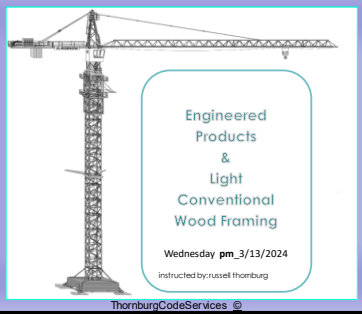
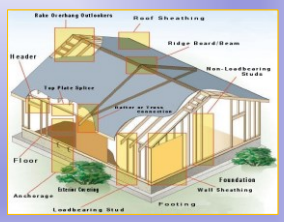


Conventional Wood Framing

- Foundation anchorage
- Floor, wall, and roof framing
- Girders and headers
- Notching and boring
- Braced wall panels
- Load path verification
- Fasteners and Fireblocking



Disclaimer

- The opinions expressed in this presentation are the opinions of the presenter, Russell Thornburg, and do not represent the official opinion of the *International Code Council (ICC) or that* of the administrative authority of any Jurisdiction, County or State. As always, the Building Official of the Jurisdiction is the **Final** Authority.
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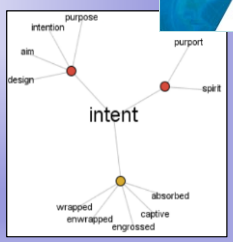
- The text in this presentation does not necessarily represent actual code language. The presented text may summarize, highlight or generalize the code section. Additional provisions or exceptions may be included in the actual code section. Many references to the code sections are given for the purpose of you verifying the complete provisions of those section/s.

Understanding the intent

- Know the Big Picture
- Identify Code Requirements
- Know Tables
- Interpret Code Accurately



R101.3

Applicability

- Conflict: general and specific = specific
- Differences: code and referenced standards = code
- Where: specific and code = most restrictive shall govern
- When: code and standard violates listing = listing and manufacturer's shall apply

dd vs. R317.3.1

R102.1

Administration

- Work exempt from permit

  …. Exemption from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction.

R105.2

Administration

- Construction Documents

  Manufacturer's installation instructions

  Manufacturer's installation instructions, as required by this code, shall be available on the job site at the time of inspection.

R106.1.2

Framing Inspection

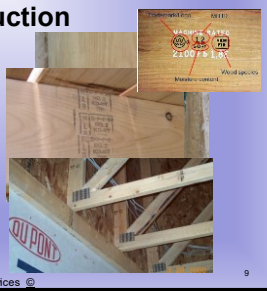
- Made after the roof, masonry, all framing, firestopping, draftstopping and bracing are in place, and
- Made after the plumbing, mechanical and electrical rough inspections are approved.

Do not cover until all has been inspected and approved.

R109.1.4

Floors, Walls, Ceilings & Roofs Construction

- All dimension lumber for shall be identified by a grade mark, certification or approved inspection agency.



R502.1, 602.1. 802.1 Identification

Floors, Walls, Ceilings & Roofs Construction

Lumber grade

- Blocking: floors & rafters – utility
- Floor joist- #3
- Girders/Headers- # 2
- Studs - # 3 or stud grade and NLB walls - Utility
- Cantilever floor joist #2
- Rafters – SS - # 3

R502., Table R502.3.3(1) fnt b, 602.2. 802

Protection against Decay

All wood meeting these parameters required to be preservative-treated in accordance with AWPA U1

- Joists or the bottom of a wood structural floor <18"
- Girders <12" to the exposed ground
- All wood framing members that rest on concrete or masonry exterior foundation walls & < 8" exposed ground

R317.1, R402.1.2

American Wood Protection Association

Protection against Decay

Location required.

2. & 3 All sills or plates that rest on concrete or masonry exterior walls *and* are less than 8 inches from exposed earth.

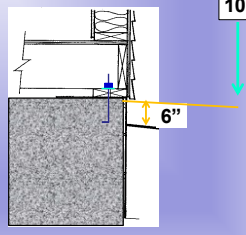
R317.1

Protection against Decay

- Wood siding, sheathing and wall framing on the exterior of a building having a clearance of < 6" from exposed ground
- < 2" measured vertically from concrete steps, porch slabs, patio slabs, and similar horizontal surfaces exposed to the weather

R317.1 item 5

- Lots shall be graded to drain surface water away from foundation walls.
- The grade shall fall not fewer than 6" w/n the first 10'



R401.3 Drainage

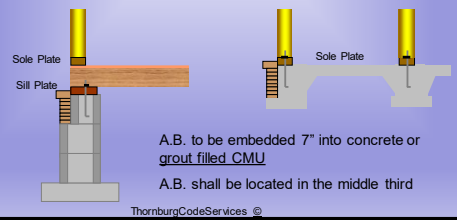
Foundation Anchorage

- Sill plates and walls supported directly on continuous foundation shall be anchored to the foundation in accordance with this section.
- Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs *and* all wood sill plates shall anchored to the foundation with anchor blots spaced a maximum of 6 feet on center.

IRC R403.1.6

R403.1.6: Foundation Anchorage

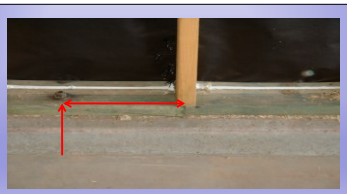
Definitions: *sill plate, sole plate*



A.B. to be embedded 7" into concrete or grout filled CMU

A.B. shall be located in the middle third

1. Minimum of ***two*** anchor bolts per plate section.
2. ***One*** bolt located not more than 12 inches nor less than seven bolts diameters (3.5") from each end of each plates.
3. Bolts **shall be** at least ½" diameter and embedded a minimum of seven inches into masonry or concrete.
4. Located in ***Middle third***



R403.1.6 Foundation Anchorage

Foundation

Foundation anchorage.

Question: How close to the edge of the plate can the hole be drilled?

Answer: The bolts shall be located in the middle third of the width of the plate. If engineered by the (NDS), for loads perpendicular to the grain, states the minimum edge distance is four times the diameter of the bolt (measured to the center of the bolt).

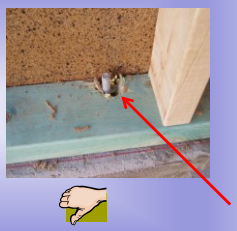
R403.1.6 & NDS, WFCM

Foundation

Foundation anchorage.

Question: Are there limitations on the size of the hole for the bolt?

Answer: Although not specifically noted in the code, the NDS specifies that holes drilled for bolts shall be a minimum of 1/32 inch to a maximum of 1/16 inch larger than the bolt diameter (9/16 inch to 5/8 inch for a ½ inch diameter bolt).



IRC R403.1.6 & NDS WFCM

Placement of the Anchor Bolts

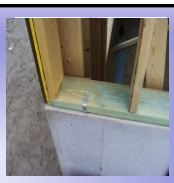
Foundation

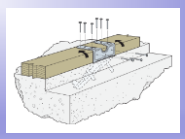
Foundation anchorage.

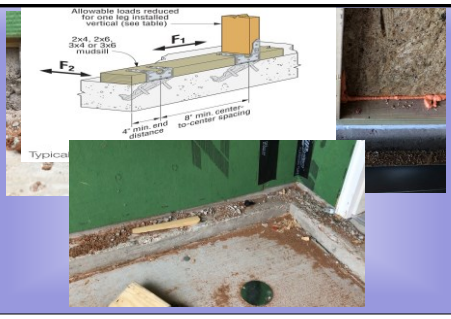
Question: Can anchor straps be used instead of the bolts?

Answer: If approved by the building official (based on testing, submittal documents, ES reports, etc.).

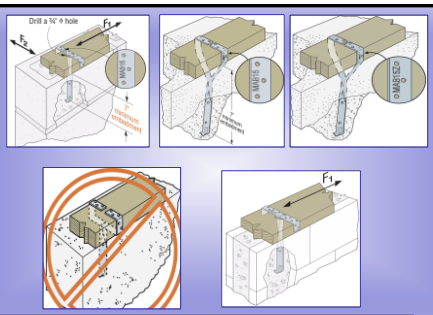
Evaluation Service (ES) Reports can be found at www.icc-es.org - (straps continued)







https://www.strongtie.com/mudsillanchors_concreteconnectorsandanchors/masa_anchor/p/masa



https://www.strongtie.com/mudsillanchors_concreteconnectorsandanchors/mab_anchor/p/mab

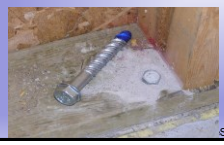
Foundation

Foundation anchorage.

Question: Can the sill plate overhang the foundation wall?

Answer: Although not clearly specified in R403.1.6 of the code, in Section 2.4.1.3 of the WFCM, "Bottom Plate," it notes that bottom plates that are connected directly to the foundation shall have full bearing on the foundation.

Foundation Anchorage



Foundation

Protection against decay.

Question: Is the interior foundation wall sill plate required to be pressure preservative treated or a species that is naturally durable?

Answer: Yes, unless separated from the ground by an impervious moisture barrier. Section R506.2.3 requires the installation of a 6 mil poly or approved vapor retarder with joints lapped between the slab and sub grade.

R317.1 & R506.2.3

Foundation

Foundation anchorage.

Question: Is a deck or porch post or addition support required to be anchored to the foundation?

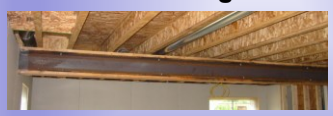
Answer: Yes. It is to be designed to resist lateral movement and uplift.

Wood shall be pressure-preservative treated & dried after treatment in accordance with AWPA U1 (Commodity Specification A, Special Requirement 4.2), and shall bear the *label* of an accredited agency.

R402.1.2 Wood treatment, R407.3 Structural requirements, R507.8.1

Load path not complete to foundation.

Design Criteria



Not addressed in code

Fastener Schedule

Design and construction.

Question: Where are the nailing requirements for framing members (plates, studs, joists, rafters, ties, bracing, sheathing, etc.)?

Answer: Most of the fastening provisions are in the tables and figures in IRC Chapter 6.
(continued on next page)

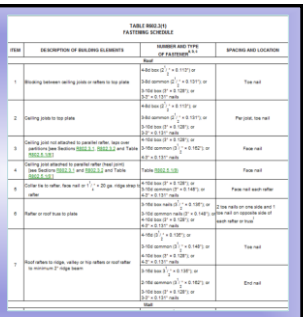
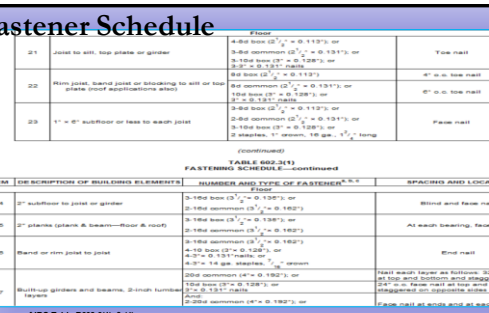


TABLE R602.3(1)
FASTENING SCHEDULE

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION
	Roof		
1	Blocking between ceiling joists or rafters to top plate	4-8d box ($2\frac{1}{2}$" × 0.113"); or 3-8d common ($2\frac{1}{2}$" × 0.131"); or 3-10d box (3" × 0.128"); or 3" × 0.131" nails	Toe nail
2	Ceiling joists to top plate	4-8d box ($2\frac{1}{2}$" × 0.113"); or 3-8d common ($2\frac{1}{2}$" × 0.131"); or 3-10d box (3" × 0.128"); or 3" × 0.131" nails	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions (see Sections R802.3.1, R802.3.2 and Table R802.5.1(9))	4-10d box (3" × 0.128"); or 3-16d common ($3\frac{1}{2}$" × 0.162"); or 4" × 0.131" nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) (see Sections R802.3.1 and R802.3.2 and Table R802.5.1(9))	Table R802.5.1(9)	Face nail
5	Collar tie to rafter, face nail or $1\frac{1}{2}$" × 20 ga. ridge strap to rafter	4-10d box (3" × 0.128"); or 3-10d common (3" × 0.148"); or 4" × 0.131" nails	Face nail each rafter
6	Rafter or roof truss to plate	4-16d box ($3\frac{1}{2}$" × 0.135"); or 3-16d common nails (3" × 0.148"); or 4-10d box (3" × 0.128"); or 4" × 0.131" nails	2 toe nails on one side and 1 end nail on opposite side of each rafter or truss
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2" ridge beam	4-16d ($3\frac{1}{2}$" × 0.135"); or 3-10d common ($3\frac{1}{2}$" × 0.148"); or 4-10d box (3" × 0.128"); or 4" × 0.131" nails	Toe nail
		3-16d box ($3\frac{1}{2}$" × 0.135"); or 2-16d common ($3\frac{1}{2}$" × 0.162"); or 3-10d box (3" × 0.128"); or 3" × 0.131" nails	End nail
		Wall	

Table R602.3(1)

Fastener Schedule



ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION
	Floor		
21	Joist to sill, top plate or girder	4-8d box ($2\frac{1}{2}$" × 0.113"); or 3-8d common ($2\frac{1}{2}$" × 0.131"); or 3-10d box (3" × 0.128"); or 3" × 0.131" nails	Toe nail
22	Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box ($2\frac{1}{2}$" × 0.113")	4" o.c. toe nail
		8d common ($2\frac{1}{2}$" × 0.131"); or 10d box (3" × 0.128"); or 3" × 0.131" nails	6" o.c. toe nail
23	1" × 6" subfloor or less to each joist	3-8d box ($2\frac{1}{2}$" × 0.113"); or 2-8d common ($2\frac{1}{2}$" × 0.131"); or 3-10d box (3" × 0.128"); or 2 staples, 1" crown, 16 ga., $1\frac{1}{2}$" long	Face nail

(continued)

TABLE 602.3(1)
FASTENING SCHEDULE—continued

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION
	Floor		
24	2" subfloor to joist or girder	3-16d box ($3\frac{1}{2}$" × 0.135"); or 2-16d common ($3\frac{1}{2}$" × 0.162")	Blind and face nail
25	2" planks (plank & beam—floor & roof)	3-16d box ($3\frac{1}{2}$" × 0.135"); or 2-16d common ($3\frac{1}{2}$" × 0.162")	At each bearing, face nail
26	Band or rim joist to joist	3-16d common ($3\frac{1}{2}$" × 0.162") 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails; or 4-3" × 14 ga. staples, $\frac{7}{16}$" crown	End nail
27	Built-up girders and beams, 2-inch lumber layers	20d common (4" × 0.192"); or 10d box (3" × 0.128"); or 3" × 0.131" nails And 2-20d common (4" × 0.192"); or	Nail each layer as follows: 32" o.c. at top and bottom and staggered. At ends and at each splice, nail each layer at top and bottom staggered on opposite sides Face nail at ends and at each splice

Partial scan of IRC Table R602.3(1) & (4);
Table R802.5.1(9)

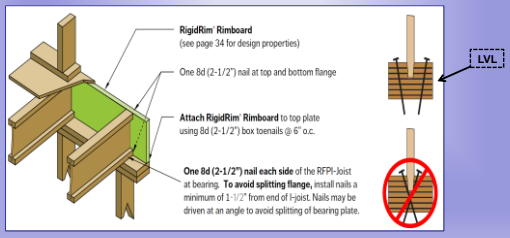
Fasteners – R317.3

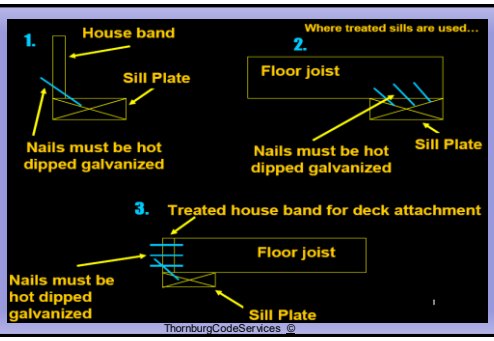
Fasteners for pressure preservative and fire-retardant treated wood shall be hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper in accordance with ASTM A 153.

This provision includes all nails used to attach floor joists, studs, or wall sheathing to the treated wood (it does not apply to ½ inch or greater steel anchor bolts).

Beware of the manufacturer's listing requirements & code language

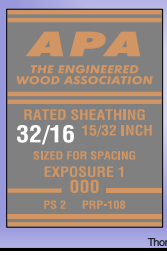
I-Joist Nailing - ???





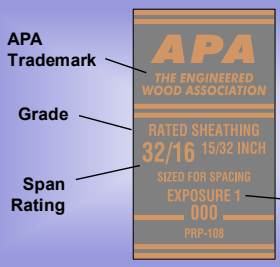
Span Ratings

Why a Safety Load?



Roof Span
Def- L/240
LL 30 PSF
DL 10 PSF

Floor Span
Def- L/360
LL 100 PSF
DL 10 PSF

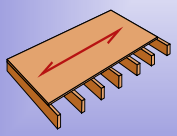


Correct Panel Selection

ROOF
30 psf LL
10 psf DL

FLOOR
100 psf LL
10 psf DL

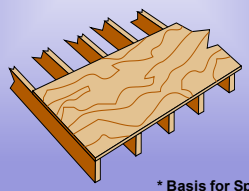
Span Rating Conditions



Strength axis perpendicular to supports

Continuous across 2 or more spans

Always Use Continuous* Spans



* Basis for Span Ratings

Question
(What's wrong with this trademark?)

- Grade?
- Span rating?
- Thickness?

ES REPORT™

ESR-1305

Reissued October 1, 2007

This report is subject to re-examination in one year.

???

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ▪ 5360 Workman Mill Road, Whittier, California 90601 ▪ (562) 699-0543
Regional Office ▪ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ▪ (205) 599-9800
Regional Office ▪ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ▪ (708) 799-2305

DIVISION: 06—WOOD AND PLASTICS
Section: 06170—Prefabricated Structural Wood

REPORT HOLDER:

LOUISIANA-PACIFIC CORPORATION
2706 HIGHWAY 421 NORTH
WILMINGTON, NORTH CAROLINA 28401
(910) 762-8878
www.lpcorp.com

EVALUATION SUBJECT:

LPI 18, LPI 20W, LPI 20, LPI 20X1.8 (ALSO KNOWN AS LPI 20 PLUS), LPI 20X1.5, LPI 32W (ALSO KNOWN AS LPI 32PLUS), LPI 32, AND LPI 42X1.8 (ALSO KNOWN AS LPI 42PLUS) WOOD I-JOISTS AND RIM BOARDS

series, except for the LPI 42X1.8 series, flange width is 2½ inches (64 mm). For the LPI 42X1.8 series, flange width is 3½ inches (89 mm). The flange thickness is 1½ inches (38 mm). The LPI wood I-joist depths range from 9½ to 24 inches (241 to 610 mm).

3.2 Material Specifications:

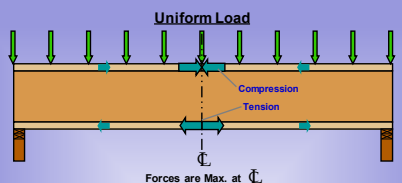
3.2.1 Flanges: Flange material is sawn lumber that meets the requirements noted in the quality control manual that contains the manufacturing standards.

3.2.2 Web: Webs are minimum ⅜-inch-thick (9.5 mm) panel for the 9½- to 16-inch (241 to 406 mm) I-joist depths, and minimum 7/16-inch-thick (11 mm) panel for the 18- to 24-inch (457 to 610 mm) I-joist depths complying with U.S. Voluntary Product Standard PS 2 and the quality control manual.

3.2.3 Adhesives: Adhesives are exterior wet use types complying with ASTM D 2559 and are of the types specified

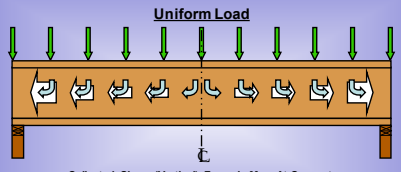
https://icc-es.org/report-listing

Bending Force in Flanges



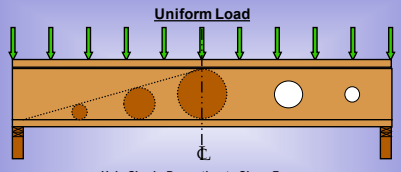
Forces are Max. at ℄

Shear Force in Web



Collected Shear (Vertical) Force is Max. At Support

Holes in Web

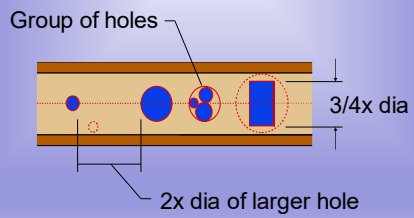


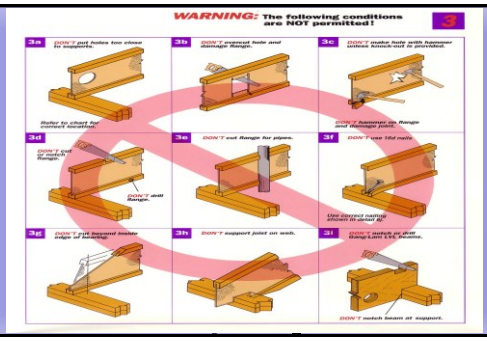
Hole Size in Proportion to Shear Force

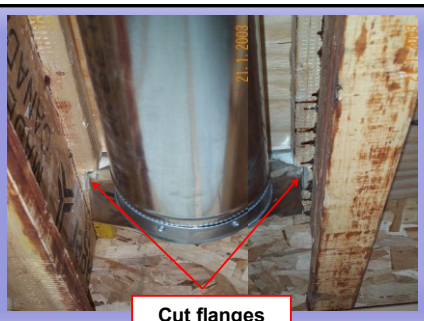
Cutting Holes

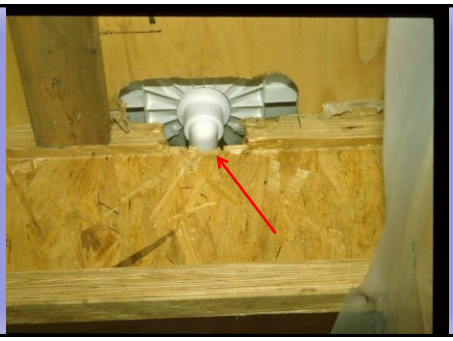
- **Limit 3 maximum size holes per span**
- **A 1-1/2 inch hole can be placed anywhere in the web, provided it has the required distance from adjacent holes**
- **Keep a minimum 1/8" between top or bottom of a hole and the flanges**
- **I-Joist top and bottom flanges must never be cut, notched, or otherwise modified**

I-Joist Holes









55

Rim Board Detail

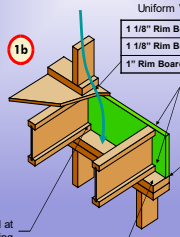
End Bearing Condition shall provide:

- Lateral Bracing
- Vertical Load Transfer

1b

Uniform Vertical Load Transfer

1 1/8" Rim Board Plus	4,850 plf
1 1/8" Rim Board	4,400 plf
1" Rim Board	3,300 plf



One 8d common or box nail at top and bottom flange

Attach Rim Board to top plate using 8d common or box toenails @ 6" o.c.

One 8d face nail at each side at bearing

Min. 1 ¾" bearing required

See EWS D710, Z725 and W345 for additional details

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Installation Notes

Rim Joist Load Transfer Capacities

- PRI Rim Joist/Blocking 2,000 plf
- 1 1/8" Rim Board (d<16") 4,400 plf
- 1 1/8" Rim Board Plus (d<16") 4,850 plf

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Rim Board Over Openings

Grade	F_{be}	E_e	F_{ve}	C_{c_E}
Rim Board and Rim Board Plus	600	550,000	270	550

Rim Boards may be used to span up to 4 feet in length, depending on the applied loads on the opening. For greater spans and additional loads, consider other engineered wood products, such as LVL.

Do not cut holes in Rim Board over opening except for 1-1/2" or less in size.

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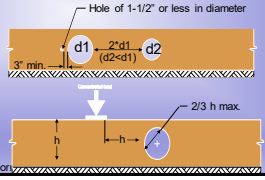
Rim Board Hole Specifications

Rim Board Depth (in.)	Maximum Allowable Hole Size (in.)	Minimum Length of Rim Board Segment for the Maximum Allowable Hole Size (in.)
9-1/2	6-1/4	50
11-7/8	7-3/4	62
14	9-1/4	74
16	10-1/2	84

Hole of 1-1/2" or less in diameter

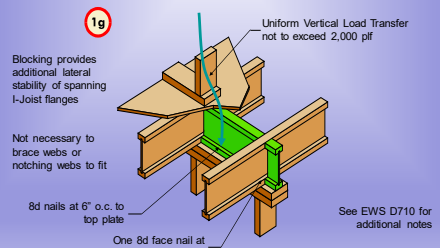


"All holes shall be cut in a workman-like manner."

Thorn

59

Interior Block Panel Detail



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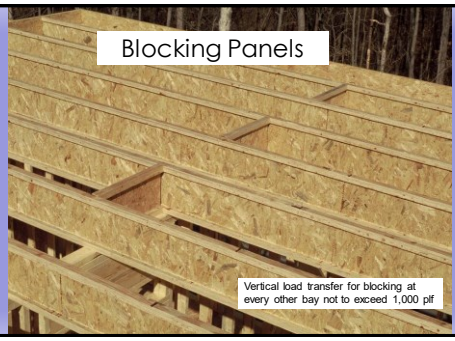
Blocking Panels



Vertical load transfer for blocking at every other bay not to exceed 1,000 plf

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NOTE
The illustration below is showing several suggested applications for the Boise Cascade EWP products. It is not intended to show an actual house under construction.

NO MIDSPAN BRIDGING IS REQUIRED FOR BCI® JOISTS

FOR INSTALLATION STABILITY, Temporary strut lines (1x4 min.) 8' on center max. Fasten at each joist with 2-8d nails minimum.

Dimension lumber is not suitable for use as a rim board in BCI® floor systems.

F01 F02 BCI® rim joist. See Floor Details below.

F07 Boise Cascade Rimboard. See pages 6 and 25 of the Eastern Specifier Guide.

F06 F09 BCI® Joist block or 2x4 "squash" block on each side required when supporting a load-bearing wall above.

When installing Boise Cascade EWP products with treated wood, use only connectors/fasteners that are approved for use with the corresponding wood treatment.

F15 VERSA-LAM® header or a BCI® Joist header.

1½" knockout holes at approximately 12" o.c. are pre-punched.

F15 F58

See PANEL 1 for allowable hole sizes and location.

F27A VERSA-LAM® LVL beam.

Endwall blocking as required per governing building code.

For load-bearing cantilever details, see PANELS 3 & 4.

BCI® Joist Blocking is required when BCI® Joists are cantilevered.

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FLOOR DETAILS

Verify capacity and fastening of hangers and connections.

6

6a OSB RIM JOIST
6b LPI RIM JOIST
6c LPI BLOCKING
6d CANTILEVER
6e CANTILEVER
6f CANTILEVER
6g DROPPED CANTILEVER
6h STAIR STRINGER
6i HANGER CONNECTIONS

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6j JOIST NAILING
6k SQUASH BLOCKS
6l SQUASH BLOCKS

WEB STIFFENER DETAILS

7

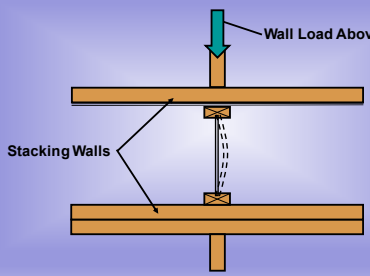
Concentrated load

NOTES:

JOIST DEPTH				
	9-1/2"	11-7/8"	14"	16"
MAXIMUM STIFFENER HEIGHT	6-3/8"	8-3/4"	10-7/8"	12-7/8"

65

Vertical Load Transfer



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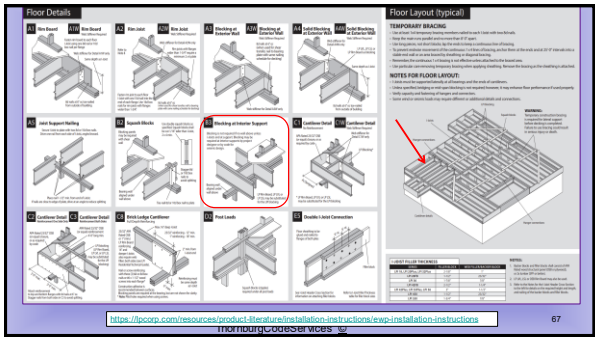
66


Floor Details
Floor Layout (typical)
TEMPORARY BRACING
NOTES FOR FLOOR LAYOUT:
https://ipcorp.com/resources/product-literature/installation-instructions/ewp-installation-instructions
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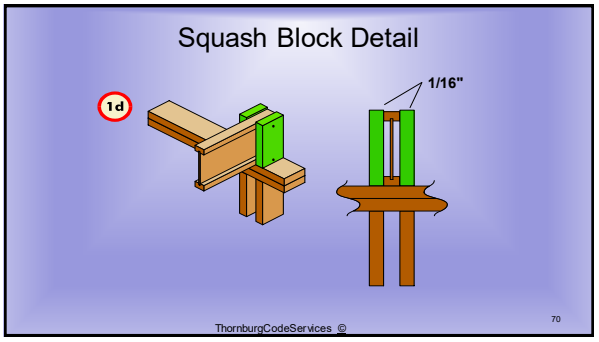
Squash Block Detail
1d
1/16"
ThornburgCodeServices ©
70


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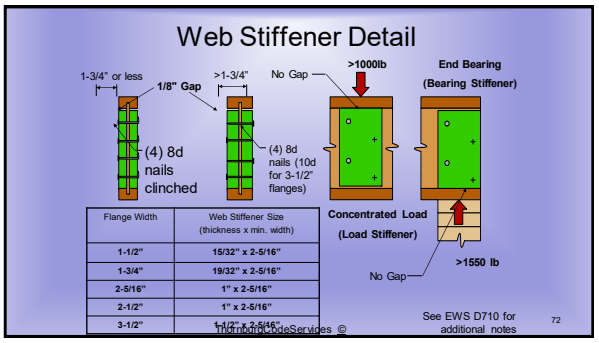
Web Stiffener Detail
1-3/4" or less
1/8" Gap
>1-3/4"
No Gap
>1000lb
End Bearing
(Bearing Stiffener)
(4) 8d nails clinched
(4) 8d nails (10d for 3-1/2" flanges)
Concentrated Load
(Load Stiffener)
>1550 lb
No Gap
Flange Width
Web Stiffener Size (thickness x min. width)
1-1/2"
15/32" x 2-5/16"
1-3/4"
19/32" x 2-5/16"
2-5/16"
1" x 2-5/16"
2-1/2"
1" x 2-5/16"
3-1/2"
1-1/2" x 2-5/16"
See EWS D710 for additional notes
ThornburgCodeServices ©
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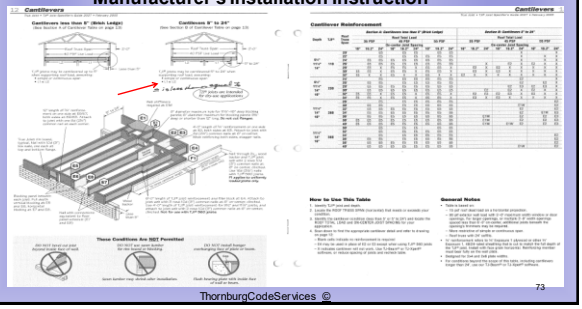
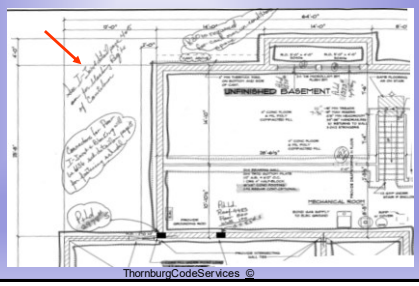
Manufacturer's Installation Instruction



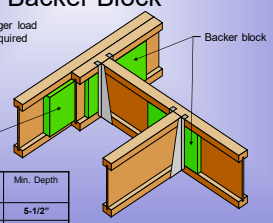
I - Joist



Approved Hangers

Backer Block

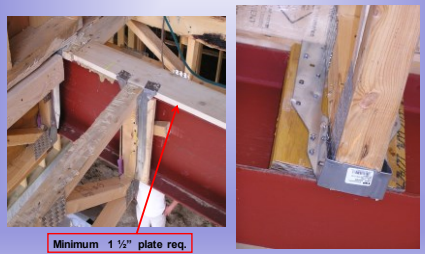
Use backer block if hanger load exceeds 250 lbs or if required by hanger manufacturer



Flange Width	Material Thk. Rqd.	Min. Depth
1-1/2"	19/32"	5-1/2"
1-3/4"	23/32"	5-1/2"
2-5/16"	1"	7-1/4"
2-1/2"	1"	5-1/2"
3-1/2"	1-1/2"	7-1/4"

See EWS D710 for additional notes

You must pay particular attention to installation details!



Minimum 1 ½" plate req.

Altered hangers

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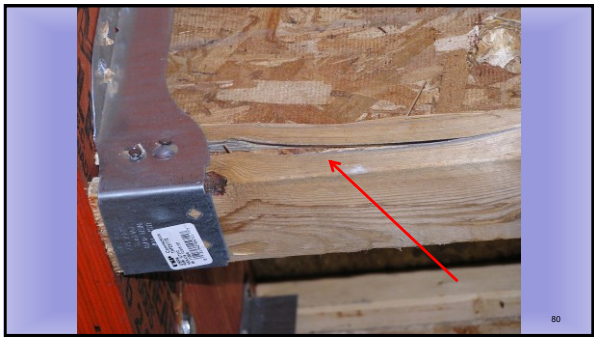
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R502.8.2 Engineered Wood Products

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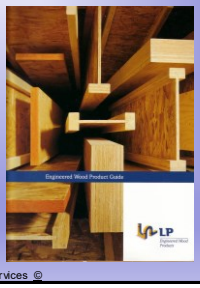
Manufacturers' Installation Requirements
Must Be Followed



84

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Unbalanced Beam Layup

(Used for simple span applications)

24F-V4 Doug Fir (12 Lamination Example)

- 2 - L2 Dense Grade Outer Comp. Lams
- 1 - L2 Grade Inner Comp. Lam
- 6 - L3 Grade Core Lams
- 1 - L2 Grade Inner Ten. Lam
- 2 - L1 Grade Outer Tension Lams

Note: lumber Fc parallel to grain is greater than Ft

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Simple Span

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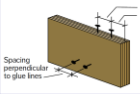
Fastening Recommendations

MINIMUM NAIL SPACING FOR RIGIDLAM LVL BEAMS

Component Solutions™) or engineering analysis.



Nail Size	Minimum Parallel Spacing	Minimum Parallel End Distance	Minimum Perpendicular Spacing
8d Box	2"	1-1/2"	2"
8d Common	3"	2"	2"
10d & 12d Box	3"	2"	2"
10d & 12d Common	4"	3"	3"
16d Sinker	4"	3"	3"
16d Common	6"	4"	3"

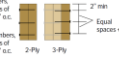
Fastening Recommendations For Multiple Ply Members

Top Loaded Members - 2 & 3 Ply

For 12" deep (or less) members, nail plies together with 2 rows of 16d×3-1/2" com. nails at 12" o.c. (add 1 row for 16d sinkers).

For 14", 16" or 18" deep members, nail plies together with 3 rows of 16d×3-1/2" com. nails at 12" o.c. (add 1 row for 16d sinkers).

For 20", 22" or 24" deep members, nail plies together with 4 rows of 16d×3-1/2" com. nails at 12" o.c. (add 1 row for 16d sinkers).



Top Loaded Members - 4 Ply

For 4-Ply Top Loaded members, it is recommended to connect the plies together with appropriate wood screws. See page 41 for approved wood screws.

The recommended fastener spacing is two rows at 24" o.c. for up to and including 16" deep members, and 3 rows at 24" o.c. for members up to and including 24" deep. If the fastener point penetrates a minimum of 75% of the 4th ply, they may be applied from one side of the beam; otherwise, the fasteners must be applied from both sides and staggered.

Load must be applied evenly to all 4 plies; otherwise, use connections for side loaded members.

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Engineered Wood Products

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Engineered Products

Engineered products (LVL beams, glue laminated beams, trusses, wood I joists, etc.) must be installed according to the manufacturer's installation instructions.

Cuts, notches & bored holes are not permitted unless the effects are specifically considered in the member design.

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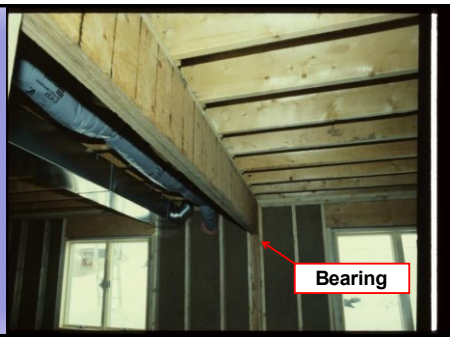

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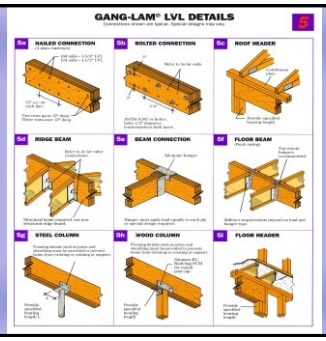

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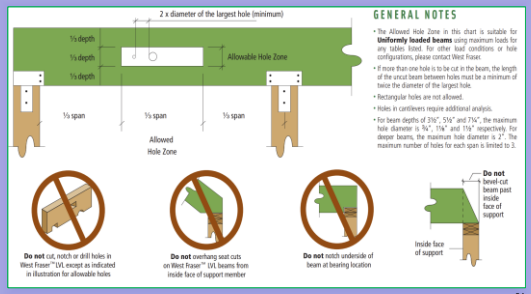

LVL USER'S GUIDE 32 WEST FRASER TIMBER

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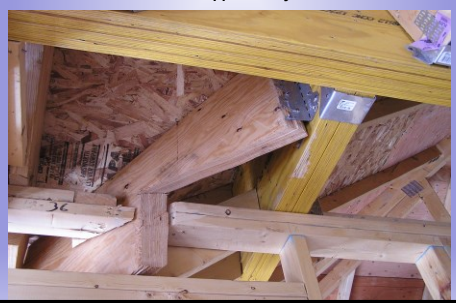
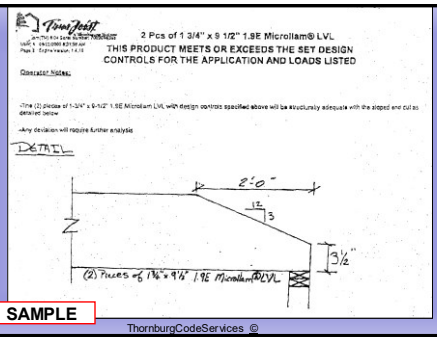
Alterations must be approved by Manufacturer.



95



SAMPLE

ThornburgCodeServices ©

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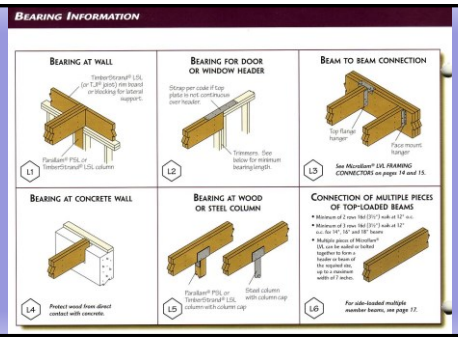
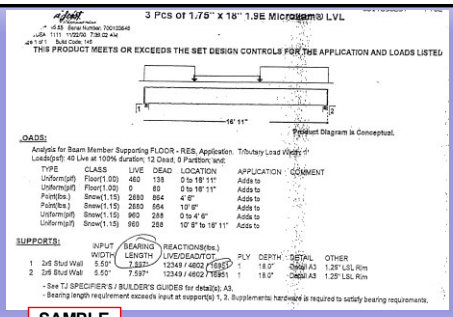
Squash Blocks




3 Pcs of 1.75" x 18" 1.9E Microllam® LVL

THIS PRODUCT MEETS OR EXCEEDS THE SET DESIGN CONTROLS FOR THE APPLICATION AND LOADS LISTED

16' 11"

Product Diagram is Conceptual.

LOADS:

Analysis for Beam Member Supporting FLOOR - RES, Application. Tributary Load Width: 0'

Loads(psf): 40 Live at 100% duration, 12 Dead, 0 Partition, and;

TYPE	CLASS	LIVE	DEAD	LOCATION	APPLICATION	COMMENT
Uniform(psf)	Floor(1.00)	460	138	0 to 18' 11"	Adds to	
Uniform(plf)	Floor(1.00)	0	80	0 to 18' 11"	Adds to	
Point(lbs.)	Snow(1.15)	2880	864	4' 6"	Adds to	
Point(lbs.)	Snow(1.15)	2880	864	13' 6"	Adds to	
Uniform(psf)	Snow(1.15)	960	288	0 to 4' 6"	Adds to	
Uniform(psf)	Snow(1.15)	960	288	10' 6" to 18' 11"	Adds to	

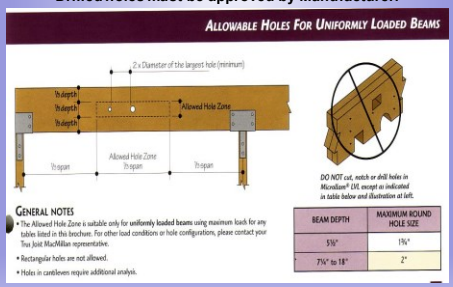
SUPPORTS:

		INPUT WIDTH	BEARING LENGTH	REACTIONS(lbs.) LIVE/DEAD/TOT	PLY	DEPTH	DETAIL	OTHER
1	2x6 Stud Wall	5.50"	7.597"	12349 / 4602 / 16951	1	18.0"	Detail A3	1.25" LSL Rim
2	2x6 Stud Wall	5.50"	7.597"	12349 / 4602 / 16951	1	18.0"	Detail A3	1.25" LSL Rim

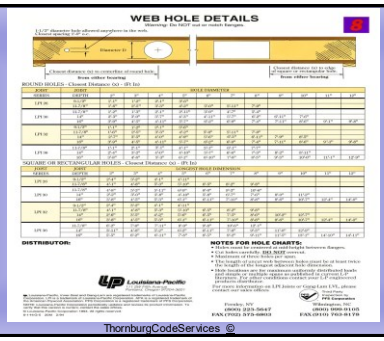
- See TJ SPECIFIER'S / BUILDER'S GUIDES for detail(s): A3.
- Bearing length requirement exceeds input at support(s) 1, 2. Supplemental hardware is required to satisfy bearing requirements.

SAMPLE

Drilled holes must be approved by Manufacturer.



R502.8.2 Engineered wood products



Properly drilled holes

Holes cut at bearing locations

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WWTP?

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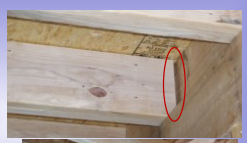
Floor framing

Bearing.

The ends of each joist, beam or girder shall have not less than 1.5 inches of bearing on wood … or by the use of approved joist hangers.



Section R502.6

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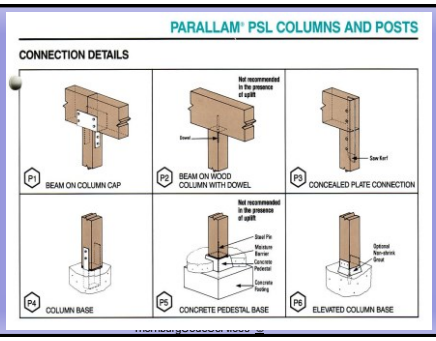

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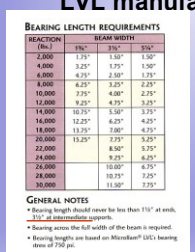
Actual bearing length may vary per LVL manufacturer and load.



BEARING LENGTH REQUIREMENTS

REACTION (lbs.)	BEAM WIDTH 1¾"	3½"	5¼"
2,000	1.75"	1.50"	1.50"
4,000	3.25"	1.75"	1.50"
6,000	4.75"	2.50"	1.75"
8,000	6.25"	3.25"	2.25"
10,000	7.75"	4.00"	2.75"
12,000	9.25"	4.75"	3.25"
14,000	10.75"	5.50"	3.75"
16,000	12.25"	6.25"	4.25"
18,000	13.75"	7.00"	4.75"
20,000	15.25"	7.75"	5.25"
22,000		8.50"	5.75"
24,000		9.25"	6.25"
26,000		10.00"	6.75"
28,000		10.75"	7.25"
30,000		11.50"	7.75"

GENERAL NOTES

- Bearing length should never be less than 1½" at ends, 3½" at intermediate supports.
- Bearing across the full width of the beam is required.
- Bearing lengths are based on Microllam® LVL's bearing stress of 750 psi.

R106.1.2 Manufacturer's installation instructions

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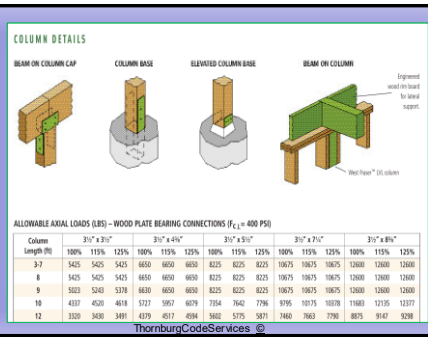


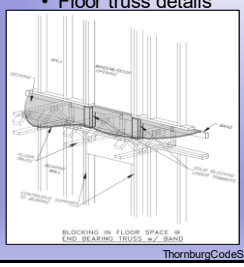
Column Length (ft)	3½" x 3½"			3½" x 4½"			3½" x 5½"			3½" x 7¼"			3½" x 8¾"		
	100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%	100%	115%	125%
3-7	5425	5425	5425	6650	6650	6650	8225	8225	8225	10675	10675	10675	12600	12600	12600
8	5425	5425	5425	6650	6650	6650	8225	8225	8225	10675	10675	10675	12600	12600	12600
9	5023	5243	5378	6630	6650	6650	8225	8225	8225	10675	10675	10675	12600	12600	12600
10	4337	4520	4618	5727	5957	6079	7354	7642	7796	9795	10175	10378	11683	12135	12377
12	3320	3430	3491	4379	4517	4594	5602	5775	5871	7460	7663	7790	8875	9147	9298

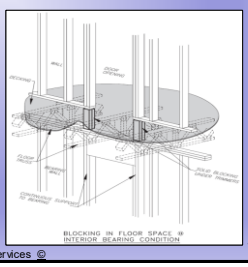
Floors – Load Paths

- Floor sag

Floors – Load Paths

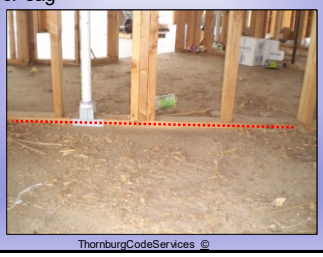
- Floor truss details





Floors – Load Paths

- Floor sag



Laminated Structural Lumber (LSL) studs

LSL studs cut too short.

121

122

Fire blocking

R302.11 Fireblocking required.
Fireblocking material shall meet Section R302.11.1

123

Framing Inspection

Fireblocking required.

"Shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space."

IRC section R302.11

124

Framing Inspection

Fireblocking required.

"Shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space."

IRC section R302.11

125

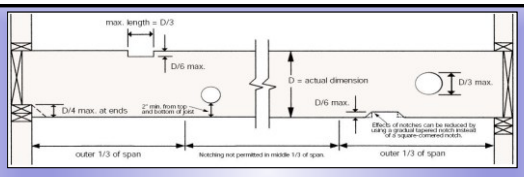
126

Framing Inspection

Fireblocking required.

"Shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space."

IRC section R302.11, R602.8, R1001.12



Notching of sawn lumber floor joist shall not exceed the limits of Figure R502.8.

Table 1: Maximum Sizes for Cuts in Floor Joists

Joist Size	Max. Hole	Max Notch Depth	Max. End Notch
2x4	none	none	none
2x6	1-1/2"	7/8"	1-3/8"
2x8	2-3/8"	1-1/4"	1-7/8"
2x10	3"	1-1/2"	2-3/8"
2x12	3-3/4"	1-7/8"	2-7/8"

Western Wood Product Association

Floor framing

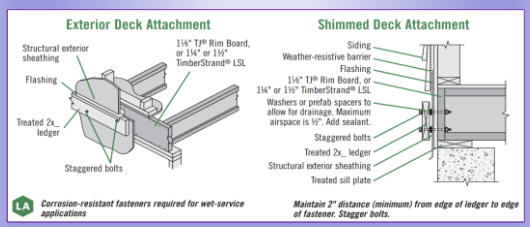
Drilled holes in floor joists.

The diameter of bored holes shall not exceed one-third the depth of the joist … Holes shall not be closer than 2 inches to the top or bottom of the member, or to any other hole … When the joist is also notched, the hole shall not be closer than 2 inches to the notch.

(notches continued on next page)

Section R502.8

Engineer Wood Product



https://www.weyerhaeuser.com/woodproducts/document-library/document_library_detail/tj-9001

Notching and Boring

- **Joists R502.8**

Notching and Boring

- Joists R502.8

Notching and Boring

- Joists R502.8

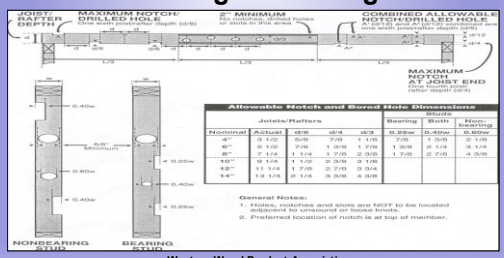
Floor framing

Framing of openings.

When the header joist does not exceed 4 feet, the header may be a single member … when the header joist exceed 4 feet it shall be doubled and of sufficient cross section to support the floor joists framed into it …

Section R502.10

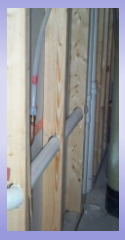
Notching and Boring

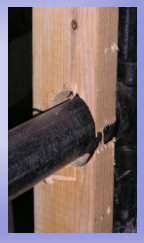


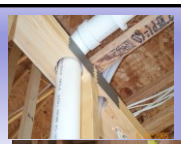
Western Wood Product Association
http://www2.wwpa.org

Section R602.6

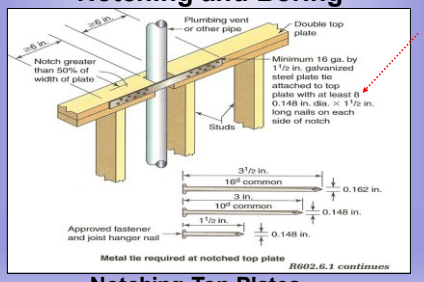
Reality







Notching and Boring



Notching Top Plates

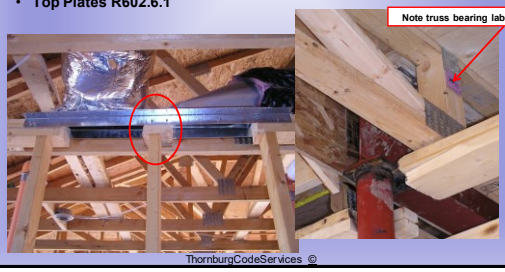
Notching and Boring

- Top Plates R602.6.1

16 gage 1.5" wide straps

Notching and Boring

- Top Plates R602.6.1

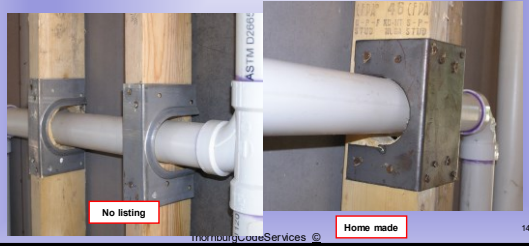


Notching and Boring

- Stud Shoes – A repair system for errant bored holes.
- Must be installed per mfr. requirements.

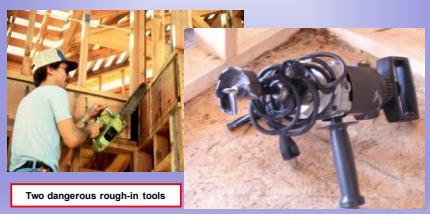
Notching and Boring

- Unapproved / unlisted Stud Shoes



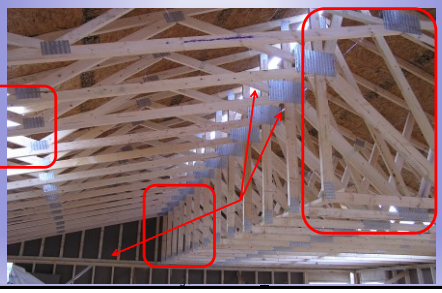
Notching and Boring

- Joists R502.8 Studs R602.6 Top Plates R602.6.1



Two dangerous rough-in tools

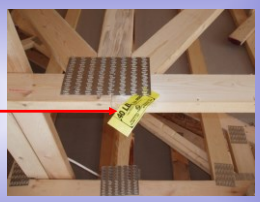
R802.10 Wood Trusses



145

Engineered roof trusses

Verify if the design loads are appropriate for the particular structure, including verification of any snow load.



Section R802.10

146

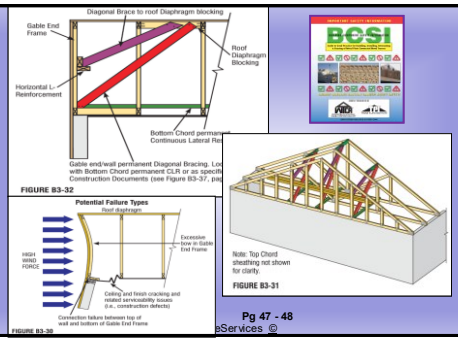
Engineered roof trusses

Verify size and nailing of lateral bracing noted on the truss specs.

1 x 4 lateral bracing will usually require two 8d nails at each truss.

Section R802.10.3 & BCSI

147



Pg 47 - 48

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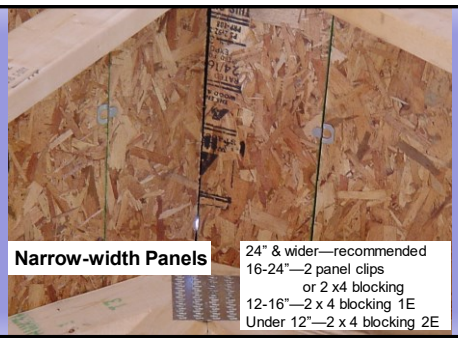
Engineered roof trusses

Verify bracing.

149



Narrow-width Panels

24" & wider—recommended
16-24"—2 panel clips
or 2 x4 blocking
12-16"—2 x 4 blocking 1E
Under 12"—2 x 4 blocking 2E

150

Gable End

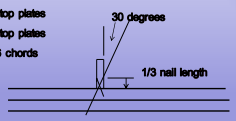
Pg. 49

Load path not complete to foundation.

How much uplift resistance will toe-nailing provide?

- 4 -16d box with spf bottom chords or top plates would provide 128 of uplift resistance.

3 toe-nails for 2x4 top plates
5 toe-nails for 2x6 top plates
Limited to 4 for 2x6 chords

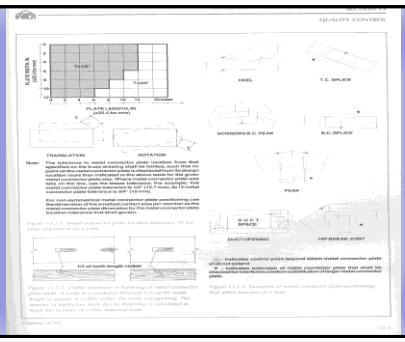


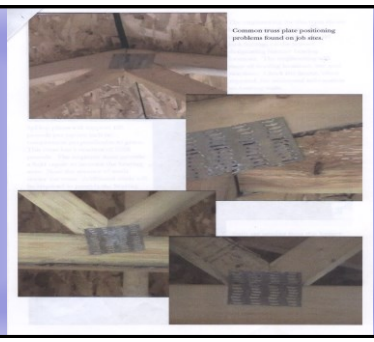
Pg 65

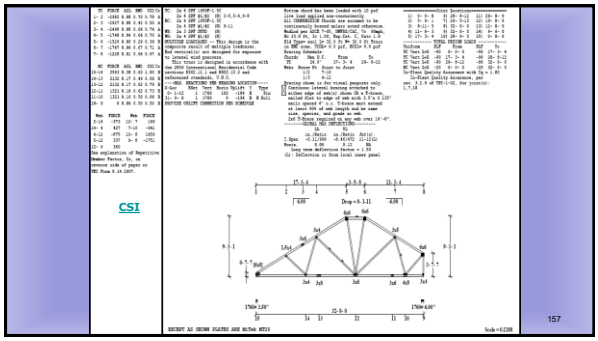
NDS provides engineering basis for toe-nail and slant-nail connections.

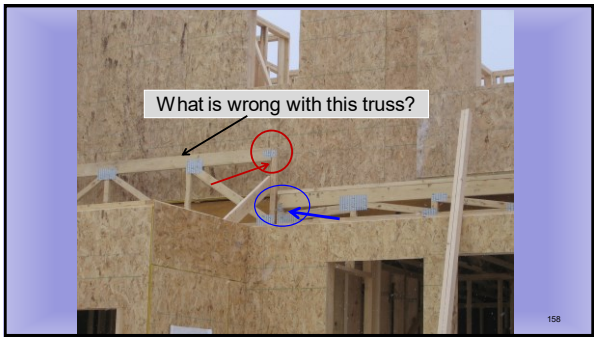
Bracing

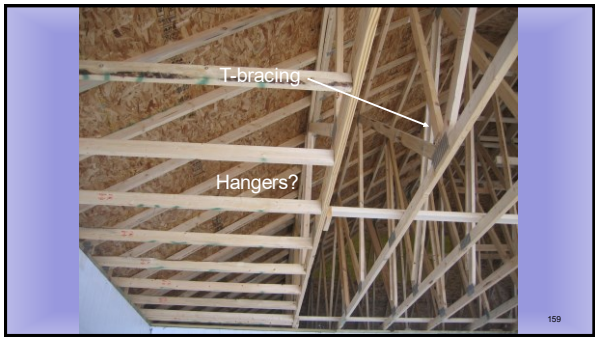
- T-bracing is used when a one of a kind truss in installed and neighboring webs or chords don't line up.
- The T-brace method required no additional bracing. Continuous lateral bracing would require an additional diagonal brace.
- The lateral bracing may also be stabilized by connecting to another part of the roof structure, that is connected to another part such as the roof diaphragm.

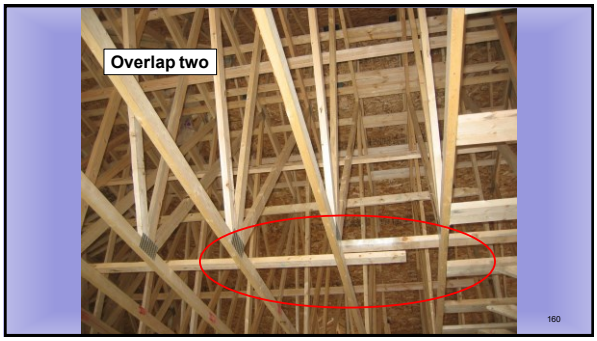


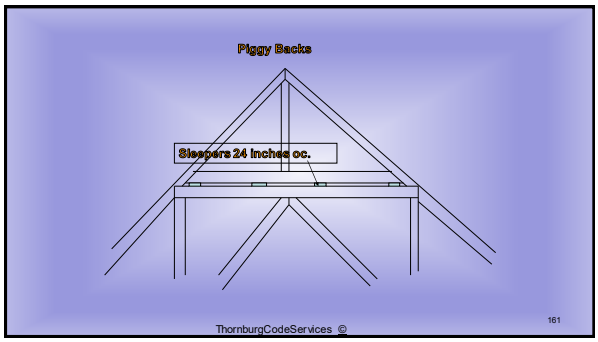



CSI
157


What is wrong with this truss?
158


T-bracing
Hangers?
159

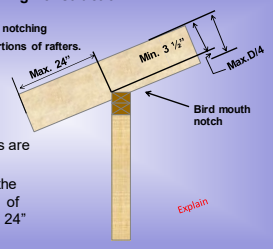

Overlap two
160


Piggy Backs
Sleepers 24 inches oc.
ThornburgCodeServices ©
161


Bearing point ?
162

CHAPTER 8: Roof-Ceiling Construction

R802.7 Cutting, drilling and notching
R802.7.1.1 Cantilevered portions of rafters.



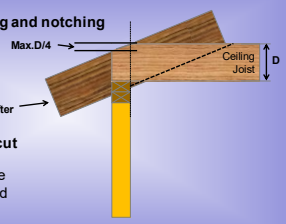
- Notches on cantilevered rafters are permitted
- Provided remaining portion of the rafter is ≥ 3 ½" **and** the length of the cantilever does not exceed 24" in Figure R802.7.1.1.

Test

R316.4Thermal barrier.
Unless otherwise allowed in Section R316.5, foam plastic shall be separated from the interior of a building by an *approved* thermal barrier

CHAPTER 8: Roof-Ceiling Construction

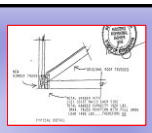
R802.7 Cutting, drilling and notching



R802.7.1.2 Ceiling joist taper cut

- Taper cuts at the ends of the ceiling joist ***shall not*** exceed **one-fourth** the depth of the member in accordance with Figure R802.7.1.2.

Framing Inspection



Alterations to trusses

Truss members shall not be cut, notched, drilled, spliced or otherwise altered in any way without the approval of a registered design professional.

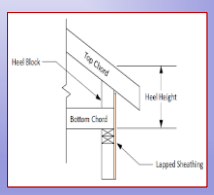
IRC section R802.10.4

Process
What is the first mistake?
What is the second mistake?

2021 IRC

Table R802.5.2(1) Heel Joint Connections

- The heel joint connection table is updated for roof spans of 24 and 36 feet and a 19.2-inch rafter spacing.



2021 IRC

Table R802.5.2(1) Rafter/Ceiling Joist Heel Joint Connections

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf) 20			30			50			70		
		Roof span (feet) 12	24	36	12	24	36	12	24	36	12	24	36
		Required number of 16d common nails per heel joint splice [a,b,c,d,f]											
3:12	12	3	5	8	3	6	9	5	9	13	6	12	17
	16	4	7	10	4	8	12	6	12	17	8	15	23
	19.2	4	8	12	5	10	14	7	14	21	9	18	27
	24	5	10	15	6	12	18	9	17	26	12	23	34
4:12	12	3	4	6	3	5	7	4	7	10	5	9	13
	16	3	5	8	3	6	9	5	9	13	6	12	17
	19.2	3	6	9	4	7	11	6	11	16	7	14	21
	24	4	8	11	5	9	13	7	13	19	9	17	26
5:12	12	3	3	5	3	4	6	3	6	8	4	7	11
	16	3	4	6	3	5	7	4	7	11	5	9	14
	19.2	3	5	7	3	6	9	5	9	13	6	11	17
	24	3	6	9	4	7	11	6	11	16	7	14	21
		:											
12:12	12	3	3	3	3	3	3	3	3	4	3	3	5
	16	3	3	3	3	3	3	3	3	5	3	4	6
	19.2	3	3	3	3	3	4	3	4	6	3	5	7
	24	3	3	4	3	3	5	3	5	7	3	6	9

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CHAPTER 8: Roof-Ceiling Construction

Table R802.5.1(9) - Ceiling Joist & Rafter Connection. Footnotes:

a. 10d common (3" × 0.148") nails shall be permitted to be substituted for 16d common (3½" × 0.162") nails where the required number of nails is taken as 1.2 times the required number of 16d common nails, rounded up to the next full nail.
b. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.
c. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.
e. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.
f. Where rafter ties are substituted for ceiling joists, the heel joint connection requirement shall be taken as the tabulated heel joint connection requirement for two-thirds of the actual rafter slope.
g. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load and roof live load.

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Ceiling joist and rafter connections

- Table R802.5.2 This prescriptive table provisions for the connection of ceiling joists to rafter ties was added to increase the number of connectors **when the ties are located higher than the top of the wall plates.**

ThornburgCodeServices ©

Strut
Size of purlin
Angle of strut; size of strut
Purlin span
Length of strut

R802.5.1
Purlins

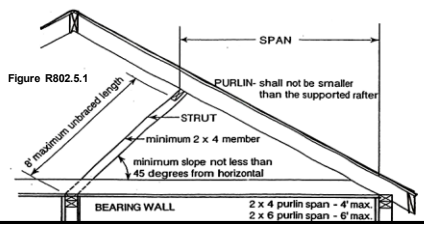

Figure R802.5.1

R802.5.1 Purlins

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CHAPTER 8: Roof-Ceiling Construction

R802.11.1 Uplift resistance.

- Uplift force does not exceed 200#
- Rafters and trusses spaced 24" oc shall be permitted to be attached Table R602.3(1).
- Wind speed 115 mph, exposure category is B, roof pitch is 5:12 or greater, **and** the roof span is 32' or less, rafters **and** trusses spaced are 24" o.c. shall be permitted to be attached according to Table R602.3(1).

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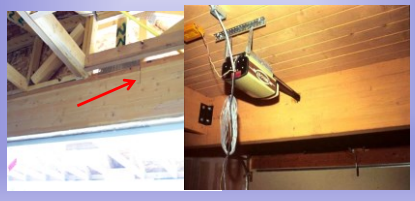
Notching and Boring

- **Engineered Wood Products R502.8.2 R802.7.2**
- **Prohibited except where permitted by manufacturer**



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Summary

- Verify all code requirements.
- Call your local building department with questions.
- …And remember: "Life is good." (Brent Snyder 2006)