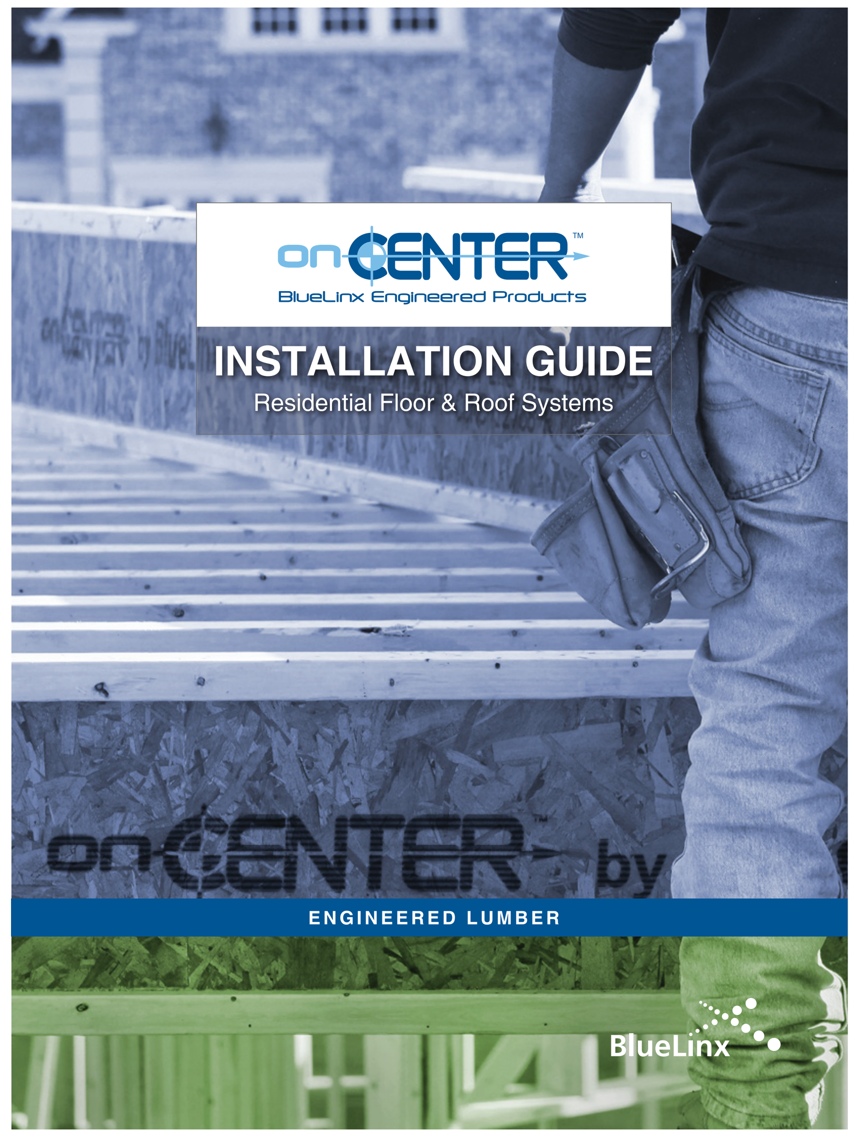


INSTALLATION GUIDE

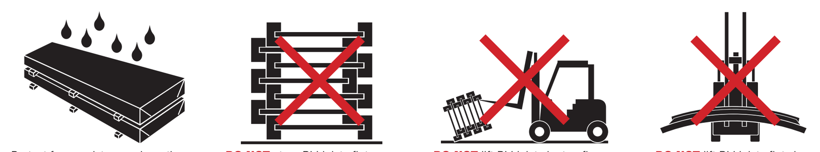
Residential Floor & Roof Systems

onCENTER BlueLinx Engineered Products

ENGINEERED LUMBER

BlueLinx

STORAGE & HANDLING



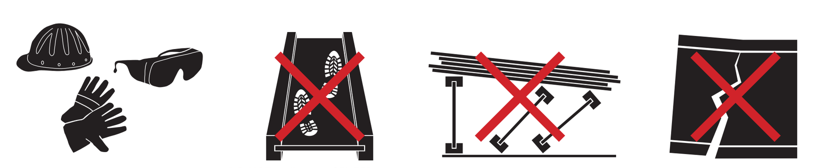
Protect from moisture and weather. Keep covered with factory wrap until time of use. Store on dry level ground using stacked support blocks 10' on-center to keep bundles off the ground and to allow air circulation.

DO NOT store BLI joists flat. (onCENTER™ LVL and rim board should be stacked flatwise).

DO NOT lift BLI joists by top flange with forklift.

DO NOT lift BLI joists flatwise.

SAFETY PRECAUTIONS



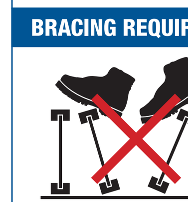
Use safety glasses, gloves, hard hats, and other personal protective equipment when handling and installing onCENTER engineered lumber. Contact BlueLinx for MSDS information.

DO NOT walk on onCENTER engineered lumber that is lying flat.

DO NOT stack building materials on unsheathed joists. Stack only over bearing walls or main beams.

DO NOT use damaged products.

BRACING REQUIREMENTS



DO NOT allow workers or loads on engineered lumber joists until properly installed and braced.

1. Joists are unstable until properly attached and braced laterally. Failure to provide stability can result in serious accidents.
2. Restrain joists and beams from rotation at the end supports by use of blocking panels, x-bridging, or continuous closure (rim board, rim joist or structural panel).
3. Install all fasteners in each joist, beam, hanger, blocking panel, x-bridging, or continuous closure as it is set.
4. Lateral restraint, such as a braced end wall or existing deck, must be established parallel to the first joist in a run. This can also be accomplished by a temporary or permanent deck (sheathing) fastened to the full length of the first 4' of joists in the run.
5. Rows of temporary bracing running at right angles to the joists and spaced not more than 10' on center must extend to the established lateral restraint. Bracing should be a minimum of 1x4, at least 8' long, attached to the top face of each joist with a minimum of two 8d nails (10d if bracing is 2x4). Ends of bracing should overlap at least two joists.
6. Ends of cantilevers require temporary bracing on both the top and bottom flanges.
7. Sheathing must be completely attached to each BLI joist before additional loads can be placed on the system.
8. Joist flanges must remain straight within ½" of true alignment.

INSTALLATION NOTES

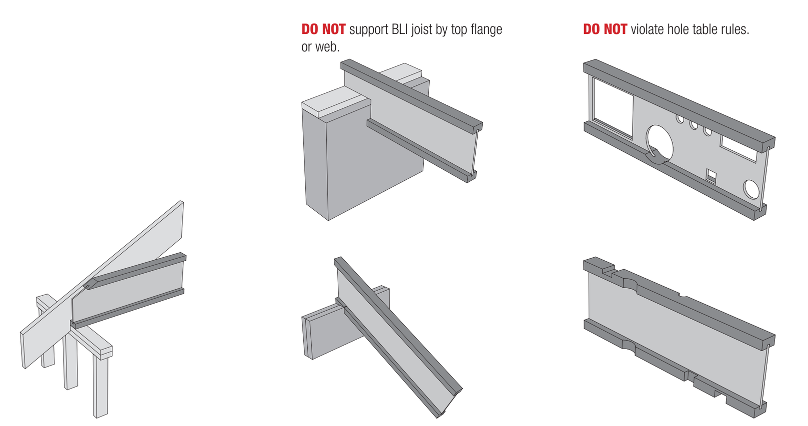
1. BlueLinx onCENTER products must be protected from weather and used only in covered, dry-use conditions (moisture content of engineered lumber must be less than 16%).
2. Engineered lumber must not be installed in direct contact with masonry or concrete.
3. BLI joists must be supported by the bottom flange on walls or beams or in hangers. They must not be supported by the top flange, by a non-structural ridge board, or by toe-nailing into a beam or ledger.
4. For BLI joists, minimum end bearing length is 1¾"; minimum intermediate bearing length is 3½".
5. When nailing to the wide face of BLI joist flanges, maintain spacing within the following ranges:

Flange Nail Spacing				
	BLI 400, 700, 900		BLI 40, 60, 80, 90	
Nail Size	Min.	Max.	Min.	Max.
8d Box, 8d Common, 10d Box, 12d Box	2"	24"	4"	24"
10d Common, 12d Common	3"	24"	4"	24"

NOTES:
1. When more than one row of nails is required, rows must be offset by at least ½" and staggered.
2. 14 gauge staples may be substituted for 8d nails if penetration into the joist flange is at least 1".
3. Do not use nails larger than those shown above when attaching sheathing to BLI joists.

6. BLI joists are manufactured with no camber, and may be installed with web markings reading right side up or upside down.
7. Except when cutting to length or for birdsmouth cuts, BLI joist flanges should not be cut, tapered, notched, or drilled.
8. Concentrated loads should be supported by the top surface of the top flange, not hung from the bottom flange (Exceptions: lighting fixtures, ceiling fans, etc.).
9. When nail type is not specified in this guide, common, box or sinkers may be used.
10. Certain applications of staple-up radiant heating may increase deflection in I-joists with solid-sawn flanges due to unequal drying within the floor cavity. Contact BlueLinx for more information.
11. With preservative treated wood, use only stainless steel or hot-dipped galvanized connectors, fasteners and other metal hardware as required by code. As a minimum requirement, hot-dipped galvanized coated fasteners should conform to ASTM Standard A 153 and hot-dipped galvanized coated connectors should conform to ASTM Standard A 653 (Class G-185). In highly corrosive environments, stainless steel connectors and fasteners should be used.

INSTALLATION CAUTIONS



DO NOT support BLI joist by top flange or web.

DO NOT violate hole table rules.

DO NOT bevel cut BLI joist past face of wall. See detail F8.

DO NOT birdsmouth cut bottom flange at high end of roof BLI joist. See roof detail R2.

DO NOT cut or notch flanges except for cutting to length and for birdsmouth cuts (roof detail R6).

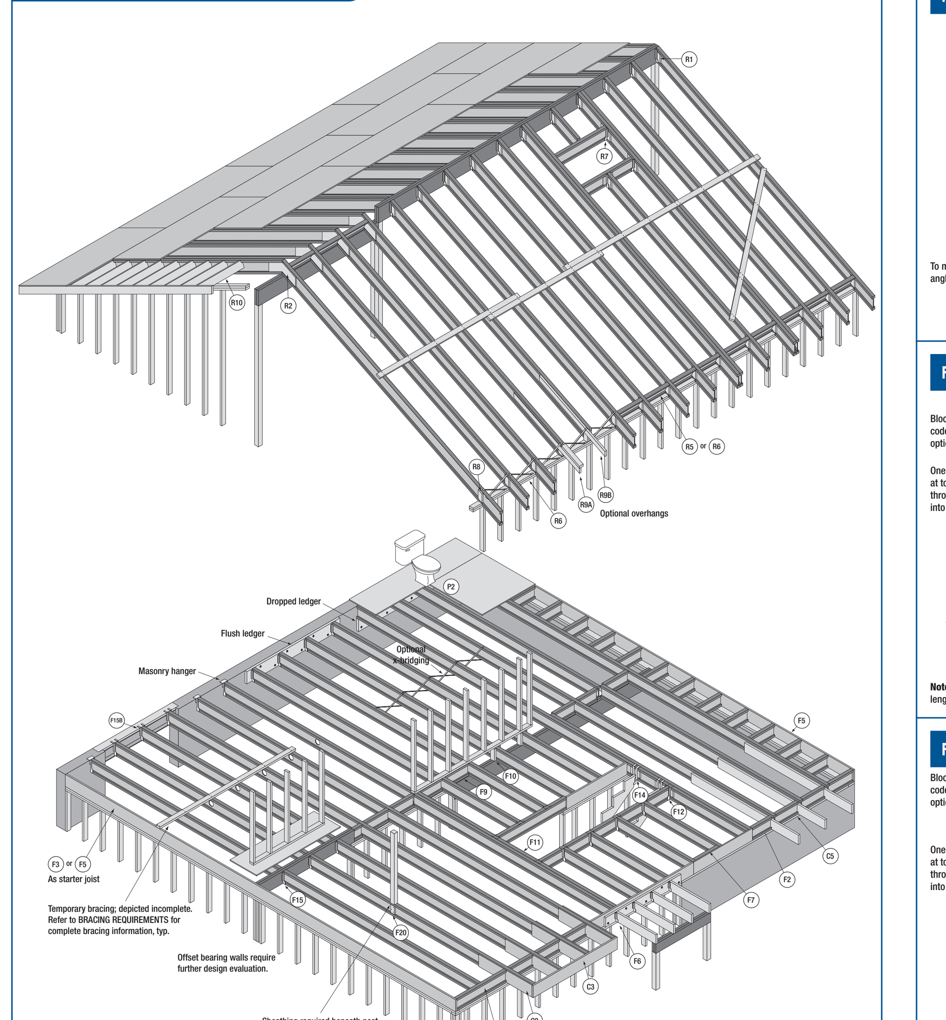
FLOOR SPANS

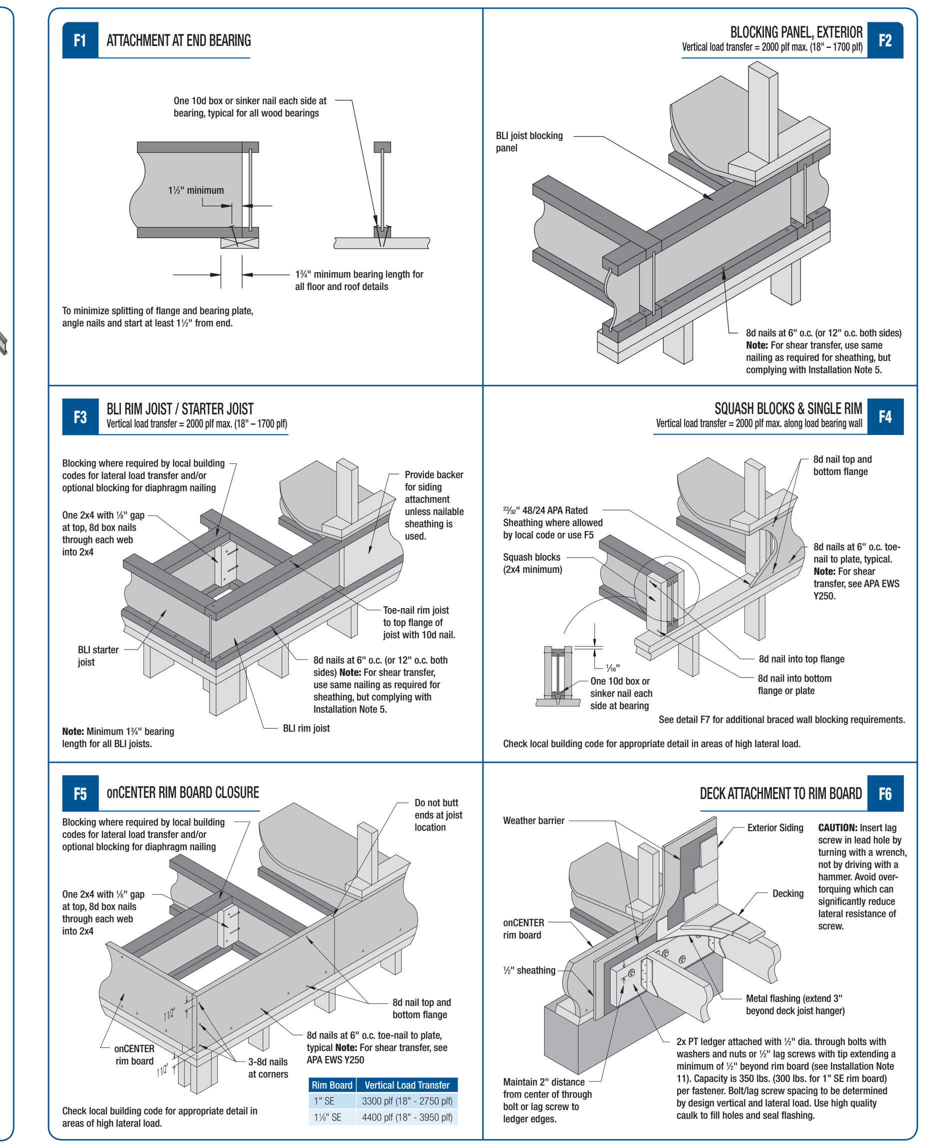
40 PSF Live Load + 10 PSF Dead Load (L/480)

Joist Series	Joist Depth	Simple Span 12" o.c.	Simple Span 16" o.c.	Simple Span 19.2" o.c.	Simple Span 24" o.c.	Multiple Span 12" o.c.	Multiple Span 16" o.c.	Multiple Span 19.2" o.c.	Multiple Span 24" o.c.
BLI 40 / BLI 400	9½"	18'-00"	16'-05"	15'-06"	14'-06"	19'-07"	17'-11"	16'-04"	14'-07"
	11⅞"	21'-05"	19'-07"	18'-06"	16'-08"	23'-05"	20'-05"	18'-07"	16'-07"
BLI 40	14"	24'-04"	22'-03"	20'-06"	18'-04"	25'-11"	22'-05"	20'-05"	18'-03"
	16"	26'-11"	24'-03"	22'-01"	19'-09"	27'-11"	24'-02"	22'-00"	19'-08"
BLI 60	11⅞"	22'-07"	20'-08"	19'-06"	18'-02"	24'-08"	22'-06"	21'-02"	19'-07"
	14"	25'-09"	23'-06"	22'-02"	20'-08"	28'-00"	25'-07"	24'-01"	19'-09"
	16"	28'-06"	26'-00"	24'-07"	22'-10"	31'-01"	28'-04"	24'-09"	19'-09"
	18"	31'-03"	28'-06"	26'-11"	24'-10"	34'-01"	29'-09"	24'-09"	19'-09"
BLI 80	11⅞"	24'-11"	22'-08"	21'-04"	19'-10"	27'-01"	24'-08"	23'-03"	21'-07"
	14"	28'-03"	25'-09"	24'-03"	22'-07"	30'-10"	28'-00"	26'-05"	23'-11"
	16"	31'-04"	28'-06"	26'-10"	25'-00"	34'-02"	31'-01"	29'-03"	23'-11"
	18"	34'-02"	31'-01"	29'-03"	24'-10"	37'-03"	33'-10"	30'-09"	24'-07"
BLI 90	11⅞"	25'-07"	23'-03"	21'-11"	20'-05"	27'-11"	25'-04"	23'-10"	21'-10"
	14"	29'-00"	26'-05"	24'-11"	23'-02"	31'-08"	28'-09"	27'-01"	23'-11"
	16"	32'-01"	29'-03"	27'-06"	25'-05"	35'-00"	31'-10"	29'-11"	25'-11"
	18"	35'-01"	31'-11"	30'-01"	24'-10"	38'-03"	34'-09"	31'-09"	25'-05"
BLI 700	11⅞"	23'-00"	21'-00"	19'-10"	18'-06"	25'-01"	22'-10"	21'-07"	18'-06"
	14"	26'-01"	23'-10"	22'-06"	20'-11"	28'-05"	25'-11"	23'-02"	18'-06"
	16"	29'-00"	26'-05"	24'-11"	23'-01"	31'-07"	27'-10"	23'-02"	18'-06"
BLI 900	11⅞"	26'-04"	24'-00"	22'-07"	21'-00"	28'-08"	26'-01"	24'-07"	22'-10"
	14"	29'-11"	27'-02"	25'-07"	23'-10"	32'-07"	29'-07"	27'-10"	25'-11"
	16"	33'-01"	30'-01"	28'-04"	26'-04"	36'-01"	32'-09"	30'-10"	26'-07"

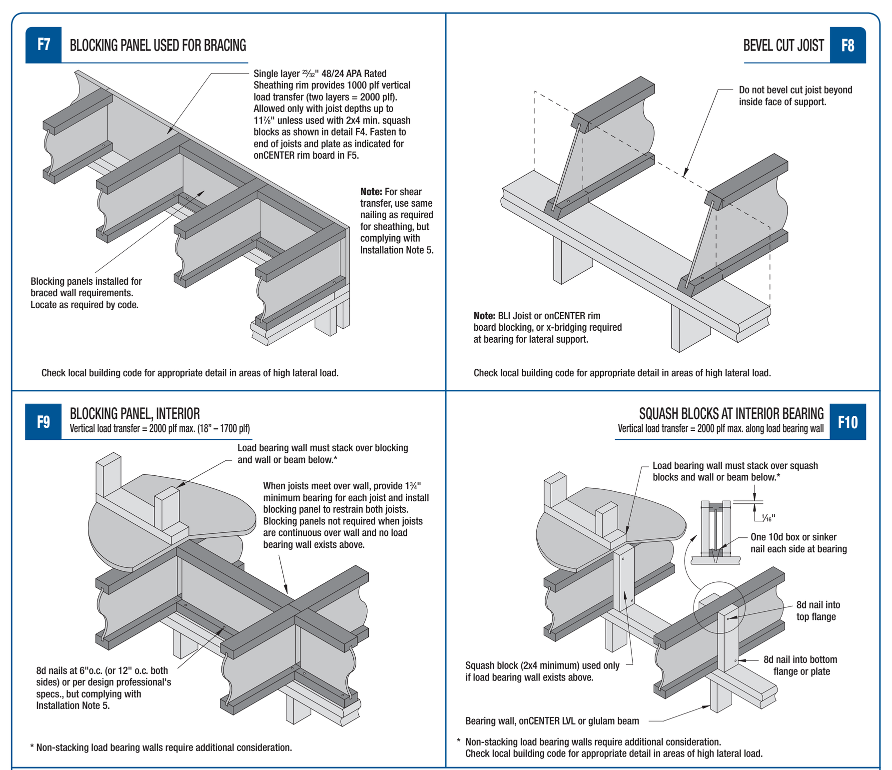
NOTES:
1. Spans are maximum clear distances between supports, based on uniform loads.
2. Live load deflection is limited to L/480, providing joists that are one-third stiffer than required by code. Experience has shown that floors designed to the code minimum live load deflection (L/360) may not meet the occupant's expectations for floor performance.
3. Spans are based on composite action with glued-nailed APA Rated Sheathing or Sturd-I-Floor panels of minimum thickness ¹⁹⁄₃₂" (40/20 or 20 oc) for joist spacing of 19.2" or less, or ²³⁄₃₂" (48/24 or 24 oc) for a joist spacing of 24". Apply a ¼" diameter continuous bead of adhesive (meeting APA AFG-01 or ASTM D 3498) to top flange of joists. Surfaces must be clean and dry. If adhesive is not used, reduce spans by 12".
4. Minimum bearing length: 1¾" (end), 3½" (intermediate).
5. For multiple-span joists, end spans must be at least 40% of adjacent span.
6. Tabulated spans for multiple-span conditions cover a wide range of span combinations. Neither simple nor multiple spans require bearing stiffeners. Longer spans may be possible by analyzing a specific span condition and/or by adding bearing stiffeners. Check using DOMA Sizer™ software.
7. For loading other than that shown above, refer to Uniform Load Tables in the onCENTER Product Guide, use DOMA Sizer software, or contact BlueLinx Engineered Lumber Technical Services.

onCENTER FRAMING SYSTEMS





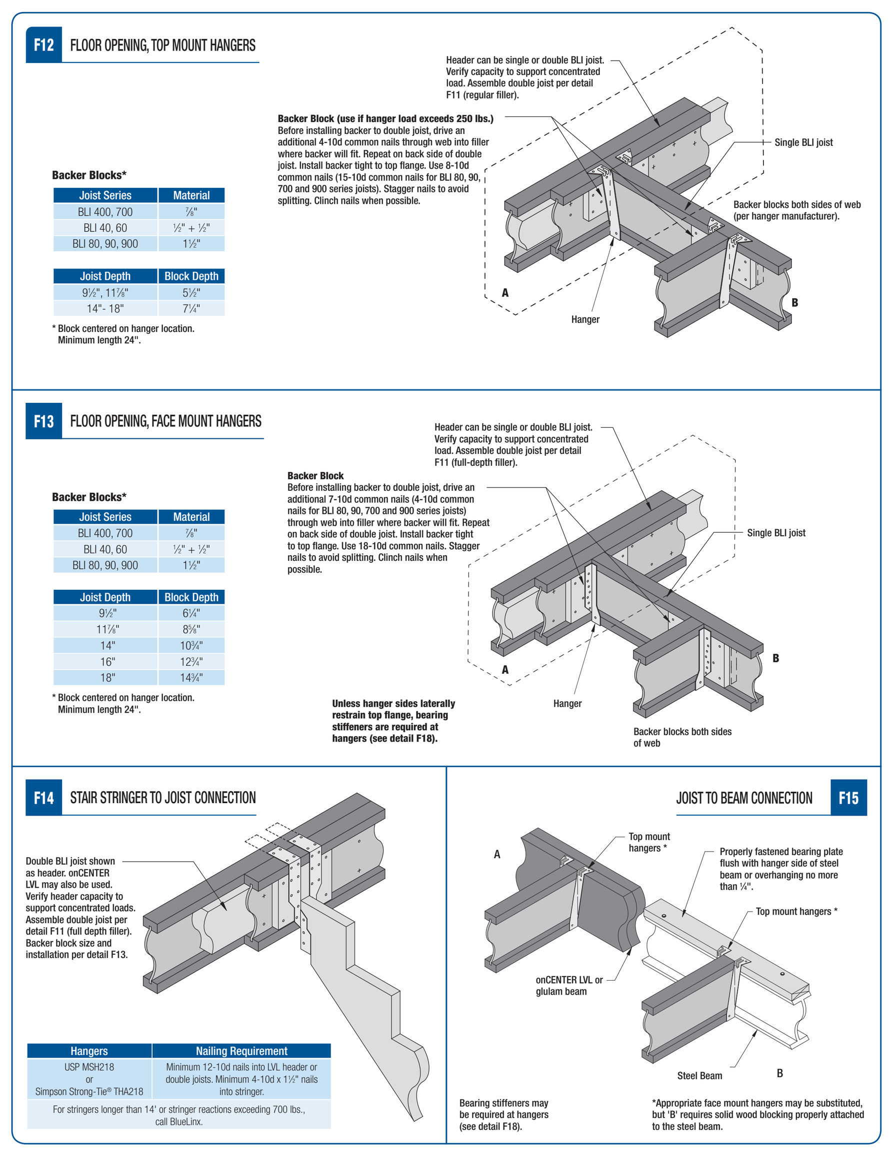
Rim Board	Vertical Load Transfer
1" SE	3300 plf (18" - 2750 plf)
1⅛" SE	4400 plf (18" - 3950 plf)



F11 Note: Filler blocks and fastening between joists can be omitted when double joists are loaded evenly from above to the tops of both joists, such as when a parallel bearing wall is directly centered over the double joist.

Joist Series	Joist Depth	Regular Filler Blocking (Detail F12)	Full-depth Filler Blocking (Details C4, F13, F14 & R7)
BLI 400	9½"	2x6 + ⅜" OSB/Plywood	2x6 + ⅜" OSB/Plywood
BLI 400, 700	11⅞"	2x6 + ⅜" OSB/Plywood	2x8 + ⅜" OSB/Plywood
BLI 700	14"	2x8 + ⅜" OSB/Plywood	2x10 + ⅜" OSB/Plywood
	16"	2x8 + ⅜" OSB/Plywood	2x12 + ⅜" OSB/Plywood
BLI 40	9½"	2x6 + ⅜" OSB/Plywood	2x6 + ⅜" OSB/Plywood
BLI 40, 60	11⅞"	2x6 + ⅜" OSB/Plywood	2x8 + ⅜" OSB/Plywood
	14"	2x8 + ⅜" OSB/Plywood	2x10 + ⅜" OSB/Plywood
	16"	2x8 + ⅜" OSB/Plywood	2x12 + ⅜" OSB/Plywood
BLI 60	18"	2x8 + ⅜" OSB/Plywood	2x12 + ⅜" OSB/Plywood
BLI 80, 90, 900	11⅞"	2-2x8	2-2x8
	14"	2-2x8	2-2x10
	16"	2-2x8	2-2x12
BLI 80, 90	18"	2-2x8	2-2x12

1) Support back of web during nailing to prevent damage to web-flange connection.
2) Leave ⅛" gap between top of filler blocking and bottom of top flange.
3) Block solid between joists. For all applications except cantilever reinforcement, filler need not be one continuous length, but must extend the entire length of span. For double I-joist cantilever reinforcement C4, filler must be one continuous piece extending the full length of the reinforcement.
4) Place joists together and nail from each side with 2 rows of 10d common nails (16d common for BLI 80, BLI 90, and BLI 900) at 12" o.c. Stagger rows on opposite side 6".



F12 Backer Blocks*

Joist Series	Material
BLI 400, 700	⅞"
BLI 40, 60	½" + ½"
BLI 80, 90, 900	1½"

Joist Depth	Block Depth
9½", 11⅞"	5½"
14"- 18"	7¼"

* Block centered on hanger location. Minimum length 24".

F13 Backer Blocks*

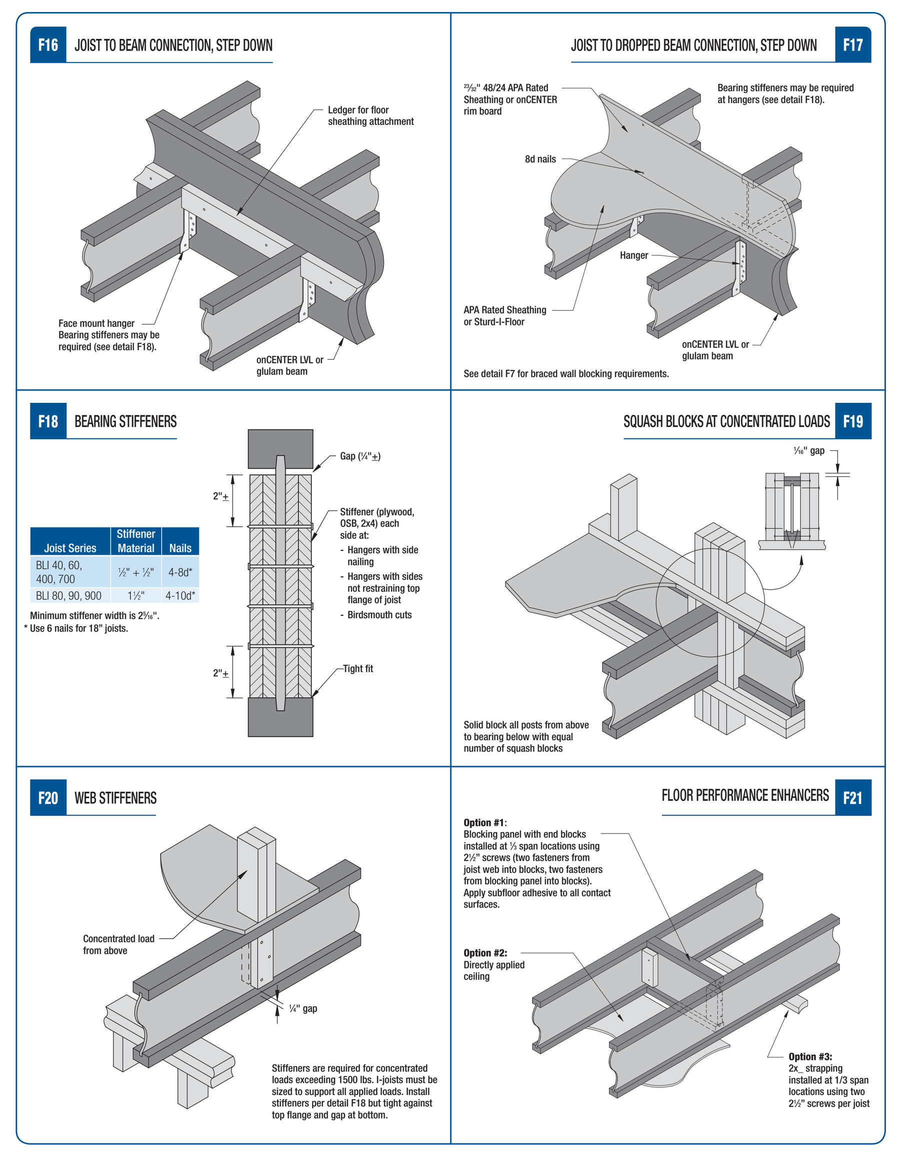
Joist Series	Material
BLI 400, 700	⅞"
BLI 40, 60	½" + ½"
BLI 80, 90, 900	1½"

Joist Depth	Block Depth
9½"	6¼"
11⅞"	8⅝"
14"	10¾"
16"	12¾"
18"	14¾"

* Block centered on hanger location. Minimum length 24".

F14

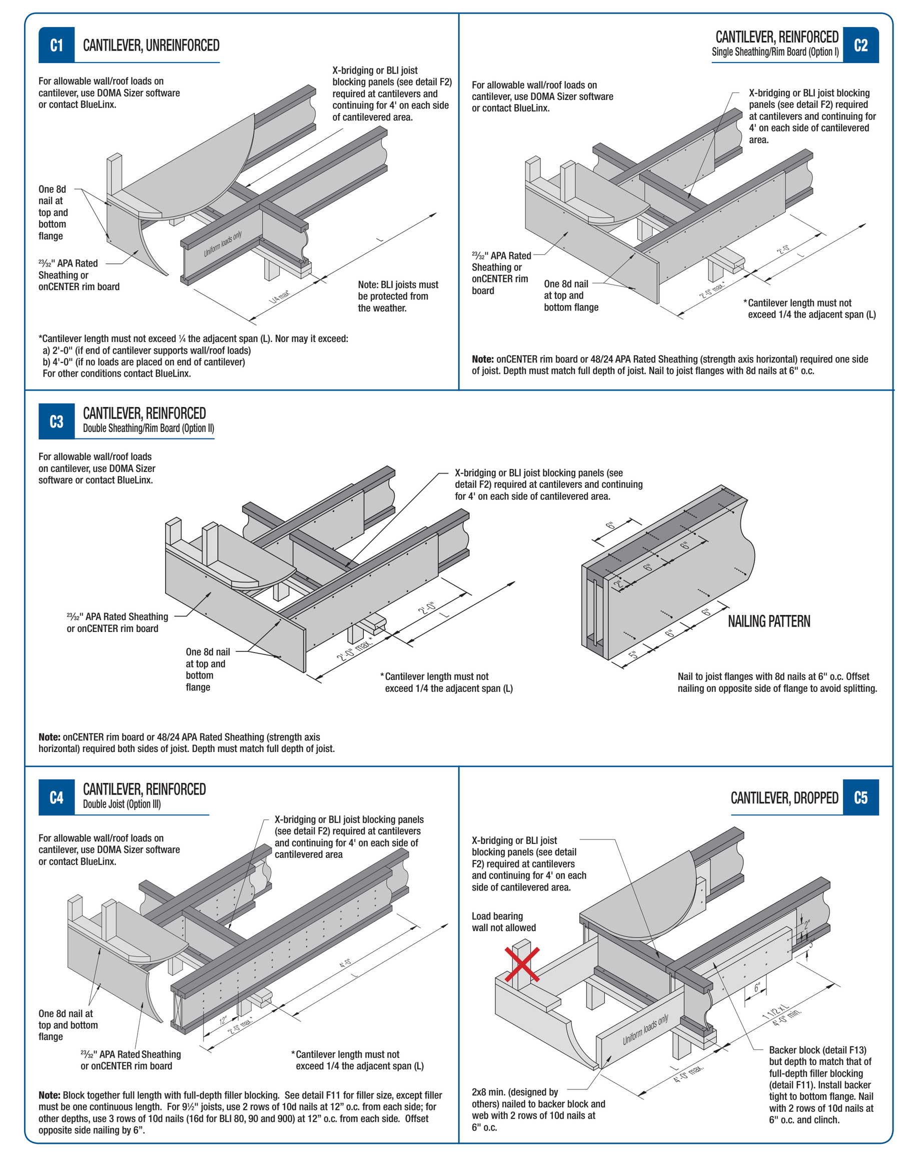
Hangers	Nailing Requirement
USP MSH218 or Simpson Strong-Tie® THA218	Minimum 12-10d nails into LVL header or double joists. Minimum 4-10d x 1½" nails into stringer.
For stringers longer than 14' or stringer reactions exceeding 700 lbs., call BlueLinx.	

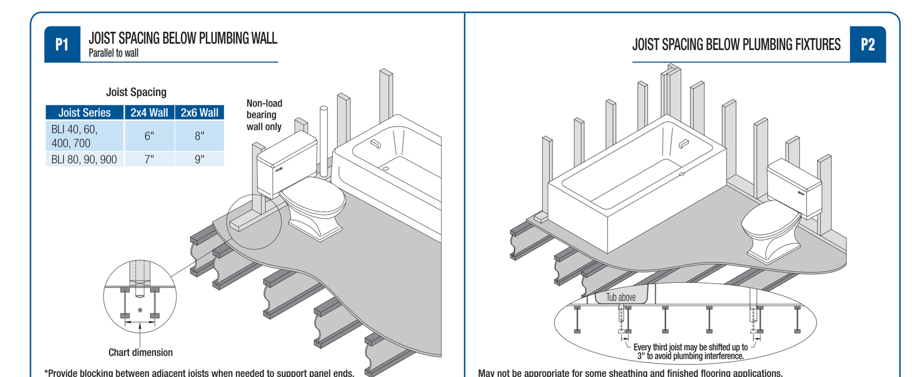


F18

Joist Series	Stiffener Material	Nails
BLI 40, 60, 400, 700	½" + ½"	4-8d*
BLI 80, 90, 900	1½"	4-10d*

Minimum stiffener width is 2⁵⁄₁₆".
* Use 6 nails for 18" joists.



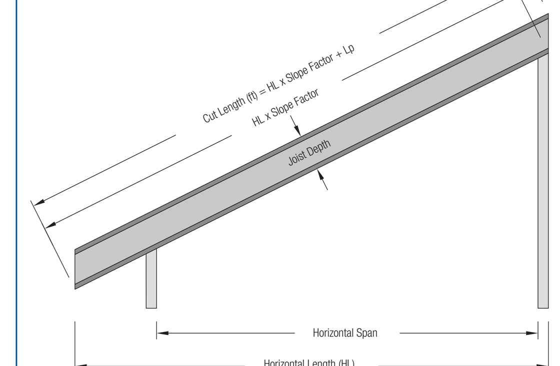


P1 Joist Spacing

Joist Series	2x4 Wall	2x6 Wall
BLI 40, 60, 400, 700	6"	8"
BLI 80, 90, 900	7"	9"

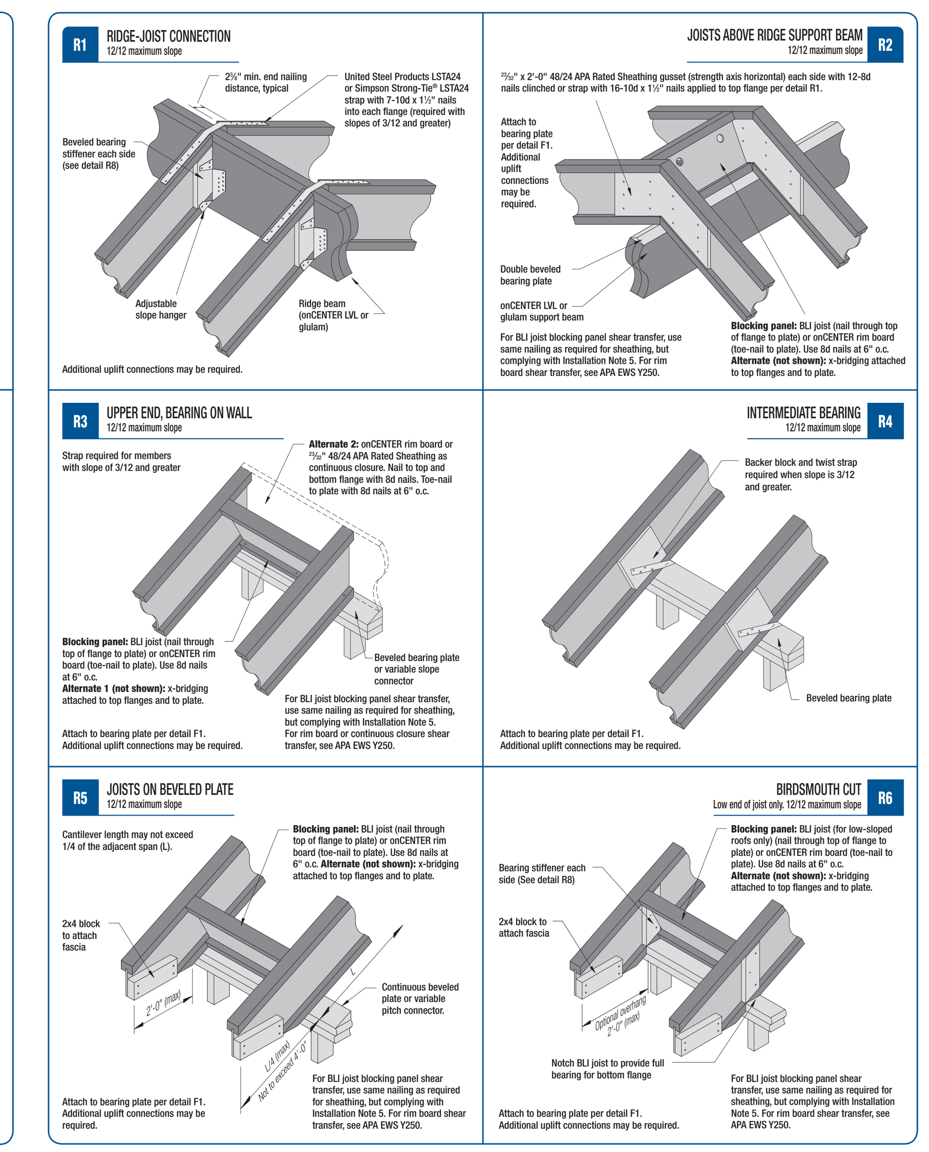
ROOF SLOPE FACTORS & PLUMB CUT INCREASES

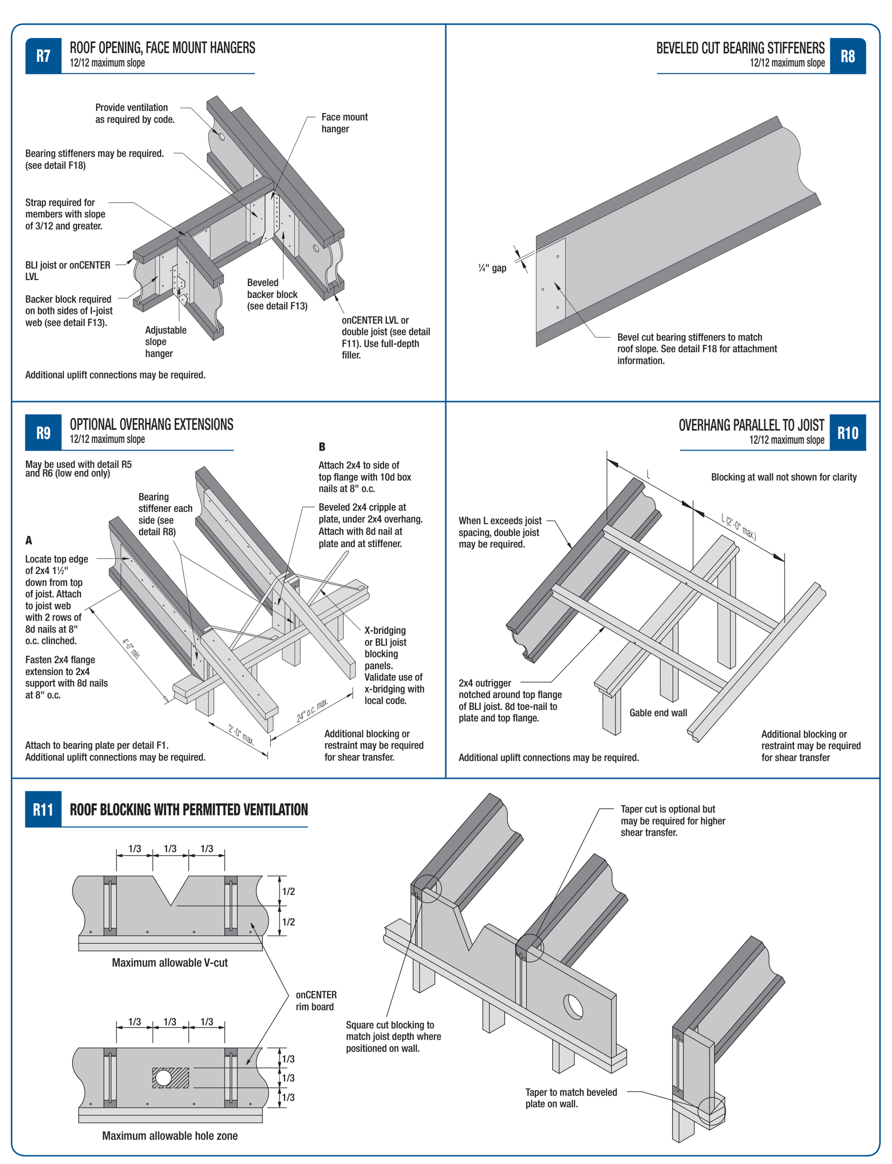
	Slope (/12) & Slope Factor												
	2½	3	3½	4	4½	5	6	7	8	9	10	11	12
	1.021	1.031	1.042	1.054	1.068	1.083	1.118	1.158	1.202	1.250	1.302	1.357	1.414
Joist Depth	Amount to Increase Length for Plumb Cut (Lp in feet)												
9½"	0.165	0.198	0.231	0.264	0.297	0.330	0.396	0.462	0.528	0.594	0.660	0.726	0.792
11⅞"	0.206	0.247	0.289	0.330	0.371	0.412	0.495	0.577	0.660	0.742	0.825	0.907	0.990
14"	0.243	0.292	0.340	0.389	0.438	0.486	0.583	0.681	0.778	0.875	0.972	1.069	1.167
16"	0.278	0.333	0.389	0.444	0.500	0.556	0.667	0.778	0.889	1.000	1.111	1.222	1.333
18"	0.313	0.375	0.438	0.500	0.563	0.625	0.750	0.875	1.000	1.125	1.250	1.375	1.500



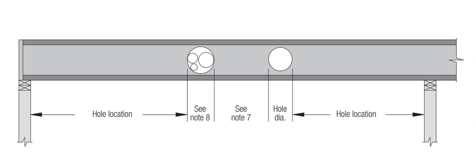
EXAMPLE:
11⅞" BLI joists, 6/12 slope, 15' 8½" Horizontal Span, 2' overhang (horizontal) and 3½" walls.

HL = 2' + 3½" + 15' 8½" + 3½" = 18' 3½"
3.5"/12 = .292' , 18' + .292' = 18.292'
18.292' x 1.118 (Slope Factor from chart) = 20.45'
20.45' + .495' (Lp from chart) = 20.945' (20')
0.945' x 12 = 11.34" (11")
0.34" x 16 = 5.44, round to 6 (sixteenths)
Cut Length = 20' 11⅜"





HOLES



Hole location is minimum distance from inside face of support to nearest edge of hole.

DO NOT cut or drill flanges.

Allowable Hole Location for BLI 400 (Simple or Multiple Span)

Joist Depth	Joist Clear Span	2"	3"	4"	5"	6"	6½"	7"	8"	8⅞"	9"	10"	11"	12"	13"
9½"	10'	0'-6"	0'-6"	0'-9"	1'-9"	3'-0"	3'-6"								
	12'	0'-6"	1'-3"	2'-3"	3'-3"	4'-3"	5'-0"								
	14'	0'-6"	1'-0"	2'-3"	3'-6"	5'-0"	5'-9"								
	16'	0'-6"	0'-6"	2'-0"	3'-6"	5'-3"	6'-0"								
	18'	0'-6"	0'-6"	0'-9"	2'-6"	4'-6"	5'-6"								
11⅞"	10'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-3"	2'-3"	3'-3"					
	12'	0'-6"	0'-6"	0'-9"	1'-0"	1'-6"	2'-0"	2'-6"	3'-9"	4'-9"					
	14'	0'-6"	0'-6"	0'-9"	1'-9"	3'-0"	3'-6"	4'-0"	5'-3"	6'-3"					
	16'	0'-6"	0'-6"	0'-9"	1'-9"	3'-0"	3'-9"	4'-3"	5'-9"	7'-3"					
	18'	0'-6"	0'-6"	0'-9"	1'-0"	2'-6"	3'-3"	4'-0"	5'-9"	7'-6"					
	20'	0'-6"	0'-6"	0'-9"	1'-0"	2'-0"	2'-9"	3'-9"	5'-9"	7'-9"					
	22'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	2'-0"	4'-6"	7'-0"					

Allowable Hole Location for BLI 40, 60, 80, 90, 700, and 900 (Simple or Multiple Span)

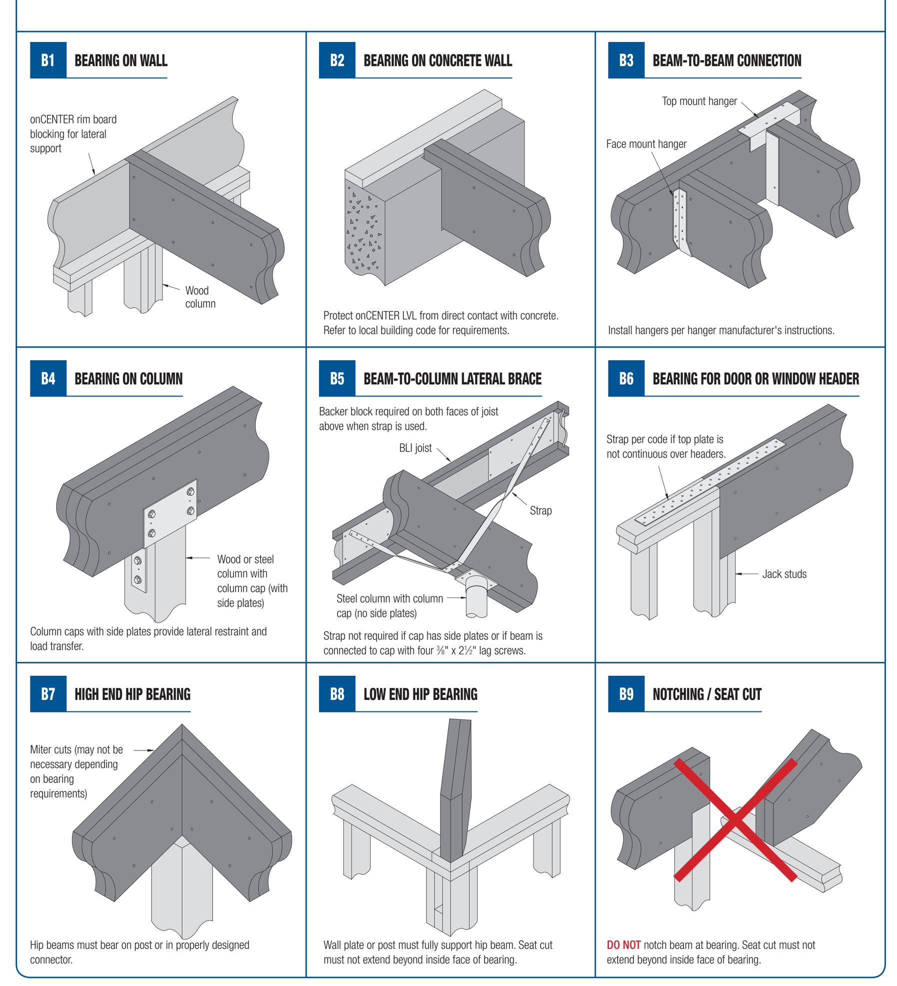
Joist Depth	Joist Clear Span	2"	3"	4"	5"	6¼"	7"	8"	8⅝"	9"	10"	10¾"	11"	12"	12¾"
9½"	10'	0'-6"	0'-6"	0'-9"	1'-9"	3'-3"									
	12'	0'-6"	1'-3"	2'-3"	3'-3"	4'-6"									
	14'	0'-6"	1'-0"	2'-3"	3'-6"	5'-6"									
	16'	0'-6"	0'-6"	2'-0"	3'-6"	5'-9"									
	18'	0'-6"	0'-6"	0'-9"	2'-6"	5'-0"									
11⅞"	12'	0'-6"	0'-6"	0'-9"	1'-0"	1'-9"	2'-6"	3'-9"	4'-6"						
	14'	0'-6"	0'-6"	0'-9"	1'-9"	3'-3"	4'-0"	5'-3"	6'-0"						
	16'	0'-6"	1'-3"	2'-3"	3'-3"	4'-6"	5'-6"	6'-6"	7'-6"						
	18'	1'-6"	2'-6"	3'-6"	4'-6"	6'-0"	6'-9"	8'-0"							
	20'	0'-9"	2'-0"	3'-3"	4'-6"	6'-3"	7'-3"	8'-9"							
	22'	1'-6"	2'-9"	4'-0"	5'-6"	7'-3"	8'-3"	9'-9"							
	24'	0'-6"	1'-9"	3'-3"	4'-9"	7'-0"	8'-3"	10'-0"	11'-3"						
14"	14'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-6"	2'-6"	3'-3"	3'-9"	4'-9"	5'-9"			
	16'	0'-6"	0'-6"	0'-9"	1'-0"	2'-0"	2'-9"	4'-0"	4'-6"	5'-0"	6'-3"	7'-3"			
	18'	0'-6"	0'-6"	1'-0"	2'-0"	3'-3"	4'-3"	5'-3"	6'-0"	6'-6"	7'-9"				
	20'	0'-6"	0'-6"	0'-9"	1'-6"	3'-0"	4'-0"	5'-3"	6'-3"	6'-9"	8'-6"				
	22'	0'-6"	0'-6"	1'-6"	2'-9"	4'-3"	5'-6"	6'-9"	7'-9"	8'-3"	10'-0"				
	24'	0'-6"	1'-0"	2'-3"	3'-6"	5'-3"	6'-3"	7'-9"	8'-9"	9'-3"	10'-9"				
	26'	0'-6"	0'-6"	1'-0"	2'-6"	4'-6"	5'-9"	7'-6"	8'-6"	9'-3"	11'-3"				
	28'	0'-6"	0'-9"	2'-3"	3'-9"	5'-9"	7'-0"	8'-9"	10'-0"	10'-6"	12'-6"				
16"	14'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-3"	2'-6"	3'-3"	3'-6"	4'-9"	5'-6"
	16'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-6"	2'-3"	2'-9"	3'-9"	4'-6"	5'-0"	6'-3"	7'-0"
	18'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	2'-0"	3'-0"	3'-6"	4'-0"	5'-3"	6'-0"	6'-3"	7'-6"	
	20'	0'-6"	0'-6"	0'-9"	1'-3"	2'-6"	3'-3"	4'-3"	5'-0"	5'-6"	6'-6"	7'-6"	7'-9"	9'-0"	
	22'	0'-6"	0'-6"	0'-9"	1'-0"	1'-9"	2'-9"	4'-0"	4'-9"	5'-3"	6'-9"	7'-9"	8'-3"	9'-9"	
	24'	0'-6"	0'-6"	0'-9"	1'-6"	3'-0"	4'-0"	5'-3"	6'-0"	6'-9"	8'-0"	9'-3"	9'-9"	11'-3"	
	26'	0'-6"	0'-6"	0'-9"	2'-0"	3'-9"	4'-9"	6'-0"	7'-0"	7'-6"	9'-0"	10'-3"	10'-6"	12'-3"	
	28'	0'-6"	0'-6"	0'-9"	1'-0"	2'-6"	3'-6"	5'-3"	6'-3"	7'-0"	8'-9"	10'-3"	10'-9"	12'-9"	
	30'	0'-6"	0'-6"	0'-9"	1'-9"	3'-9"	5'-0"	6'-6"	7'-6"	8'-3"	10'-0"	11'-6"	11'-9"	13'-9"	
	32'	0'-6"	0'-6"	0'-9"	1'-0"	2'-3"	3'-6"	5'-6"	6'-9"	7'-6"	9'-6"	11'-0"	11'-6"	13'-9"	
18"	16'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	2'-3"	2'-6"	3'-6"	4'-6"
	18'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	2'-6"	3'-3"	3'-9"	4'-9"	5'-9"
	20'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-9"	2'-3"	2'-9"	3'-9"	4'-9"	5'-0"	6'-3"	7'-3"
	22'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	2'-0"	3'-6"	4'-6"	4'-9"	6'-3"	7'-6"
	24'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	2'-0"	3'-0"	3'-3"	4'-9"	5'-9"	6'-3"	7'-9"	8'-9"
	26'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	2'-0"	2'-9"	3'-3"	4'-9"	6'-0"	6'-3"	8'-0"	9'-3"
	28'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-3"	2'-3"	3'-0"	4'-9"	6'-0"	6'-6"	8'-3"	9'-9"
	30'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	2'-6"	3'-9"	4'-3"	6'-0"	7'-3"	7'-9"	9'-9"	11'-3"
	32'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-0"	1'-9"	2'-6"	4'-6"	6'-0"	6'-6"	8'-9"	10'-6"
	34'	0'-6"	0'-6"	0'-9"	1'-0"	1'-0"	1'-0"	1'-0"	2'-0"	2'-9"	4'-9"	6'-6"	7'-0"	9'-3"	11'-3"

EXAMPLE:
Determine the allowable location for an 8" round hole in an 11⅞" BLI 60 joist spanning 17'- 4". In the leftmost column locate the joist depth of 11⅞". In the next column, find both the 16' row and the 18' row. Following the 16' row across to the column for an 8" diameter hole yields a distance of 6'-6". The 18' row yields a distance of 8'-0". The larger distance controls, so 8'-0" is the minimum clear distance for an 8" round hole.

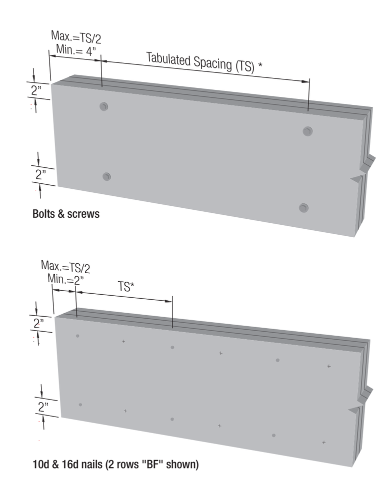
NOTES:
1. Hole locations are based on uniform loads of 40 psf live and 10 or 20 psf dead, and worst case of simple or multiple spans.
2. For joist clear spans between those shown, check minimum distance for both spans adjacent to that span, and use the larger distance. Example: 7" diameter hole in 16" joist clear spanning 21'-9". At 20', tabulated distance is 3'-3"; at 22', distance is 2'-6". Use 3'-3" as minimum distance.
3. For multiple span applications, use longest span to determine permissible hole locations in either span.
4. Holes may be placed vertically anywhere in web, but a minimum clearance of ⅛" must be maintained from flange.
5. To determine locations for rectangular holes, multiply longest side of rectangular hole by 1.33 and use table to find location for that round hole diameter. Then add (round hole diameter – rectangular hole length) / 2. Example: for a rectangular hole 4" long and 6" high, the longest side is 6", so the round hole diameter to look up would be 1.33 x 6, or 8". Say the tabulated minimum distance for the 8" hole is 10'-0". Adding (8"- 4") / 2, or 2" gives a minimum distance of 10'-2" for the rectangular hole.
6. Small holes (1½" diameter and less) may be located anywhere in web if: A) Spaced a minimum horizontal clear distance of 2 diameters, but no less than 1", from any hole, B) No more than 2 small holes are placed next to each other and/or adjacent to larger holes, and C) Adjacent groups of small holes are spaced a minimum horizontal clear distance of 12".
7. Holes larger than 1½" diameter must meet the following requirements for minimum clear distance between holes: A) Two round holes - 2 times the larger hole diameter. B) A rectangular hole and a round hole - 2 times the hole diameter or 2 times the rectangular hole width, whichever is greater.
8. Multiple round holes grouped closely together may be considered as a single hole circumscribing them.
9. For other conditions, or for more precise hole locations, use DOMA® Sizer software.

onCENTER LVL BEARING DETAILS

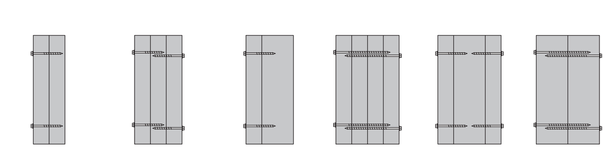
- Required bearing length depends on applied loads, but may not be less than 1½" for end and 3" for intermediate bearings.
- Verify adequacy of supporting material to carry applied loads



MULTIPLE-PLY LVL FASTENING GENERAL NOTES



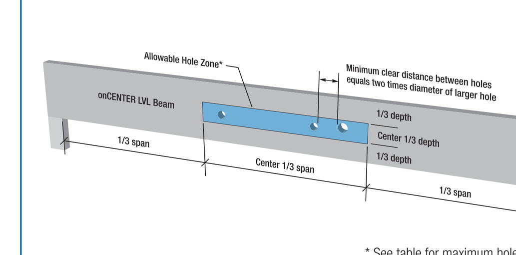
1. These minimum requirements are adequate only when all loads are evenly applied to the top surface of all plies. If loads are applied to the side face(s) of the beam, see designer's specifications.
2. Table below shows required fastener spacings and number of rows. End distances and edge distances must comply with diagram on the left. For offset fastening patterns, maximum end distance applies to all rows.
3. Fastening requirements for depths less than 7¼" require special consideration. Contact BlueLinx.
4. All fasteners must have full embedment of the shank, but must not be over-driven, over-tightened, or countersunk.
5. Bolt hole diameter must be ¹⁄₃₂" to ¹⁄₁₆" larger than the bolt diameter. Bolts are to meet ASTM A307 or SAE J429 grades. Each bolt must extend through the full thickness of the member and at least ½" beyond. Use washers under the head and nut.
6. Carriage bolts (½" diameter) are acceptable to use for the ½" bolt fastener. Carriage bolt heads may be drawn into the face of the LVL beam such that the top of the heads are even with the exterior face of the outer ply of the LVL.
7. Spacings closer than those indicated may be acceptable, but require evaluation. Please contact BlueLinx.
8. SDS and SDW structural screws are produced by Simpson Strong-Tie® Company, Inc. WS structural screws are produced by United Steel Products Company. TrussLOK® structural screws are produced by FastenMaster-OMG, Inc. Install screws per the specific manufacturer's guidelines.



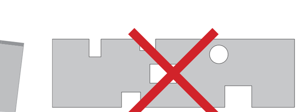
Fastener Type	LVL Depth	3½" Wide 2-ply 1¾"	5¼" Wide 3-ply 1¾"	5¼" Wide 1¾" + 3½"	7" Wide 4-ply 1¾"	7" Wide 1¾" + 3½" + 1¾"	7" Wide 2-ply 3½"
10d Box Nails (0.128" x 3")	7¼" ≤ d < 14"	3 rows @ 12" o.c.	3 rows @ 12" o.c. (BF)	3 rows @ 12" o.c.	-	3 rows @ 12" o.c. (BF)	-
	d ≥ 14"	4 rows @ 12" o.c.	4 rows @ 12" o.c. (BF)	4 rows @ 12" o.c.	-	4 rows @ 12" o.c. (BF)	-
16d Common Nails (0.162" x 3½")	7¼" ≤ d < 14"	2 rows @ 12" o.c.	2 rows @ 12" o.c. (BF)	2 rows @ 12" o.c.	-	2 rows @ 12" o.c. (BF)	-
	d ≥ 14"	3 rows @ 12" o.c.	3 rows @ 12" o.c. (BF)	3 rows @ 12" o.c.	-	3 rows @ 12" o.c. (BF)	-
3⅜", 3½" Screws	d ≥ 7¼"	2 rows @ 24" o.c.	2 rows @ 24" o.c. (BF)	2 rows @ 24" o.c.	-	2 rows @ 24" o.c. (BF)	-
5" Screws		-	2 rows @ 24" o.c.		-		
6" Screws		-	-		2 rows @ 24" o.c. (BF)		
6¾" Screws		-	-		2 rows @ 24" o.c.		
½" Through Bolts		2 rows @ 24" o.c.	2 rows @ 24" o.c.		2 rows @ 24" o.c.		

NOTES:
1. Screws are SDS, SDW, WS, or TrussLOK.
2. If "BF" is shown, fastener schedule must be repeated on each face, with fasteners on back face offset one-half the indicated spacing of front face.

ALLOWABLE HORIZONTAL HOLES IN onCENTER LVL



* See table for maximum hole sizes



DO NOT cut, notch, or drill onCENTER LVL except as shown in this guide.

Allowable Hole Sizes

Beam Depth	Maximum Round Hole Diameter
4⅜"	¾"
5½"	1⅛"
7¼"	1½"
9¼" - 24"	2"

NOTES:
1. Hole(s) must be located entirely in the Allowable Hole Zone.
2. Rectangular holes not allowed.
3. No more than 3 holes allowed per span.
4. Table applies to single and multiple span uniformly loaded beams only. Table not valid for cantilevers.
5. To avoid problems with rigid pipes, consider hole location, clearance, and effects of beam deflection.

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onCENTER™ BlueLinx Engineered Products

BlueLinx Corporation
4300 Wildwood Parkway
Atlanta, GA 30339
1-877-914-7770
www.buildonCENTER.com

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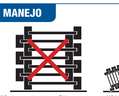
Printed in the U.S.A. on recycled paper. 1/13 Lit. Item # OCLIG

ALMACENAMIENTO Y MANEJO

Proteja de la humedad y el clima. Mantenga los materiales cubiertos con la envoltura de fábrica hasta el momento de usarlos. Almacene sobre el suelo nivelado y sobre usando bloques de soporte apilados de 10' de ancho a centro para mantener los bultos alejados del suelo y permitir la circulación del aire.



NO almacene las vigueta BLI horizontalmente. (La UI, y los bordes onCENTER deben apilarse horizontalmente).

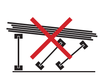
NO levante las vigueta BLI por brida superior con ascensor tenedor.

NO levante las vigueta BLI horizontalmente.

PRECAUCIONES DE SEGURIDAD

Use lentes de seguridad, guantes, cascos y otro equipo de protección personal al manejar e instalar la madera diseñada onCENTER. Contacto BlueLinx para de datos seguridad de materiales de la hoja la información.

NO camine sobre madera diseñada onCENTER que está reposando horizontalmente.



NO apile los materiales de construcción sobre vigueta sin revestimiento. Apile sólo sobre muros de carga o vigas principales.

NO use productos dañados.

REQUISITOS DE REFORZAMIENTO

NO permita el acceso a trabajadores o cargas sobre las vigueta de madera diseñada hasta que estén instaladas o reforzadas apropiadamente.

1. Las viguetas son inestables hasta que se fijan correctamente y se refuerzan lateralmente.
   Al no proporcionar estabilidad pueden provocar accidentes graves.
2. Soporte las viguetas y vigas para que no giren en los soportes de los extremos usando paredes de bloques, arriostramiento o cierre continuo (tabla de rebordo, vigueta de borde o panel estructural).
3. Instale todos los sujetadores en cada viguetа, viga, conector, panel de bloques, arriostramiento o cierre continuo a medida que se instalen.
4. La sujeción lateral, como una pared de extremo reforzada o una cubierta existente, debe estabilizarse paralela a la primera viguetа de una secuencia. Esto también puede lograrse con una cubierta temporal (permanentemente) sujetada a todo el tramo de los primeros 4' de viguetas de la secuencia.
5. Las hileras de reforzamiento temporal instaladas en ángulos rectos a las viguetas y con espacios de no más de 10' centro a centro deben extenderse hasta la sujeción lateral estabilizada. El reforzamiento debe ser como mínimo de 1x4, al menos 8' de largo, fijado a la cara superior de cada viguetа con un mínimo de dos clavos 8d (1-0d si el reforzamiento es de 2x4). Los extremos del reforzamiento deben trasladarse al menos en dos viguetas.
6. Los extremos de los voladizos requieren reforzamiento temporal en la brida superior e inferior.
7. El revestimiento debe fijarse por completo a cada viguetа BLI antes de aplicar cargas adicionales al sistema.
8. Las bridas de la viguetа deben permanecer rectas a ½" de la alineación correcta.

NOTAS DE INSTALACIÓN

1. Los productos onCENTER de BlueLinx deben protegerse del clima y usarse sólo en condiciones bajo techo y de uso en seco (el contenido de humedad de la madera diseñada no debe ser mayor a 16%).
2. La madera diseñada no debe instalarse en contacto directo con mampostería u concreto.
3. Las viguetas de BLI deben ser soportadas por la brida inferior en los muros o vigas o conectores. No deben ser soportadas por la brida superior, por una tabla de rebordo no estructural ni por un clavado oblicuo en una viga o larguero.
4. Para las viguetas BLI, el tramo del reforzamiento extremo mínimo es 1½", el tramo del reforzamiento intermedio mínimo es 3½".
5. Al clavar en la cara ancha de las bridas de las viguetas BLI, mantenga el espacio dentro de los siguientes rangos:

Separación de clavos en las bridas				
Tamaño del clavo	BLI 400, 700, 900		BLI 40, 60, 80, 90	
	Mín.	Máx.	Mín.	Máx.
Caja de 8d, común de 8d, caja de 10d, caja de 12d	2"	24"	4"	24"
Común de 10d, común de 12d	3"	24"	4"	24"

NOTAS:
1. Cuando se requiera más de una hilera de clavos, deslizar las hileras por al menos ½".
2. Pueden usarse grapas de calibre 14 en lugar de clavos 8d si la penetración en la brida de la vigueta es al menos 1".
3. No use clavos más largos que los mostrados anteriormente al unir el revestimiento a las viguetas BLI.
6. Las viguetas BLI están fabricadas sin curvatura y pueden instalarse con la lectura de las marcas hacia arriba o hacia abajo.
7. Excepto cuando se corta a la medida o para cortes de pico de pájaro, las bridas de la vigueta BLI no deben cortarse, chaflanarse, avinagrarse o barrenarse.
8. Las cargas concentradas deben ser soportadas por la superficie superior de la brida superior y no colgarse de la brida inferior (Excepciones: accesorios de iluminación, ventiladores de techo, etc.).
9. Cuando el tipo de clavo no se especifica en esta guía, pueden usarse clavos comunes, de caja o perforadores.
10. Ciertas aplicaciones de calefacción radiante con grapas pueden aumentar la desviación de las viguetas doble T con bridas sólidas debido a un secado desigual dentro de la cavidad del piso. Contacte a BlueLinx para más información.
11. Con la madera tratada con conservadores, use sólo conectores o sujetadores de acero inoxidable o acero galvanizado por inmersión en caliente y otros accesorios de metal como lo requiere el código. Como un requerimiento mínimo, los sujetadores galvanizados por inmersión en caliente deben apegarse al Estándar A 153 de ASTM y los conectores galvanizados por inmersión en caliente deben apegarse al Estándar A 653 (Clase G-185) de ASTM. En entornos altamente corrosivos, deben usarse conectores y sujetadores de acero inoxidable.

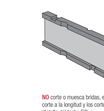
PRECAUCIONES DE LA INSTALACIÓN

NO soporte las viguetas BLI por la brida superior o el alma.

NO viole las reglas de la tabla de agujeros.

NO bisele la vigueta BLI más allá de la cara del muro. Vea detalle F8.

NO corte en pico de pájaro la brida inferior en el extremo alto de la vigueta BLI de techo. Vea el detalle del techo R6.



NO corte o muesca bridas, excepto para el corte a la medida y los cortes pico de pájaro (detalle del techo R6).

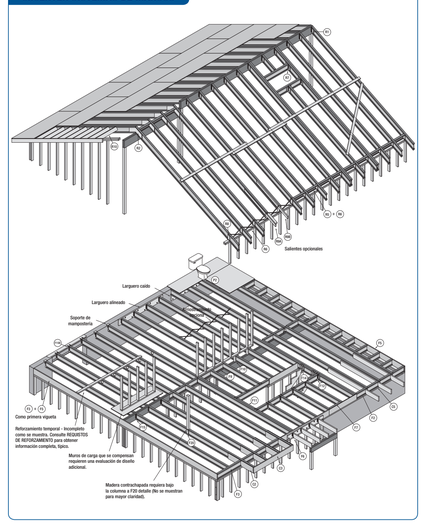
DISTANCIAS MÁXIMAS DE LAS VIGUETAS

40 PSF carga viva + 10 PSF carga muerta (L/480)

Joist Series	Joist Depth	Distancia simple				Distancia múltiple			
		12" o.c.	16" o.c.	19.2" o.c.	24" o.c.	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
BLI 40 / BLI 400	9¼"	18'-00"	16'-05"	15'-06"	14'-06"	19'-07"	17'-11"	16'-04"	14'-07"
	11¼"	21'-05"	19'-07"	18'-06"	16'-08"	23'-00"	20'-05"	18'-07"	16'-07"
BLI 40	14"	24'-04"	22'-03"	20'-06"	18'-04"	25'-11"	22'-05"	20'-05"	18'-02"
	16"	26'-11"	24'-03"	22'-01"	19'-09"	27'-11"	24'-02"	22'-00"	19'-08"
BLI 60	11¼"	22'-02"	20'-08"	19'-06"	18'-02"	24'-08"	22'-06"	21'-02"	19'-02"
	14"	25'-09"	23'-06"	22'-02"	20'-08"	28'-00"	25'-07"	24'-01"	19'-09"
	16"	28'-06"	26'-00"	24'-05"	22'-10"	31'-01"	28'-04"	24'-00"	19'-09"
	18"	31'-03"	28'-06"	26'-11"	24'-10"	34'-01"	29'-09"	24'-09"	19'-09"
BLI 80	11¼"	24'-11"	22'-08"	21'-04"	19'-10"	27'-01"	24'-08"	23'-03"	21'-07"
	14"	28'-02"	25'-07"	24'-02"	22'-07"	30'-10"	28'-00"	25'-11"	23'-11"
	16"	31'-04"	28'-06"	26'-10"	25'-00"	34'-02"	31'-01"	29'-03"	23'-11"
	18"	34'-02"	31'-01"	29'-03"	24'-10"	37'-03"	33'-10"	30'-09"	24'-07"
BLI 90	11¼"	25'-07"	23'-03"	21'-11"	20'-05"	27'-11"	25'-04"	23'-10"	21'-11"
	14"	29'-00"	26'-05"	24'-11"	23'-02"	31'-06"	28'-09"	27'-01"	23'-11"
	16"	32'-01"	29'-03"	27'-06"	25'-05"	35'-00"	31'-10"	29'-11"	25'-11"
	18"	35'-01"	31'-11"	30'-01"	24'-10"	38'-03"	34'-09"	31'-09"	25'-05"
BLI 700	11¼"	23'-09"	21'-07"	19'-10"	18'-06"	25'-01"	22'-10"	21'-01"	18'-06"
	14"	26'-01"	23'-10"	22'-06"	20'-11"	28'-05"	25'-11"	23'-02"	18'-06"
	16"	29'-00"	26'-05"	24'-11"	23'-01"	31'-07"	27'-10"	27'-02"	23'-02"
BLI 900	11¼"	26'-04"	24'-00"	22'-07"	21'-00"	28'-08"	26'-01"	24'-07"	22'-10"
	14"	29'-11"	27'-02"	25'-07"	23'-10"	32'-07"	29'-07"	27'-10"	25'-11"
	16"	33'-01"	30'-01"	28'-04"	26'-04"	36'-01"	32'-09"	30'-10"	26'-07"

NOTAS:
1. Las distancias son el espacio entre los soportes y se basan en cargas uniformes.
2. La deviación de carga viva se limita a L/480, sólo si las viguetas son un tercio más rígidas de lo requerido por el código. La experiencia ha demostrado que los pisos diseñados según la deviación de carga viva mínima requerida por el código (L/360) pueden no cumplir con las expectativas del residente en cuanto al desempeño del piso.
3. Las distancias se basan en la acción del compuesto con el revestimiento APA Rated clavado o pegado o paneles de Sturd-I-Floor con grosor mínimo de ¾" (19/20 o 20 oc) para una separación de viguetas de 19.2" o menos, o 7/8" (48/24 o 2.4 oc) para una separación de viguetas de 24". Aplique una línea continua de adhesivo de ¼" de diámetro (cumpliendo con APA AFG-01 o ASTM D 3498) a las bridas superiores de las viguetas. Las superficies deben estar limpias y secas. Si el revestimiento sólo se fija con clavos (no se recomienda), reduzca las separaciones en 12".
4. Tramo de refuerzamiento mínimo: 1½" (extremo), 3½" (intermedio).
5. Para viguetas de distancia múltiple: Las distancias de extremos deben ser al menos un 40% de la distancia adyacente.
6. Distancias en la tabla de arriba cubren una amplia gama de combinaciones de distancia. Distancias individuales y múltiples, no requieren ingeniería. Distancias más largas puede ser posible mediante el análisis de una condición distancia específica y / o mediante la adición de rigidizadores de soporte. Comprueba el uso de software DOMA Size™.
7. Para las cargas distintas a las mostradas anteriormente, consulte las Tablas de carga uniforme en la guía del producto de onCENTER, use el software DOMA Size o contacte al servicio técnico para madera diseñada de BlueLinx.

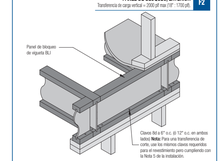
onCENTER SISTEMAS DE MARCOS



F1 CONEXIÓN EN REFORZAMIENTO DE EXTREMO

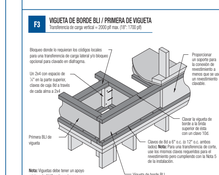
F2 PANEL DE BLOQUEO, EXTERIOR

Transferencia de carga vertical = 2000 pif max (10' - 1700 plf)



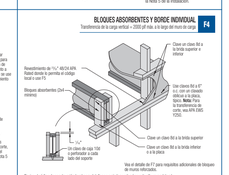
F3 VIGUETA DE BORDE BLI / PRIMERA DE VIGUETA

Transferencia de carga vertical = 2000 plf max (10' - 1700 plf)



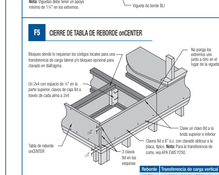
F4 BLOQUES ABSORBENTES Y BORDE INDIVIDUAL

Transferencia de la carga vertical = 2000 plf max. a lo largo del muro de carga



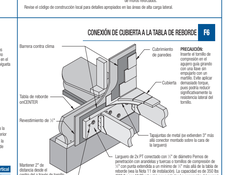
Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

F5 CIERRE DE TABLA DE REBORDE onCENTER



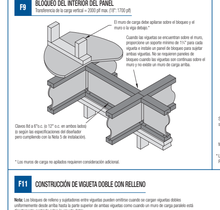
Rebordo	Transferencia de carga vertical
1"	2000 plf (10" - 2700 plf)
1½"	4400 plf (18" - 3960 plf)

F6 CONEXIÓN DE CUBIERTA A LA TABLA DE REBORDE



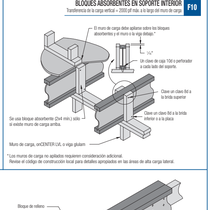
Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

F7 PANEL DE BLOQUEO USADO PARA REFORZAR



Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

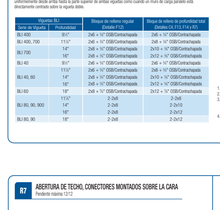
F8 CORTE BISELADO DE VIGUETA



Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

F9 BLOQUEO DEL INTERIOR DEL PANEL

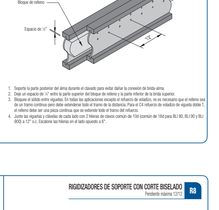
Transferencia de la carga vertical = 2000 plf max. (10' - 1700 plf)



* Los muros de carga no aplicados requieren consideración adicional.

F10 BLOQUES ABSORBENTES EN SOPORTE INTERIOR

Transferencia de la carga vertical = 2000 plf max a lo largo del muro de carga



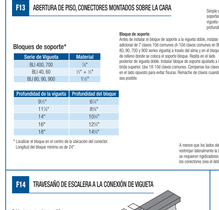
* Los muros de carga no aplicados requieren consideración adicional.
Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

F11 CONSTRUCCIÓN DE VIGUETA DOBLE CON RELLENO

Nota: Las bloques de relleno y sujetadores entre viguetas pueden omitirse cuando se cargan viguetas dobles uniformemente donde arriba hasta la parte superior de ambas viguetas como cuando un muro de carga paralelo está directamente contenido sobre la vigueta doble.

Viguetas BLI		Bloque de relleno requerido	Bloque de relleno de perforación/ clavo
Serie de Vigueta	Profundidad	Ambos (12" O.C.)	Ambos (12" O.C.)
BLI 400, 700	9¼"	2x6 + ¾" OSB/Contrachapado	2x6 + ¾" OSB/Contrachapado
BLI 400, 700	11¼"	2x6 + ¾" OSB/Contrachapado	2x6 + ¾" OSB/Contrachapado
BLI 700	14"	2x6 + ¾" OSB/Contrachapado	2x10 + ¾" OSB/Contrachapado
	16"	2x6 + ¾" OSB/Contrachapado	2x10 + ¾" OSB/Contrachapado
BLI 40	9¼"	2x6 + ¾" OSB/Contrachapado	2x6 + ¾" OSB/Contrachapado
	11¼"	2x6 + ¾" OSB/Contrachapado	2x6 + ¾" OSB/Contrachapado
BLI 40, 60	14"	2x6 + ¾" OSB/Contrachapado	2x10 + ¾" OSB/Contrachapado
	16"	2x6 + ¾" OSB/Contrachapado	2x10 + ¾" OSB/Contrachapado
BLI 60	18"	2x6 + ¾" OSB/Contrachapado	2x12 + ¾" OSB/Contrachapado
BLI 80, 90, 900	11¼"	2-2x6	2-2x6
	14"	2-2x6	2-2x10
	16"	2-2x6	2-2x10
BLI 80, 90	18"	2-2x6	2-2x12

F12 ABERTURA DE PISO, CONECTORES MONTADOS EN LA PARTE SUPERIOR



Bloques de soporte*

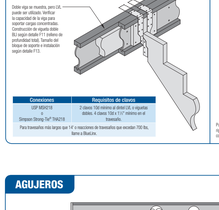
Serie de Vigueta	Material
BLI 400, 700	¾"
BLI 40, 60	½" + ½"
BLI 80, 90, 900	½"+ ½"

Profundidad de la viguetа	Profundidad del bloque
9½"	6½"
11¼"	8½"
14"	10½"
16"	12½"
18"	14½"

* Localizar el bloque en el centro de la ubicación del conector.
Longitud del bloque mínimo es de 24".

* Los muros de carga no aplicados requieren consideración adicional.
Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

F13 ABERTURA DE PISO, CONECTORES MONTADOS SOBRE LA CARA



Bloques de soporte*

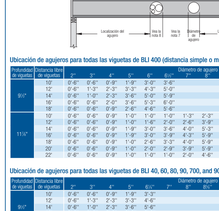
Serie de Vigueta	Material
BLI 400, 700	¾"
BLI 40, 60	½" + ½"
BLI 80, 90, 900	½"+ ½"

Profundidad de la viguetа	Profundidad del bloque
9½"	6½"
11¼"	8½"
14"	10½"
16"	12½"
18"	14½"

* Localizar el bloque en el centro de la ubicación del conector.
Longitud del bloque mínimo es de 24".

* Los muros de carga no aplicados requieren consideración adicional.
Revise el código de construcción local para detalles aprobados en las áreas de alta carga lateral.

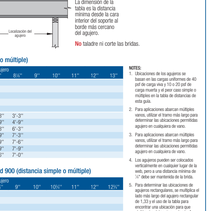
F14 TRAVESAÑO DE ESCALERA A LA CONEXIÓN DE VIGUETA



Conexiones	Requisitos de clavos
USP MSH218	2 clavos 10d mínimo al detal'OE, a viguetas dobles. 4 clavos 10d x 1½" mínimo en el travesaño.
Simpson Strong-Tie® TWA218	

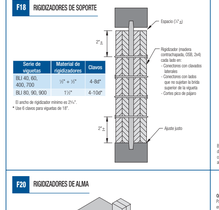
Para travesaños más largos que 14' o reacciones de travesaños que exceden 700 lbs, llame a BlueLinx.

F15 CONEXIÓN VIGUETA A VIGA

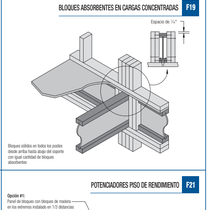


* Asiento suave conectores empotrados montados en la cara, pero requiere bloques de madera sólida fijada adecuadamente a la viga de acero.

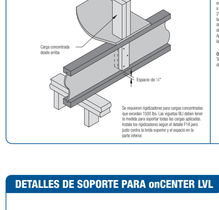
F16 CONEXIÓN VIGUETA A VIGA, ESCALÓN



F17 CONEXIÓN VIGUETA A VIGA CAÍDA, ESCALÓN



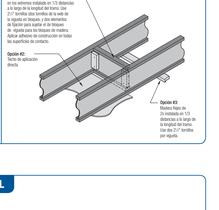
F18 RIGIDIZADORES DE SOPORTE



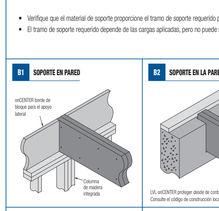
Serie de Vigueta	Material de rigidizadores	Clavos
BLI 40, 60, 400, 700	½" + ½"	4-16d*
BLI 80, 90, 900	¾"	4-10d*

* Ancho de rigidizador mínimo es 3½".
* Use 6 clavos para viguetas de 18".

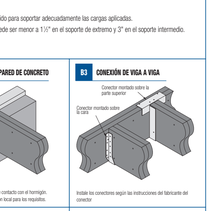
F19 BLOQUES ABSORBENTES EN CARGAS CONCENTRADAS



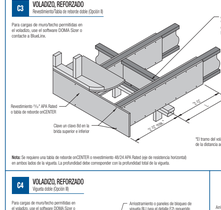
F20 RIGIDIZADORES DE ALMA



F21 POTENCIADORES PISO DE RENDIMIENTO



C1 VOLADIZO, NO REFORZADO

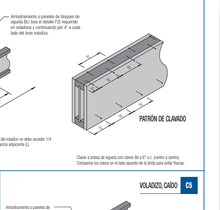


*El tramo del voladizo no debe exceder 1/4 de la distancia adyacente (L)

Nota: Se requiere una tabla de reborde onCENTER o revestimiento 48/24 APA Rated (ejp de resistencia horizontal) en el lado de la vigueta. La profundidad debe corresponder con la profundidad total de la vigueta.

C2 VOLADIZO, REFORZADO

Revestimiento Tabla de reborde doble (Opción A)



*El tramo del voladizo no debe exceder 1/4 de la distancia adyacente (L)

Nota: Se requiere una tabla de reborde onCENTER o revestimiento 48/24 APA Rated (ejp de resistencia horizontal) a un lado de la vigueta. La profundidad debe corresponder con la profundidad total de la vigueta. Clave a las bridas de la vigueta con clavos 8d a 6" o c.

C3 VOLADIZO, REFORZADO

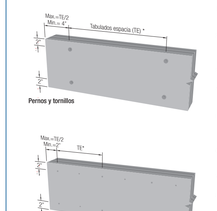
Revestimiento Tabla de reborde doble (Opción B)

*El tramo del voladizo no debe exceder 1/4 de la distancia adyacente (L)

Nota: Se requiere una tabla de reborde onCENTER o revestimiento 48/24 APA Rated (ejp de resistencia horizontal) en el lado de la vigueta. La profundidad debe corresponder con la profundidad total de la vigueta. Clave a las bridas de la vigueta con clavos 8d a 6" o c. Cumpla la sunting Compense los clavos en el lado opuesto de la brida para evitar fisuras.

C4 VOLADIZO, REFORZADO

Tabla de reborde doble (Opción B)



Nota: Coloque los bloques en todo el tramo con bloques de relleno de profundidad total. Vea el detalle F11 para el bloque de relleno. Clave a las bridas de la vigueta con clavos 8d a 6" o c. Cumpla la sunting Compense los clavos en el lado opuesto de la brida para evitar fisuras. Use un clavo cada lado para otras profundidades, use 3 hileras de clavos 10d (16d para BLI 80 y 90) a 12" o c. en cada lado, compense el clavado del lado contrario por 6".

C5 VOLADIZO, CAÍDO

P1 SEPARACIÓN DE VIGUETAS DEBAJO DEL MURO CON INSTALACIÓN DE PLOMERÍA

Separación de viguetas

Vigueta	Main 2x4	Main 2x6
BLI 40, 60, 400, 700	6"	8"
BLI 80, 90, 900	7"	9"

*Proporcionar bloques entre las viguetas adyacentes cuando se necesite para soportar los extremos de las paredes.

P2 SEPARACIÓN DE VIGUETAS DEBAJO DE LOS ACCESORIOS DE PLOMERÍA

Puede no ser apropiado para algunas mesadevelad