

## SUBJECT: SHEAR WALL & DIAPHRAGM CAPACITY OF EXTREME SIPS

Extreme SIPs have been evaluated for use as shear walls and diaphragms in structures. Shear wall and diaphragm applications include both wall and roof assemblies that are subjected to seismic or wind loads. Through large and small-scale testing conducted at the APA laboratories, overseen by an independent structural consultant, it was determined that Extreme SIPs can develop design diaphragm capacities of up to 850 lbs./ft. Please refer to the Extreme Panel Load Chart #7A for SIPs Screw and nail spacing required to obtain this capacity.

These tests have allowed for the determination of design capacities for SIPs Screws and nails when used in diaphragms. The following lateral load capacities are recommended:

- SIP Screws: 250 lbs.
- 8d nails @ surface splines: 62.5 lbs.

### DESIGN VALUES INCLUDE A SAFETY FACTOR OF THREE ON THE ULTIMATE LOAD.

In all shear wall and diaphragm applications, the design of the lateral load-resisting system must be engineered to provide a load path for the forces that the structure experiences. This is provided by the engineer of record on the specific project.

Current Extreme Panel Load Charts can be found at [www.extremepanel.com](http://www.extremepanel.com).

LOAD CHART #7A						
Roof/Floor Diaphragms Loads - PLF <sup>1, 5</sup> • Type S Spline						
Minimum Connections <sup>2</sup>				Allowable Shear Load (PLF)	G' Apparent Shear Stiffness (lbf/in)	Maximum Aspect Ratio
Interior Supports <sup>2</sup>	Spline <sup>3</sup>	Boundary <sup>4</sup>				
		Support	Spline			
SIP Screw with 1" penetration 12" on center	0.113"x 2-1/2" nails, 3" on center 7/16" x 3" OSB Box/Block Spline	PBS No. 14 SIP Screw with 1" penetration 12" on center	0.113" x 2-1/2" nails, 6" on center	430	24000	4:1
SIP Screw with 1" penetration 12" on center	0.113"x 2-1/2" nails, 3" on center, 2 rows, staggered 7/16" x 3" OSB Box/Block Spline	PBS No. 14 SIP Screw with 1" penetration 3" on center	0.113" x 2-1/2" nails, 4" on center	460	30300	4:1
SIP Screw with 1" penetration 2" on center	0.113"x 2-1/2" nails, 3" on center, 2 rows, staggered 7/16" x 3" OSB Box/Block Spline	PBS No. 14 SIP Screw with 1" penetration 2" on center	0.113" x 2-1/2" nails, 1-1/2" on center	655	41300	4:1
SIP Screw with 1" penetration 4" on center	0.113"x 2-1/2" nails, 3" on center, 2 rows, staggered 7/16" x 3" OSB Box/Block Spline	PBS No. 14 SIP Screw with 1" penetration 4" on center	0.113" x 2-1/2" nails, 3" on center	795	93700	3:1
SIP Screw with 1" penetration 4" on center	0.113"x 2-1/2" nails, 6" on center, 2 rows, staggered 23/32" x 4" OSB Box/Block Spline	PBS No. 14 SIP Screw with 1" penetration 4" on center	0.113" x 2-1/2" nails, 6" on center	1130	110600	3:1

<sup>1</sup> The maximum diaphragm length-to-width ratio shall not exceed 4:1. Load may be applied parallel to continuous panel joints.

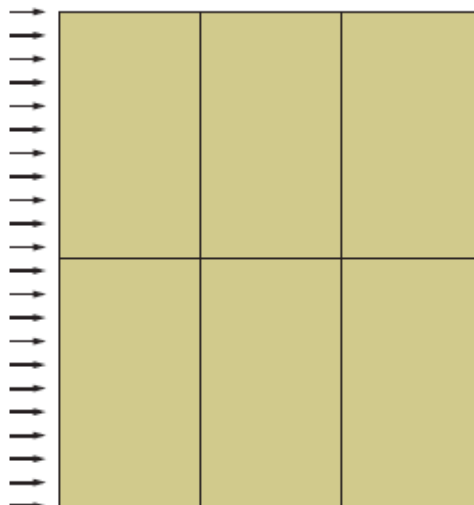
<sup>2</sup> Interior supports shall be spaced not to exceed 12 feet (3.66 m) on center and have a minimum width of 3-1/2 inches (88.9 mm) and a specific gravity of 0.42 or greater. Specified fasteners are required on both sides of panel joint where panels are joined over a support. See Figure 4A.

<sup>3</sup> Box/Block Spline fastened at top only, at interior panel-to-panel joints. Specified fasteners are required on both sides of panel joint. See Figure 4B.

<sup>4</sup> Boundary spline shall be solid 1-1/2 inches (38.1 mm) wide, minimum, and have a specific gravity of 0.42 or greater. Boundary supports shall have a minimum width of 3-1/2 inches (88.9 mm) and a specific gravity of 0.42 or greater. Specified spline fasteners are required through both facings. See Figure 4C.

<sup>5</sup> Diaphragms shall be designed by a registered design professional in accordance with accepted engineering practice.

### DIAPHRAGM LOAD



### TYPE S SPLINE



<b>LOAD CHART #4A</b>				
<b>Shear Loads - PLF<sup>1-7</sup> Seismic Design Categories A-C</b>				
<b>Type S or Type L Spline</b>				
Framing Minimum SG	Minimum Facing Connections <sup>4</sup>			Shear Load (PLF)
	Chord <sup>4,5</sup>	Plate	Spline	
0.50	0.113"x 2-1/2" nails 6" on center	0.113"x 2-1/2" nails 6" on center	(7/16" OSB Faced x 3" wide Box/Block Spline) 0.113"x 2-1/2" nails, 6" on center	410
0.50	0.113"x 2-3/8" nails 6" on center Staggered (2 rows)	0.113"x 2-3/8" nails 6" on center	(7/16" OSB Faced x 3" wide Box/Block Spline) 0.113"x 2-3/8" nails, 6" on center <sup>6</sup>	460
0.42	0.113"x 2-3/8" nails 6" on center Staggered (2 rows)	0.113"x 2-3/8" nails 4" on center Staggered (2 rows)	(7/16" OSB Faced x 3" wide Box/Block Spline) 0.113"x 2-3/8" nails, 4" on center <sup>6</sup>	700
0.42	0.148"x 2-3/8" nails 6" on center Staggered (2 rows)	0.148"x 2-3/8" nails 3" on center	(23/32" OSB Faced x 3" wide Box/Block Spline) 0.148"x 2-3/8" nails, 3" on center stagger (2 rows) <sup>7</sup>	1000

<sup>1</sup> Wind and seismic loads in seismic design categories A, B, C.

<sup>2</sup> Aspect ratio (height:width) does not exceed 2:1.

<sup>3</sup> Shear wall height-width ratios greater than 2:1, but not exceeding 3.5:1, are permitted for assemblies using lumber splines provided the allowable shear strength values in the table are multiplied by 2w/h.

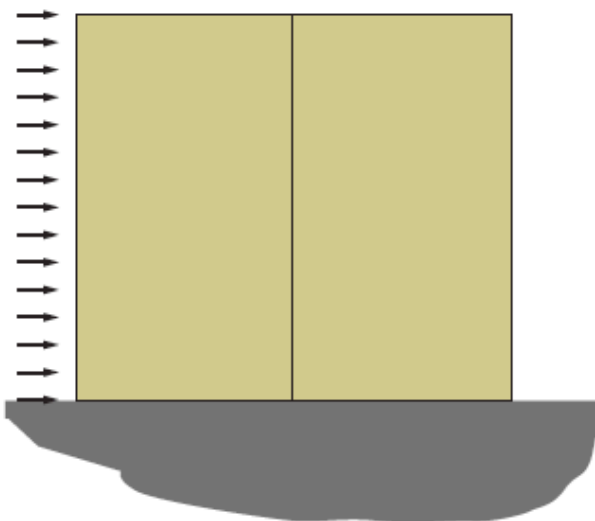
<sup>4</sup> Required connections must be made on each side of the SIPs. Dimensional or engineered lumber shall have an equivalent specific gravity not less than specified.

<sup>5</sup> Chords, hold-downs and connections to other structural elements must be designed by a registered designer professional in accordance with accepted engineering practice.

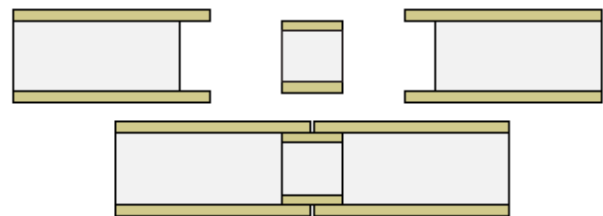
<sup>6</sup> 4 inch (101.6 mm) wide spline.

<sup>7</sup> 4 inch (101.6 mm), 23/32 inch (18.25 mm) thick facing.

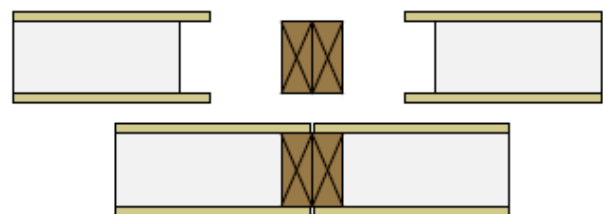
### SHEAR LOAD



### TYPE S SPLINE



### TYPE L SPLINE



## SUBJECT: EXTREME SIPS USED IN FLOOR APPLICATIONS

Extreme SIPs are often used in floor applications when an insulated floor system is required. Examples of this situation include over a non-conditioned crawl space, the floor of a sunroom addition, or a bedroom floor over an unheated garage.

When using Extreme SIPs in floor applications, there are a few design considerations to keep in mind. Extreme recommends that the floor panel be overlaid with an additional layer of 7/16" sheathing to minimize any potential for puncturing of the SIP's structural skins and to provide a divorcement layer to protect the structural integrity of the SIP should flooring need to be replaced. The application of these divorcement materials will prevent any damage to the top OSB structural facing of the SIP if the floor finishing were to need replacing. The OSB facings of a SIP are part of the SIP's structural component assembly; therefore, the OSB facings must remain intact to provide long-term structural capacity.

Floor SIPs, without added spline structure (e.g., Type I and Type L Splines), are not able to support load-bearing walls and cannot be cantilevered over a lower wall to support an upper wall and roof systems. Please consult the Extreme Panel Load Charts for Type I Splines and Type L Splines. The load limitations of SIPs used in floor systems are covered by Extreme Panel Load Charts #6a, #6b, #6c, and other technical bulletins.

Building codes have specific requirements for materials used to create floor assemblies. In residential applications, the floor system must be able to carry a uniform load of 40 psf. Commercial floor assemblies, such as those found in churches, schools, banks, hotels, etc., have more stringent requirements. These include the capacity to support uniform loads greater than 40 psf and the ability to support concentrated loads. The concentrated load requirement for most commercial structures is 1000 or 2000 pounds over a 30" x 30" (6.25 sq. ft.) area.

Two typical Extreme SIPs floor assemblies have been subjected to concentrated floor load testing. The results from this testing demonstrate that Extreme SIPs floor assemblies meet the code requirement for commercial floors of 2000-pound concentrated loads, while providing a safety factor of three.

Load Charts #6A, #6B & #6C (Pages 2-4) demonstrate the load capacities for floor design applications. View on the following pages or at [www.extremepanel.com](http://www.extremepanel.com).

<b>LOAD CHART #6A</b>											
<b>Roof/Floor Uniform Transverse Loads - PSF <sup>1-4</sup></b>											
<b>Type S Spline</b>											
SIP Thickness	Deflection Limit	SIP Span (ft.)									
		4' 4	8'	10'	12'	14'	16'	18'	20'	22'	24'
4-1/2"	L/360	100	32	23	NA	NA	NA	NA	NA	NA	NA
	L/240	143	48	35	NA	NA	NA	NA	NA	NA	NA
	L/180	143	63	47	NA	NA	NA	NA	NA	NA	NA
6-1/2"	L/360	105	51	38	29	23	NA	NA	NA	NA	NA
	L/240	162	76	57	44	35	NA	NA	NA	NA	NA
	L/180	191	80	61	50	42	NA	NA	NA	NA	NA
8-1/4"	L/360	120	67	51	40	32	26	22	NA	NA	NA
	L/240	179	94	71	57	48	40	33	NA	NA	NA
	L/180	179	94	71	57	48	41	36	NA	NA	NA
10-1/4"	L/360	131	86	66	52	43	35	29	25	21	NA
	L/240	168	94	75	63	54	47	41	36	32	NA
	L/180	168	94	75	63	54	47	41	36	33	NA
12-1/4"	L/360	132	94	75	63	53	44	37	32	27	23
	L/240	163	94	75	63	54	47	42	37	34	31
	L/180	163	94	75	63	54	47	42	37	34	31

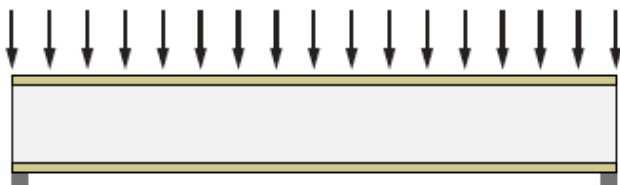
<sup>1</sup> Table values assume a simply supported SIP with 1-1/2 inches (38.1 mm) of continuous bearing. Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load. Values do not include the dead weight of the SIP.

<sup>2</sup> Deflection limit shall be selected by building designer based on the serviceability requirements of the structure and the requirements of applicable building code. Values are based on loads of short duration only and do not consider the effects of creep.

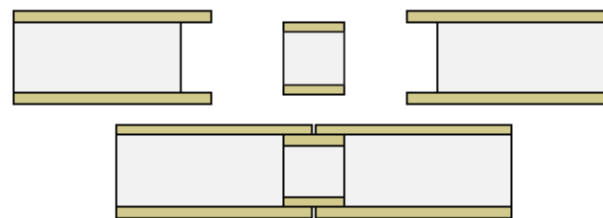
<sup>3</sup> Table values for 8-foot (2.44 m) spans apply to SIPs constructed with the OSB strength axis oriented either parallel or perpendicular to span direction. Table values for other spans are based on the OSB strength axis parallel to the span direction.

<sup>4</sup> SIPs shall be a minimum of 8-foot (2.44 m) long spanning two 4-foot (1.22 m) spans.

### TRANSVERSE LOAD



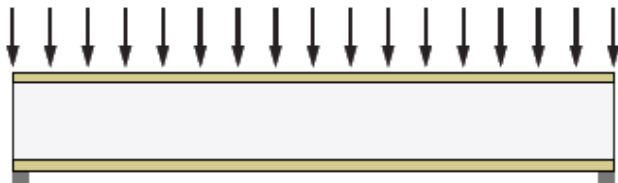
### TYPE S SPLINE



<b>LOAD CHART #6B</b>											
<b>Roof/Floor Uniform Transverse Loads - PSF<sup>1-4</sup></b>											
<b>Type I Spline</b>											
SIP Thickness	Deflection Limit	SIP Span (feet)									
		4 <sup>4</sup>	8	10	12	14	16	18	20	22	24
10-1/4"	L/360	197	164	124	72	67	61	48	34	29	24
	L/240	336	164	124	107	96	84	70	49	43	36
	L/180	336	164	124	107	96	84	76	65	56	47
12-1/4"	L/360	258	143	103	86	83	77	61	42	37	32
	L/240	318	143	103	93	85	77	68	59	54	46
	L/180	318	143	103	93	85	77	68	59	54	49

- <sup>1</sup> Table values assume a simply supported SIP with 1-1/2 inches (38.1 mm) of continuous bearing. Permanent loads, such as dead load, shall not exceed 0.50 times the tabulated load. Splines consist of I-beam, 2-1/4 inch (57.2 mm) wide flange (minimum) with a depth equal to the core thickness, spaced not to exceed 48 inches (1219.2 mm) on center.
- <sup>2</sup> Deflection limit shall be selected by building designer based on the serviceability requirements of the structure and the requirements of applicable building code.
- <sup>3</sup> Table values for 8-foot (2.44 m) spans apply to SIPs constructed with the OSB strength axis oriented either parallel or perpendicular to span direction. Table values for other spans are based on the OSB strength axis parallel to the span direction.
- <sup>4</sup> SIP shall be a minimum of 8 foot (2.44 m) long spanning a minimum of two 4-foot (1.22 m) spans.

### TRANSVERSE LOAD



### TYPE I SPLINE

