In climates or conditions where there is an extreme continuous vapor drive from warm to cold, vapor barriers must be properly installed to the warm side.
- A drain plane (i.e. house wrap) is required between SIPs and exterior cladding and flashing (i.e. siding, trim, etc.) due to possible leakage.
- Proper ventilation systems must be in place when required.
- Roofing materials must be maintained to prevent leakage, condensation, and water/ice buildup or damming.
- Interior surface will be covered with a material that meets the 15 minute thermal barrier requirement. (1/2" drywall meets this requirement.) Other cladding may be required to meet more restrictive fire codes.
- Panels will be separated from the ground by a minimum of 8".
- Insulation breaks, 3/16" or greater, will have expanded foam applied by the contractor. There must be no small continuous tunnels along the edge of the SIPs 3/16"or greater. All junctures will be sealed as per installation instructions and good practices.
- It is understood that PorterCorp is not the contractor and that installation and building maintenance is the responsibility of the owner and their contractor.
- As in all good building practices, building codes, and installation instructions, insect and moisture barriers shall be in place.
- SIPs, as delivered, do not meet typical fire or thermal barrier codes. The owner is responsible for applying the correct interior cladding as required in local codes.

PorterCorp shall not be liable for any act of God, fire, vandalism, settlement, incidental or consequential damages, erosion of foundation, or extreme site conditions. This Limited Warranty does not cover damage due to insects, animals, birds, and the like.

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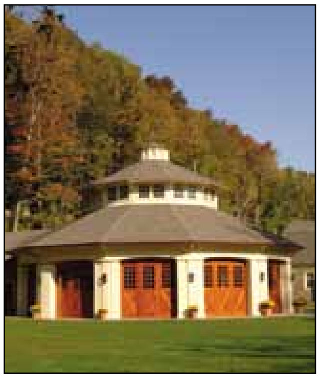
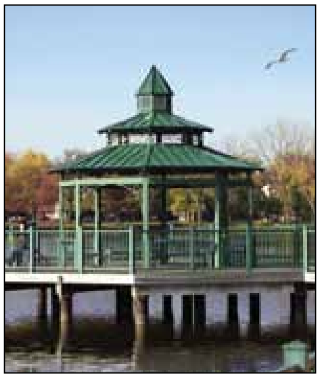
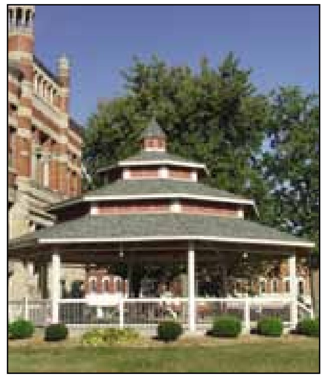
poligon® PARK ARCHITECTURE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