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Technical Bulletin (TB-LVL-2)

Subject: Multi-ply IB LVL Fastening

July 2013 (Updated June 2017)

International Beams LVL (laminated veneer lumber) typically comes in 1 ¾" thicknesses (although 3 ½" thickness is also available). Each 1 ¾" LVL is referred to as a ply. Thus, two 1 ¾" LVL's is considered a two-ply assembly. When greater than 1 ¾" thickness is required for strength, it is necessary to fasten the multiple LVL plies together to act as a single unit. Up to four LVL plies can be fastened together. Several combinations of nailed and bolted fastening assemblies are indicated in our IB LVL Design Manual. There are many other possible configurations and fasteners. Not all fasteners have suitable length and properties for multi-ply fasteners, so alternate fasteners should be engineered by a design professional experienced in wood construction.

Some proprietary screws have been designed specifically for LVL multi-ply fastening. TrussLok screws, manufactured by FastenMaster, and SDW screws, manufactured by Simpson Strong-Tie, are two such fasteners. The advantage over bolted fastening is that these screws are self-driving (no pre-drilling required) and can be installed from only one face of a multi-ply LVL. The screws also help draw the LVL plies together. For this reason, they are sometimes preferred even in assemblies where nailed fastening is permitted.

The following tables, with notes and illustrations, can be used as design aids for fastening IB LVL's. The tables are for side-applied loads, but as indicated in footnote 1, if the LVL is top-loaded and the load is shared equally by all LVL plies, the minimum specified fastening schedule may be used. An example of such a top-loaded condition is I-joists continuous over an interior multi-ply LVL beam.

(TB-LVL-2) MULTI-PLY IB LVL FASTENING

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TRUSSLOK SCREW MULTI-PLY IB LVL FASTENING (U.S. ASD)
ALLOWABLE SIDE-LOADED UNIFORM LOAD (PLF)

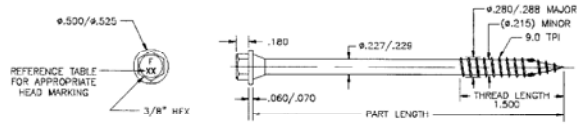
IB 2.0E-3100Fb LVL SG=0.50 (1.75" thick each ply)

Fastened with TrussLok screws (installed from one face only)

TrussLok Screw Size	Rows	2		3		4		2		3		4		2		3		4	
	Spacing	24		24		24		16		16		16		12		12		12	
	load side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side
EWS338-F3.3	2 - PLY	516	586	774	879	1032	1172	774	879	1161	1319	1548	1758	1032	1172	1548	1758	2064	2344
EWS005-F5.0	3 - PLY	387	440	581	659	774	879	581	659	871	989	1161	1319	774	879	1161	1319	1548	1758
EWS670-F6.7	4 - PLY	344	391	516	586	688	781	516	586	774	879	1032	1172	688	781	1032	1172	1376	1563

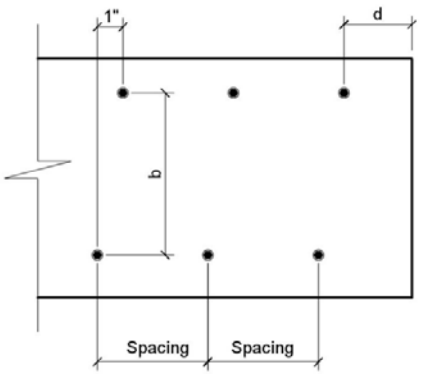
Notes:

1) Table is for LVL ply-to-ply attachment to act as a single unit with side-applied uniformly distributed loads. For top-loaded conditions, or when loaded equally on both sides, it is permitted to use minimum two rows of fasteners at maximum 24 inches o.c. spacing (see also note 7).
2) Table values indicate maximum capacity in pounds per linear foot (plf) for floor loading (C_D = 1.0). For roof loading, multiply table value by 1.15.
3) Observe the following fastener location requirements (also illustrated below):
   - e = 1 1/2": edge distance; hold at outer rows
   - d = 4": minimum end distance (along the grain)
   - b = 3": minimum vertical spacing (across the grain)
   - s: horizontal spacing of rows indicated in the table (inches)



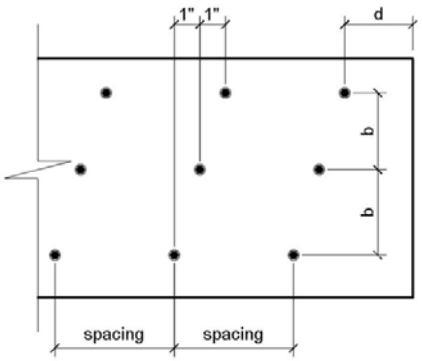
TRUSSLOK SCREW

4) TrussLok screws, manufactured by Fastenmaster: 0.228" nominal diameter, 0.215" root diameter, F_{yb} = 202,200 psi. (reference: ICC-ES ESR-1078, reissued February 1, 2007)
5) Side framing must be properly fastened to LVL per hanger manufacturer's requirements.
6) Verify adequacy of beam prior to using this table.
7) Use minimum two rows of fasteners for 7 1/4" to 11 7/8" LVL beam depths and minimum three rows of fasteners for 14" to 24" depths. For less than 7 1/4" LVL beam depth, contact International Beams.



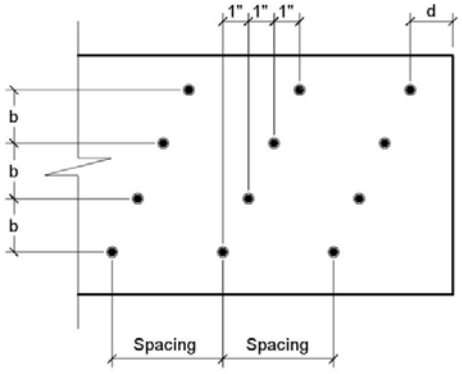
Two Rows

(7 1/4" to 11 7/8" depth)



Three Rows

(14" to 24" depth)



Four Rows

(14" to 24" depth)

(TB-LVL-2) MULTI-PLY IB LVL FASTENING

MAX-CORE

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BOLTED MULTI-PLY IB LVL FASTENING (U.S. ASD)
ALLOWABLE SIDE-LOADED UNIFORM LOAD (PLF)

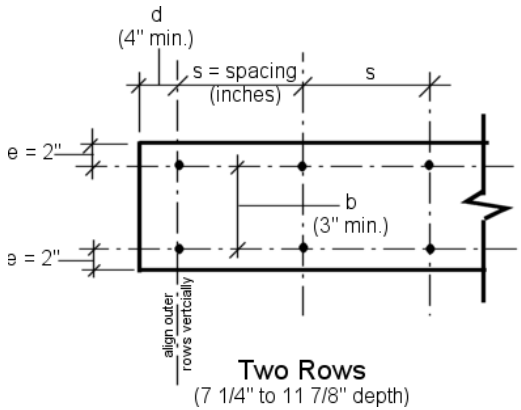
IB 2.0E-3100Fb LVL SG=0.50 Fastened with 1/2" diameter thru-bolts

(1.75" thick each ply)

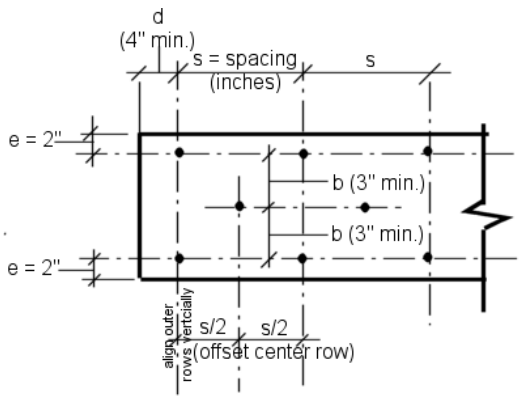
Rows	2	3	4	2	3	4	2	3	4	Applied loading
Spacing	24	24	24	16	16	16	12	12	12	
2 - PLY	500	750	1000	750	1125	1500	1000	1500	2000	One side only
3 - PLY	375	563	750	563	844	1125	750	1125	1500	One side only
4 - PLY	333	500	667	500	750	1000	667	1000	1333	One side only

Notes:

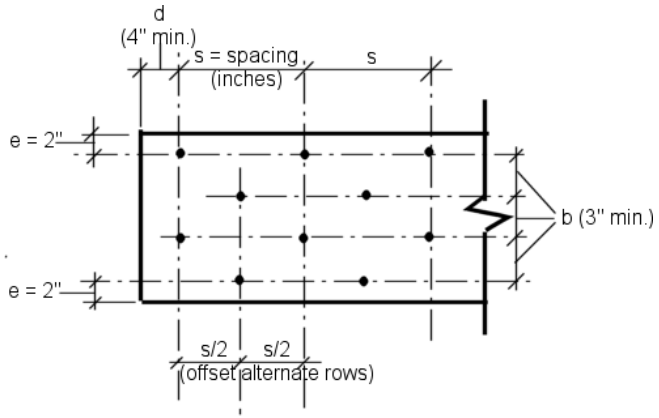
1) Table is for LVL ply-to-ply attachment to act as a single unit with side-applied uniformly distributed loads. For top-loaded conditions, or when loaded equally on both sides, it is permitted to use minimum two rows of bolt at maximum 24 inches o.c. spacing (see also note 7).
2) Table values indicate maximum capacity in pounds per linear foot (plf) for floor loading (C_D= 1.0). For roof loading, multiply table value by 1.15.
3) Observe the following bolt location requirements (also illustrated below):
   - e = 2": edge distance; hold at outer rows
   - d = 4": minimum end distance (along the grain)
   - b = 3": minimum vertical spacing (across the grain)
   - s: horizontal spacing of rows indicated in the table (inches)
4) 1/2" diameter thru-bolts, ASTM-A307 / SAE Grade 2 (F_{yb} = 45,000 psi), with washers and nuts
5) Side framing must be properly fastened to LVL per hanger manufacturer's requirements.
6) Verify adequacy of beam prior to using this table.
7) Use minimum two rows of bolts for 7 1/4" to 11 7/8" LVL beam depths and minimum three rows of bolts for 14" to 24" depths. For less than 7 1/4" LVL beam depth, contact International Beams.



Two Rows
(7 1/4" to 11 7/8" depth)



Three Rows
(14" to 24" depth)



Four Rows
(14" to 24" depth)

(TB-LVL-2) MULTI-PLY IB LVL FASTENING

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SIMPSON SDW SCREW MULTI-PLY IB LVL FASTENING (U.S. ASD)
ALLOWABLE SIDE-LOADED UNIFORM LOAD (PLF)

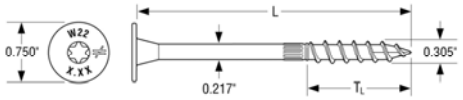
IB 2.0E-3100Fb LVL SG=0.50 Fastened with Simpson SDW screws (installed from one face only)

(1.75" thick each ply)

(1.75" thick each ply)

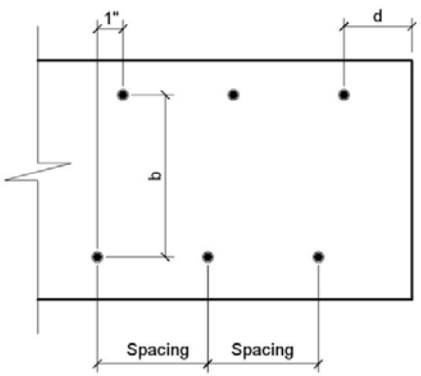
Simpson SDW Screw Size / Head Marking	Rows	2		3		4		2		3		4		2		3		4	
	Spacing	24		24		24		16		16		16		12		12		12	
	loaded side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side	point side	head side
SDW22338 / 3.37	2 - PLY	600	800	900	1200	1200	1600	900	1200	1350	1800	1800	2400	1200	1600	1800	2400	2400	3200
SDW22500 / 5.00	3 - PLY	450	600	675	900	900	1200	675	900	1013	1350	1350	1800	900	1200	1350	1800	1800	2400
SDW22634 / 6.75	4 - PLY	400	533	600	800	800	1067	600	800	900	1200	1200	1600	800	1067	1200	1600	1600	2133

1) Table is for LVL ply-to-ply attachment to act as a single unit with side-applied uniformly distributed loads. For top-loaded conditions, or when loaded equally on both sides, it is permitted to use minimum two rows of fasteners at maximum 24 inches o.c. spacing (see also note 7).
2) Table values indicate maximum capacity in pounds per linear foot (plf) for floor loading (C_D = 1.0). For roof loading, multiply table value by 1.15.
3) Observe the following fastener location requirements (also illustrated below):
   - e = 1 1/2": edge distance; hold at outer rows
   - d = 6": minimum end distance (along the grain)
   - b = 3": minimum vertical spacing (across the grain)
   - s: horizontal spacing of rows indicated in the table (inches)



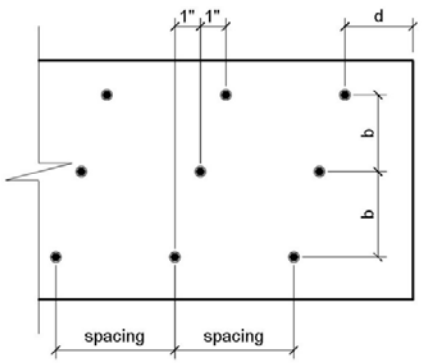
SDW SCREW

4) SDW screws, manufactured by Simpson Strong-Tie Inc.: 0.217" unthreaded shank diameter, 0.192" minor root diameter, and 0.305" major thread diameter. F_{yb} = 180,000 psi (reference: IAPMO-ES ER-0192, issued August 2010, and flier F-SDW10-R, expires 1/13)
5) Side framing must be properly fastened to LVL per hanger manufacturer's requirements.
6) Verify adequacy of beam prior to using this table.
7) Use minimum two rows of fasteners for 7 1/4" to 11 7/8" LVL beam depths and minimum three rows of fasteners for 14" to 24" depths. For less than 7 1/4" LVL beam depth, contact International Beams.



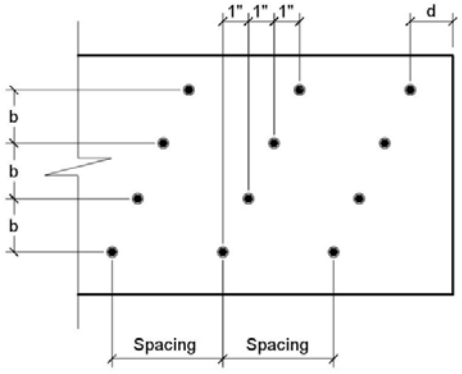
Two Rows

(7 1/4" to 11 7/8" depth)



Three Rows

(14" to 24" depth)



Four Rows

(14" to 24" depth)

(TB-LVL-2) MULTI-PLY IB LVL FASTENING

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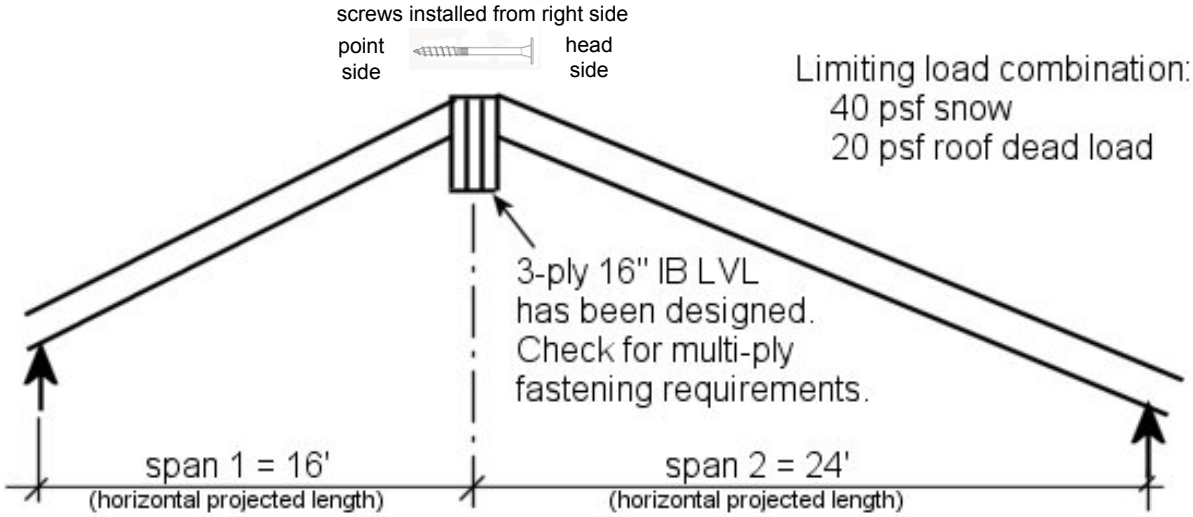
Illustration for Use of Multi-ply IB LVL Fastener Tables



step 1) Size the IB LVL beam

step 2) Determine the minimum number of fastener rows. Per note 7 of the IB fastening tables, the minimum number of rows for 16" depth is three.

step 3) Calculate the loads to be used for multi-ply fastening.

PLF due to span 1 is: (16' x 60 psf) / 2 = 480 plf

PLF due to span 2 is: (24' x 60 psf) / 2 = 720 plf

step 4) Use the IB fastening tables to determine the critical fastening condition. Note that screw capacities are slightly lower if the load is applied on the screw point side instead of the screw head side. If you have no control over which face the screws will be installed from, you should use the lower capacities for load applied to the point side. Try three rows at 24" o.c. spacing. Since the critical load combination includes snow, it is permitted to multiply the table value by 1.15.

TrussLok screws: point side, (581 x 1.15) = 668 plf > 480 plf, so O.K.; head side, (659 x 1.15) = 758 plf > 720 plf, so O.K.
Note: if span 2 is loaded on the point side of the TrussLok screws, then 668 plf < 720 plf, so there would not be enough screws and you would need to reduce screw spacing to three rows at 16" o.c. (871 x 1.15) = 1002 plf > 720 plf, so O.K.

1/2" diameter thru-bolts: (does not matter which side the head or washer and nut is located) Design for the largest side-load of 720 plf, (563 x 1.15) = 647 plf, so there would not be enough bolts and you would need to reduce bolt spacing to three rows at 16" o.c. (844 x 1.15) = 971 plf > 720 plf, so O.K.

Simpson SDW screws: point side, (675 x 1.15) = 776 plf > both 480 plf and 720 plf, so three rows at 24" o.c. is permitted regardless of which side the SDW screws are intalled from.