Residential Framing Inspections

Based on 2005 CSBC / 2003 IRC

2012 Career Development Seminar

Office of Education & Data Management

Dept. of Construction Services

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Architect / Building Official / Builder

Required Inspections

SECTION R109
INSPECTIONS

R109.1 Types of inspections. For onsite construction, from time to time the building official, upon notification from the permit holder or his agent, shall make or cause to be made any necessary inspections and shall either approve that portion of the construction as completed or shall notify the permit holder or his or her agent wherein the same fails to comply with this code.

Commentary on R109.1

- Inspections are necessary to verify that the construction conforms to the code requirements, and this section outlines the minimum required inspections. Besides the minimum required inspections that are specifically listed, the building official has the authority to require additional inspections so that compliance with the code can be determined. It is the duty of the permit holder or an authorized agent of the permit holder to notify the building department that some or all of the work covered by the permit is ready and available for inspection. At that point, the appropriate jurisdictional inspector performs the necessary on-site inspection. The inspector then must inform the permit holder or agent that the work has been inspected. This may be through a telephone call, an electronic message or in many cases a written record of the inspection posted at the job site.

Required Inspections

R109.1.4 Frame and masonry inspection. Inspection of framing and masonry construction shall be made after the roof, masonry, all framing, firestopping, draftstopping and bracing are in place and after the plumbing, mechanical and electrical rough inspections are approved.

Commentary on R109.1.4

- The framing inspection is usually the final opportunity for the inspector to view all of the items that will be concealed within the structure. The inspection includes the structural framework of the building as well as any fireblocking or draftstopping that will be contained within concealed spaces. All of the electrical, mechanical, gas and plumbing inspections must be completed and approved prior to the framing inspection. This allows any framing members to be repaired while they are accessible.

R109.3

R109.3 Inspection requests. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall be the duty of the person requesting any inspections required by this code to provide access to and means for inspection of such work.

- The individual doing the authorized work has the responsibility for notifying the building department when the work is ready for inspection. Each building department establishes its own procedures on how and when requests should be made. Once an inspection has been scheduled, access to the area ready for inspection must be provided. The individuals performing the work should make the inspection process run as smoothly as possible.

R109.4

R109.4 Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. The building official upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or shall notify the permit holder or an agent of the permit holder wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.

Commentary on R109.4

- Work must not continue past the point of a required inspection until it has been approved by the building department. It is possible that if the work progresses beyond this point and is not in total compliance with the code, some of the work may have to be removed. It is critical that each individual stage of the project be approved prior to continuance of construction.

  As indicated in Section R109.1, inspections must be performed when requested, and the inspector must indicate if the construction is either satisfactory or is not compliant. If the work is not approved, it must be corrected, and a reinspection must be requested. No work may be concealed until the building department approves it.

Know which code to inspect by

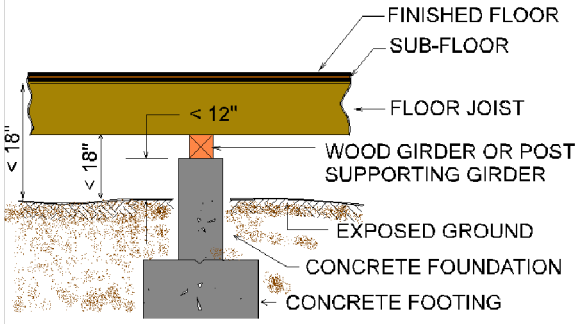
2003 IRC
2003 IBC
AWC Wood Frame Construction Manual

R319 – Protection from decay

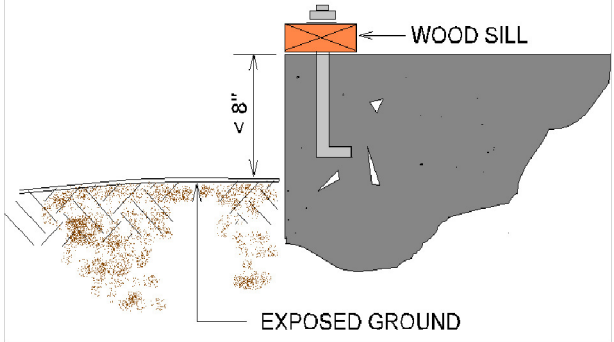
R319.1 Location required. In areas subject to decay damage as established by Table R301.2(1), the following locations shall require the use of an approved species and grade of lumber, pressure treated in accordance with AWPA C1, C2, C3, C4, C9, C15, C18, C22, C23, C24, C28, C31, C33, P1, P2 and P3, or decay-resistant heartwood of redwood, black locust, or cedars.

1. Wood joists or the bottom of a wood structural floor when closer than 18 inches (457 mm) or wood girders when closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.

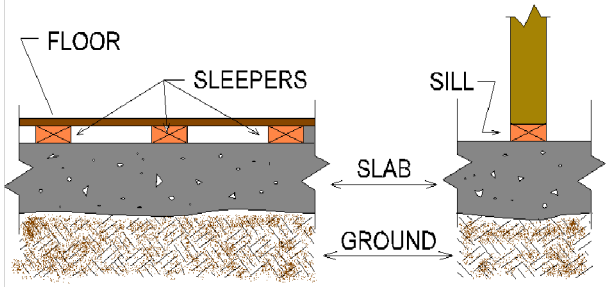
R319 - Decay Protection



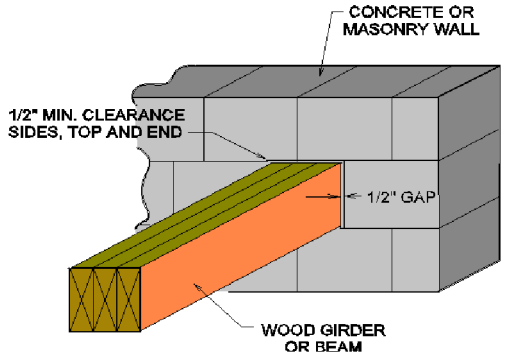
2. All wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.



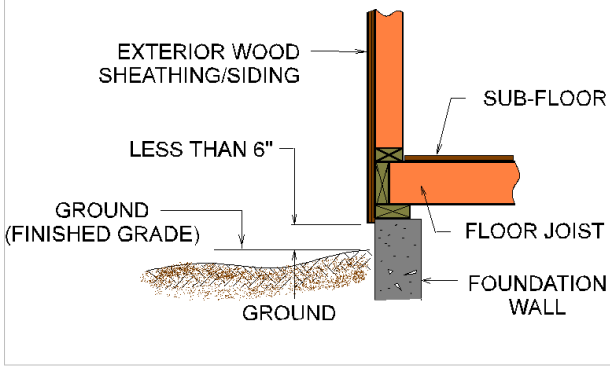
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.



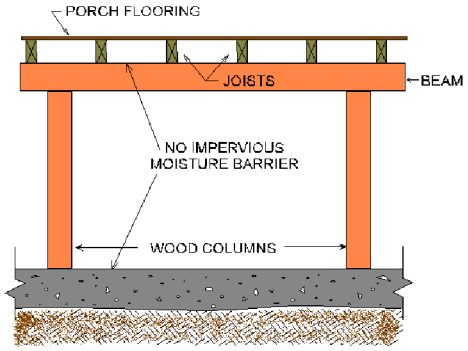
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 0.5 inch (12.7 mm) on tops, sides and ends.



5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground.



6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.



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7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.

Definitions

- Load
- Live Loads
- Dead Loads
- Lateral Loads
- Deflection

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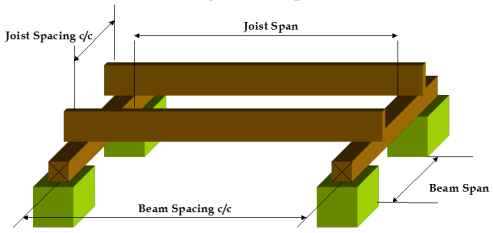
Definitions:

Spacing



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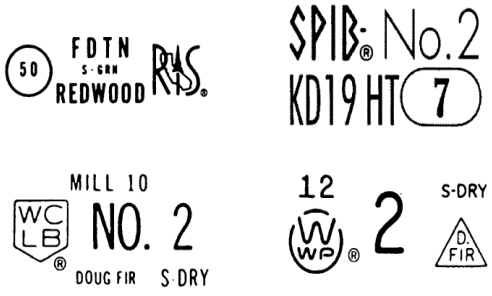
What is the lumber?

SECTION R502
WOOD FLOOR FRAMING

R502.1 Identification. Load-bearing dimension lumber for joists, beams and girders shall be identified by a grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOC PS 20. In lieu of a grade mark, a certificate of inspection issued by a lumber grading or inspection agency meeting the requirements of this section shall be accepted.

Grade marks



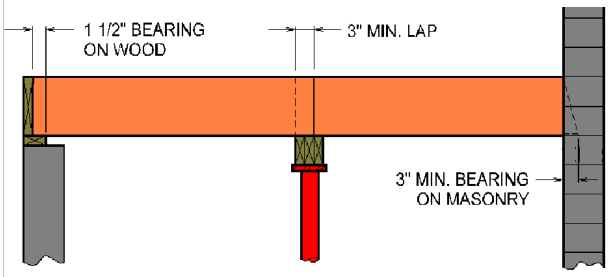
Floor construction

R502.6 Bearing. The ends of each joist, beam or girder shall have not less than 1.5 inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete except where supported on a 1-inch-by-4-inch (25.4 mm by 102 mm) ribbon strip and nailed to the adjacent stud or by the use of approved joist hangers.

R502.6.1 Floor systems. Joists framing from opposite sides over a bearing support shall lap a minimum of 3 inches (76 mm) and shall be nailed together with a minimum three 10d face nails. A wood or metal splice with strength equal to or greater than that provided by the nailed lap is permitted.

R502.6.2 Joist framing. Joists framing into the side of a wood girder shall be supported by approved framing anchors or on ledger strips not less than nominal 2 inches by 2 inches (51 mm by 51 mm).

Joist, Beam & Girder Bearing



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Bearing on wood

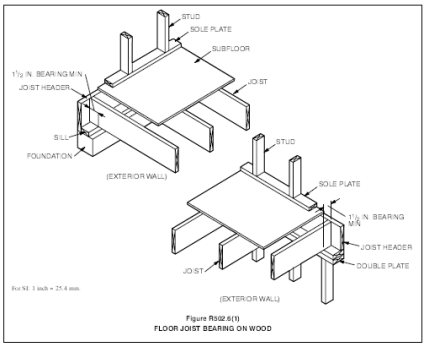


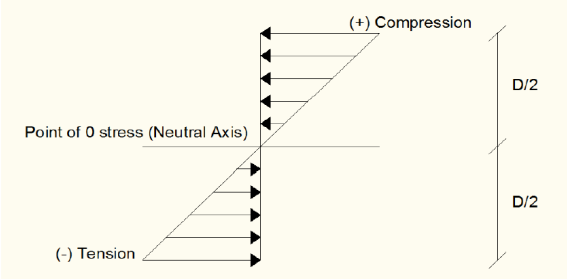
Figure R502.6(1)
FLOOR JOIST BEARING ON WOOD

Limit the holes!

R502.8 Drilling and notching. Structural floor members shall not be cut, bored or notched in excess of the limitations specified in this section. See Figure R502.8.

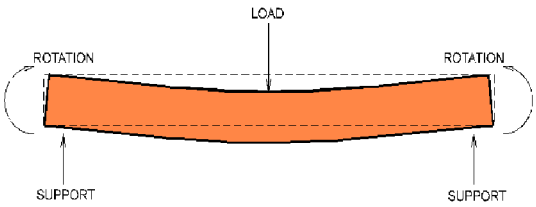
- Some designs and installation practices require that limited notching and cutting occur. Notching should be avoided when possible, and holes bored in beams and joists create the same problems as notches. When necessary, the holes should be located in areas with the least stress concentration, generally along the neutral axis of the joist. Limitations on the allowable cutting and notching of wood floor joists are meant to retain structural or functional integrity.

Neutral axis in floor members



Cutting, Notching & Bored Holes

- Simple Span



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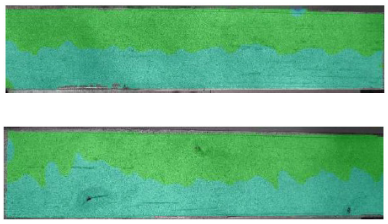
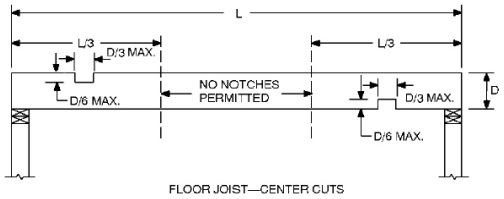
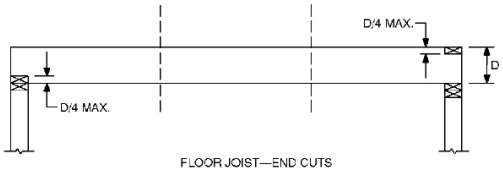
Neutral axis



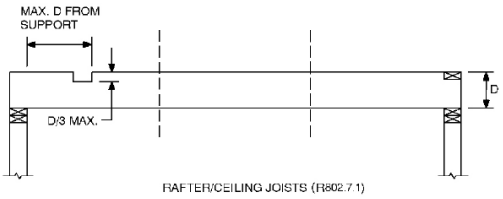
Cutting, Notching & Bored Holes



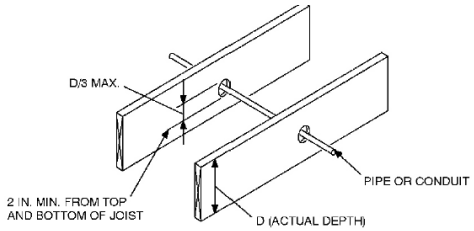
FLOOR JOIST—CENTER CUTS



FLOOR JOIST—END CUTS

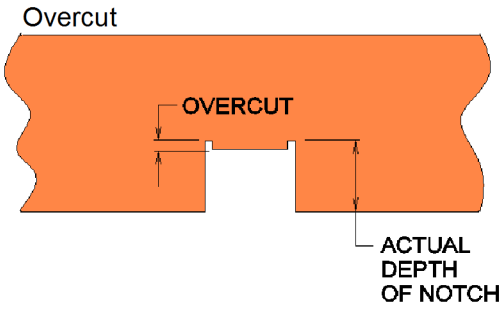


RAFTER/CEILING JOISTS (R802.7.1)



Cutting, Notching & Bored Holes

Overcut



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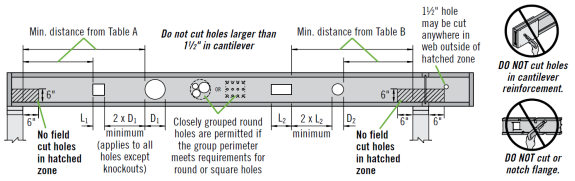
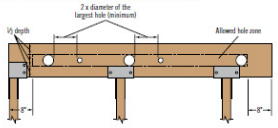
R502.8.2 Engineered wood products. Cuts, notches and holes bored in trusses, laminated veneer lumber, glue-laminated members or I-joists are not permitted unless the effects of such penetrations are specifically considered in the design of the member.

ALLOWABLE HOLES—TJI® JOISTS



ALLOWABLE HOLES

1.55E TimberStrand® LSL Headers and Beams



General Notes

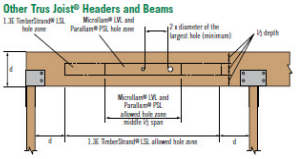
- Allowed hole zone suitable for headers and beams with **uniform and/or concentrated loads** anywhere along the member.
- Round holes only.
- No holes in headers or beams in plank orientation.

1.55E TimberStrand® LSL

Header or Beam Depth	Maximum Round Hole Size
9¼"–9½"	3"
11¼"–11⅞"	3½"
14"–16"	4½"

• See illustration for allowed hole zone.

Other Trus Joist® Headers and Beams



General Notes

- Allowed hole zone suitable for headers and beams with **uniform loads only**.
- Round holes only.
- No holes in cantilevers.
- No holes in headers or beams in plank orientation.

Other Trus Joist® Beams

Header or Beam Depth	Maximum Round Hole Size
9½"	1"
11⅞"	1½"
14"–20"	2"

• See illustration for allowed hole zone.

DO NOT cut, notch, or drill holes in headers or beams except as indicated in the illustrations and tables

WARNING: Drilling, sawing, sanding or machining wood products generates wood dust, a substance known to the State of California to cause cancer. For more information on Proposition 65, visit www.wy.com/inform.

Fastening - connections

R502.9 Fastening. Floor framing shall be nailed in accordance with Table R602.3(1). Where posts and beam or girder construction is used to support floor framing, positive connections shall be provided to ensure against uplift and lateral displacement.

❖ Commentary Figure R502.9 shows various methods of accomplishing the mandatory positive connection between post and beam or girder construction.

TABLE R602.3(1)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a,b,c]	SPACING OF FASTENERS
Joist to sill or girder, toe nail	3-8d	—
1" × 6" subfloor or less to each joist, face nail	2-8d 2 staples, 1½"	— —
2" subfloor to joist or girder, blind and face nail	2-16d	—
Sole plate to joist or blocking, face nail	16d	16" o.c.
Top or sole plate to stud, end nail	2-16d	—
Stud to sole plate, toe nail	3-8d or 2-16d	—
Double studs, face nail	10d	24" o.c.
Double top plates, face nail	10d	24" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d	16" o.c.
Double top plates, minimum 24-inch offset of end joints, face nail in lapped area	8-16d	—
Blocking between joists or rafters to top plate, toe nail	3-8d	—
Rim joist to top plate, toe nail	8d	6" o.c.
Top plates, laps at corners and intersections, face nail	2-10d	—
Built-up header, two pieces with ½" spacer	16d	16" o.c. along each edge
Continued header, two pieces	16d	16" o.c. along each edge
Ceiling joists to plate, toe nail	3-8d	—
Continuous header to stud, toe nail	4-8d	—
Ceiling joist, laps over partitions, face nail	3-10d	—
Ceiling joist to parallel rafters, face nail	3-10d	—
Rafter to plate, toe nail	2-16d	—
1" brace to each stud and plate, face nail	2-8d 2 staples, 1½"	— —
1" × 6" sheathing to each bearing, face nail	2-8d 2 staples, 1½"	— —
1" × 8" sheathing to each bearing, face nail	2-8d 3 staples, 1½"	— —
Wider than 1" × 8" sheathing to each bearing, face nail	3-8d 4 staples, 1½"	— —
Built-up corner studs	10d	24"o.c.
Built-up girders and beams, 2-inch lumber layers	10d	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
2" planks	2-16d	At each bearing
Roof rafters to ridge, valley or hip rafters: toe nail face nail	4-16d 3-16d	— —
Rafter ties to rafters, face	3-8d	—

(continued)

TABLE R602.3(1)—continued
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b,c,d,e]	SPACING OF FASTENERS	
		Edges (inches)[f]	Intermediate supports[e,g] (inches)
Wood structural panels, subfloor, roof and wall sheathing to framing, and particleboard wall sheathing to framing			
5/16"–1/2"	6d common nail (subfloor, wall) 8d common nail (roof)[f]	6	12[g]
19/32"–1"	8d common nail	6	12[g]
1 1/8"–1 1/4"	10d common nail or 8d deformed nail	6	12
Other wall sheathing[h]			
1/2" regular cellulosic fiberboard sheathing	1 1/2" galvanized roofing nail 6d common nail staple 16 ga., 1 1/2 long	3	6
1/2" structural cellulosic fiberboard sheathing	1 1/2" galvanized roofing nail 8d common nail staple 16 ga., 1 1/2 long	3	6
25/32" structural cellulosic fiberboard sheathing	1 3/4" galvanized roofing nail 8d common nail staple 16 ga., 1 3/4 long	3	6
1/2" gypsum sheathing	1½" galvanized roofing nail; 6d common nail; staple galvanized, 1½ long; 1½ screws, Type W or S	4	8
5/8" gypsum sheathing	1 3/4" galvanized roofing nail; 8d common nail; staple galvanized, 1⅝" long; 1⅝" screws, Type W or S	4	8
Wood structural panels, combination subfloor underlayment to framing			
3/4" and less	6d deformed nail or 8d common nail	6	12
7/8"–1"	8d common nail or 8d deformed nail	6	12
1 1/8"–1 1/4"	10d common nail or 8d deformed nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

a. All nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi (551 MPa) for shank diameter of 0.192 inch (20d common nail), 90 ksi (620 MPa) for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi (689 MPa) for shank diameters of 0.142 inch or less.

b. Staples are 16 gage wire and have a minimum 7/16-inch on diameter crown width.

c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

d. Four-foot-by-8-foot or 4-foot-by-9-foot panels shall be applied vertically.

e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).

f. For regions having basic wind speed of 110 mph or greater, 8d deformed nails shall be used for attaching plywood and wood structural panel roof sheathing to framing within minimum 48-inch distance from gable end walls, if mean roof height is more than 25 feet, up to 35 feet maximum.

g. For regions having basic wind speed of 100 mph or less, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. When basic wind speed is greater than 100 mph, nails for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.

h. Gypsum sheathing shall conform to ASTM C 79 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to either AHA 194.1 or ASTM C 208.

i. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and at all floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and at all roof plane perimeters. Blocking of roof or floor sheathing panel edges perpendicular to the framing members shall not be required except at intersection of adjacent roof planes. Floor and roof perimeter shall be supported by framing members or solid blocking.

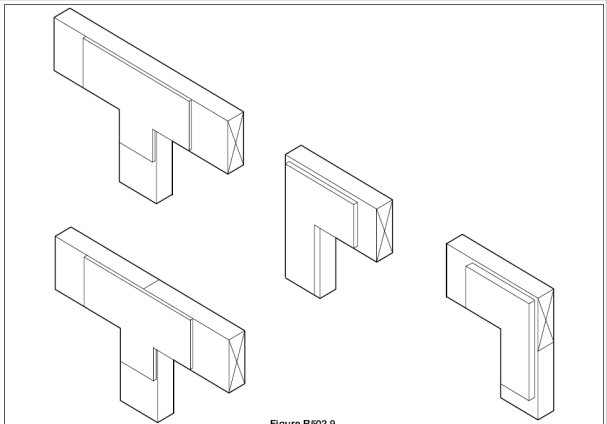
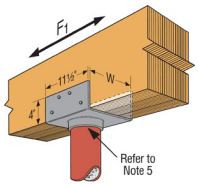
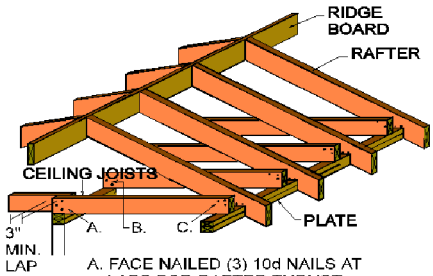


Figure R502.9
POSITIVE CONNECTION BETWEEN POSTS AND GIRDERS



Roof and Ceiling Framing Construction



A. FACE NAILED (3) 10d NAILS AT LAPS FOR RAFTER THRUST
B. (3) 8d TOENAILED TO PLATE TYPICAL
C. FACE NAILED (3) 10d NAILS

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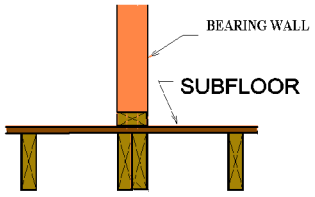
Floor & Ceiling Header Inspection

- Determine if the joists parallel to bearing walls above are of adequate size to support the load



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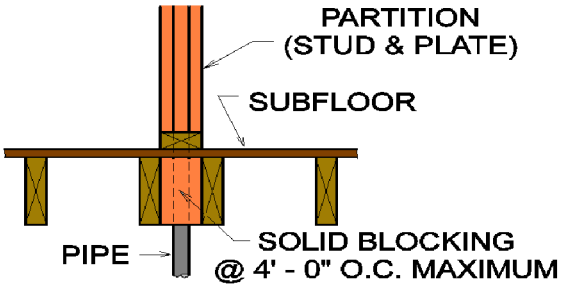
Floor & Ceiling Header



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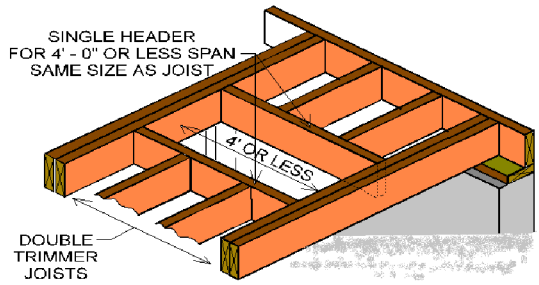
Floor & Ceiling Header



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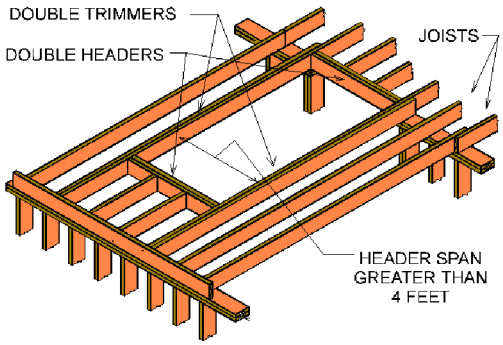
Floor & Ceiling Header



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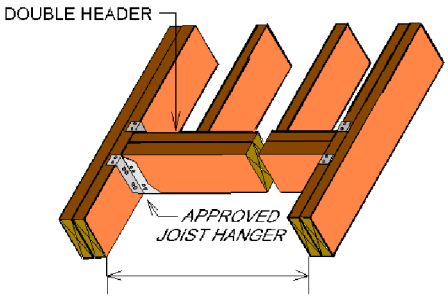
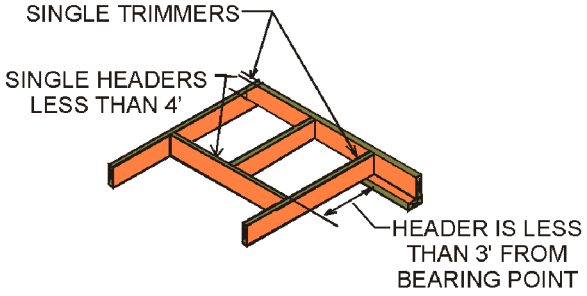
Floor & Ceiling Header



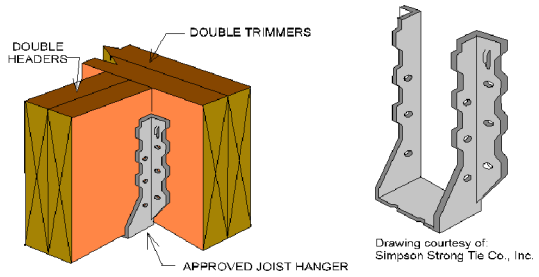
154

Floor & Ceiling Header



155

Floor & Ceiling Header



Drawing courtesy of:
Simpson Strong Tie Co., Inc.

156

Lateral restraint

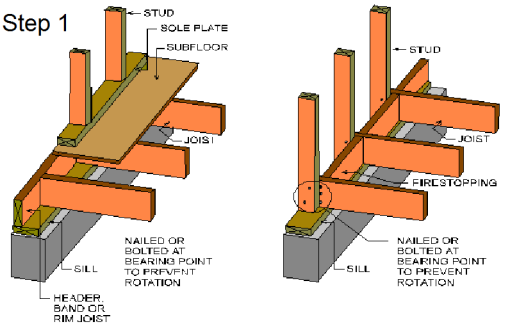
R502.7 Lateral restraint at supports. Joists shall be supported laterally at the ends by full-depth solid blocking not less than 2 inches (51 mm) nominal in thickness; or by attachment to a header, band, or rim joist, or to an adjoining stud; or shall be otherwise provided with lateral support to prevent rotation.

Exception: In Seismic Design Categories D_1 and D_2, lateral restraint shall also be provided at each intermediate support.

- Bridging, blocking or some other acceptable means of holding a joist in place is required so the floor joists do not twist out of the plane of the applied load. Lateral support at the ends of joists provide an additional function by transferring lateral loads to the supporting elements. Lateral support at ends may be provided by full-depth solid blocking not less than 2 inches (51 mm) in thickness, or the ends of joists may be nailed or bolted to a header, band or rim joist or to an adjoining stud as shown in Commentary Figure R502.7.

Joist Lateral Support & Bridging

- Step 1

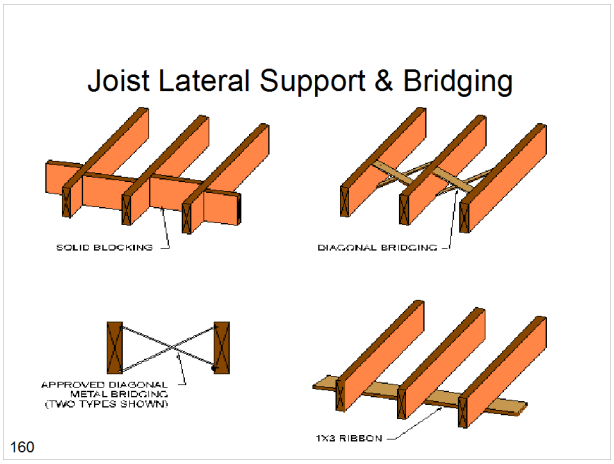


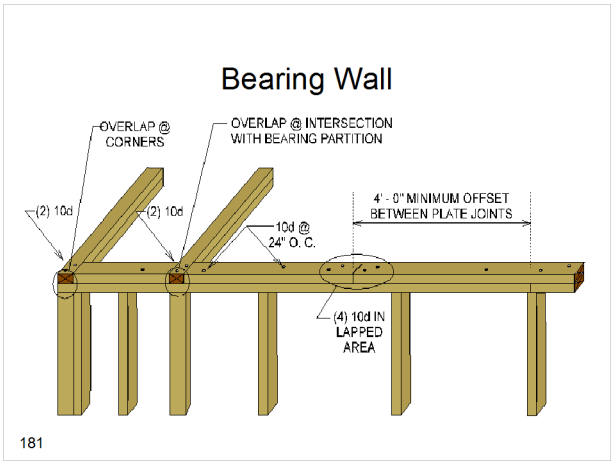
159

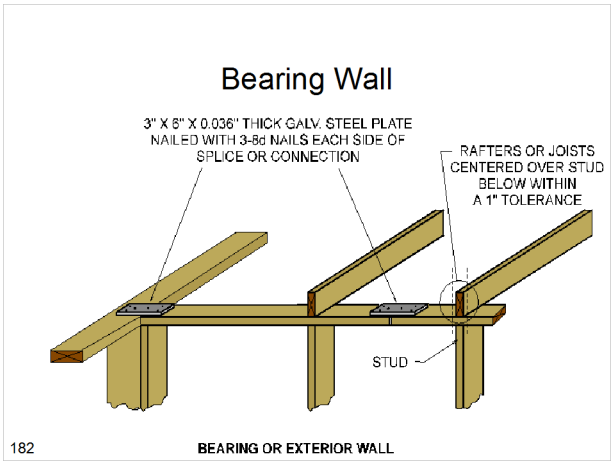
Bridging usually required?

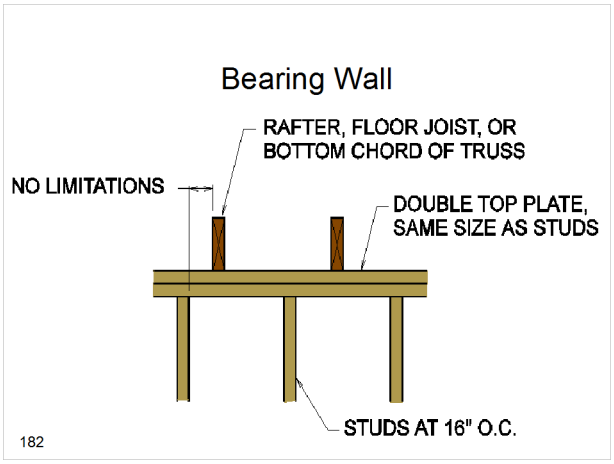
R502.7.1 Bridging. Joists exceeding a nominal 2 inches by 12 inches (51 mm by 305 mm) shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous 1-inch-by-3-inch (25.4 mm by 76 mm) strip nailed across the bottom of joists perpendicular to joists at intervals not exceeding 8 feet (2438 mm).

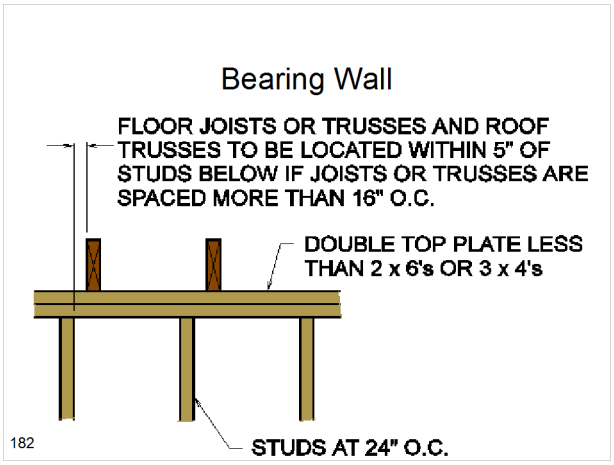
- In addition to the lateral support at the ends, joists are required to have intermediate lateral support at intervals not exceeding 8 feet (2438 mm). Intermediate blocking is not required for joists 2 inches by 12 inches (51 mm by 305 mm) or smaller. The intermediate lateral support may be provided by solid blocking, diagonal bridging or wood bridging not less than 1 inch by 3 inches (25 mm by 76 mm) nominal, nailed to the bot-

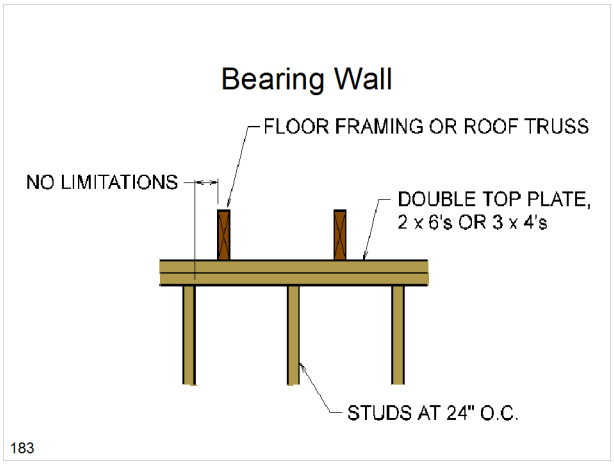

Joist Lateral Support & Bridging
SOLID BLOCKING
DIAGONAL BRIDGING
APPROVED DIAGONAL METAL BRIDGING (TWO TYPES SHOWN)
1X3 RIBBON
160

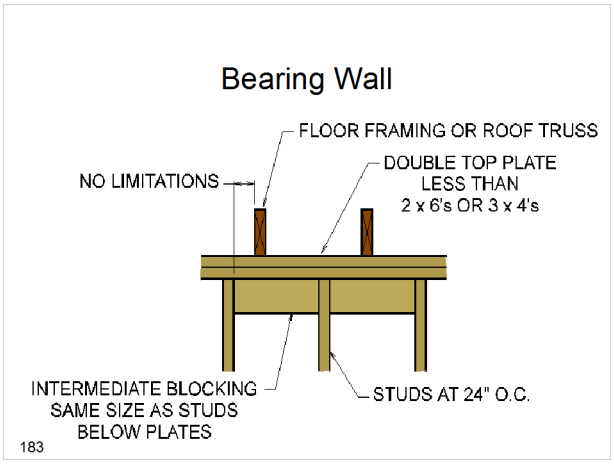

Bearing Wall
OVERLAP @ CORNERS
OVERLAP @ INTERSECTION WITH BEARING PARTITION
(2) 10d
(2) 10d
10d @ 24" O. C.
4' - 0" MINIMUM OFFSET BETWEEN PLATE JOINTS
(4) 10d IN LAPPED AREA
181

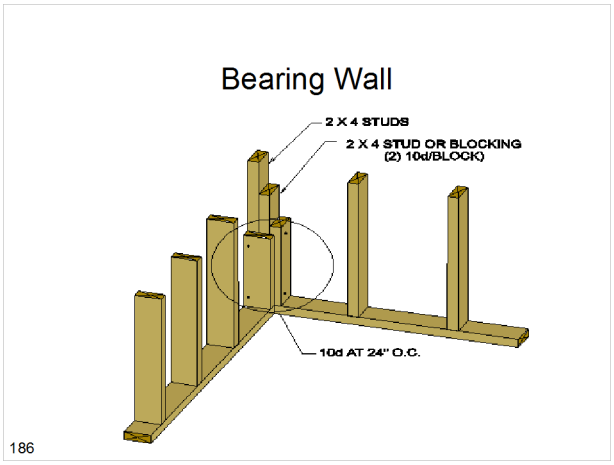

Bearing Wall
3" X 6" X 0.036" THICK GALV. STEEL PLATE NAILED WITH 3-8d NAILS EACH SIDE OF SPLICE OR CONNECTION
RAFTERS OR JOISTS CENTERED OVER STUD BELOW WITHIN A 1" TOLERANCE
STUD
182
BEARING OR EXTERIOR WALL

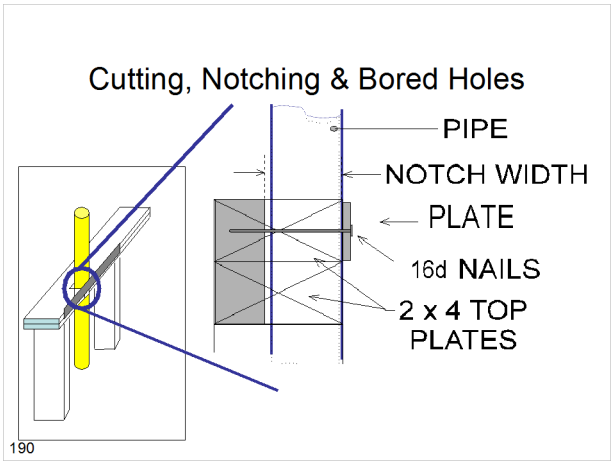

Bearing Wall
RAFTER, FLOOR JOIST, OR BOTTOM CHORD OF TRUSS
NO LIMITATIONS
DOUBLE TOP PLATE, SAME SIZE AS STUDS
STUDS AT 16" O.C.
182


Bearing Wall
FLOOR JOISTS OR TRUSSES AND ROOF TRUSSES TO BE LOCATED WITHIN 5" OF STUDS BELOW IF JOISTS OR TRUSSES ARE SPACED MORE THAN 16" O.C.
DOUBLE TOP PLATE LESS THAN 2 x 6's OR 3 x 4's
182
STUDS AT 24" O.C.


Bearing Wall
FLOOR FRAMING OR ROOF TRUSS
NO LIMITATIONS
DOUBLE TOP PLATE, 2 x 6's OR 3 x 4's
STUDS AT 24" O.C.
183


Bearing Wall
FLOOR FRAMING OR ROOF TRUSS
NO LIMITATIONS
DOUBLE TOP PLATE
LESS THAN
2 x 6's OR 3 x 4's
INTERMEDIATE BLOCKING
SAME SIZE AS STUDS
BELOW PLATES
STUDS AT 24" O.C.
183


Bearing Wall
2 X 4 STUDS
2 X 4 STUD OR BLOCKING
(2) 10d/BLOCK)
10d AT 24" O.C.
186

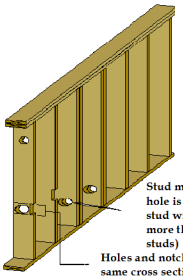

Cutting, Notching & Bored Holes
PIPE
NOTCH WIDTH
PLATE
16d NAILS
2 x 4 TOP
PLATES
190

Cutting, Notching & Bored Holes

5/8″ minimum to edge

Maximum 40% of stud width for holes

Maximum 25% of stud width for notches

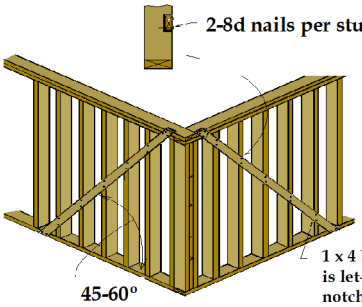


Stud must be doubled if hole is between 40-60% of stud width (allowed for no more than 2 successive studs)

Holes and notches not allowed in same cross section

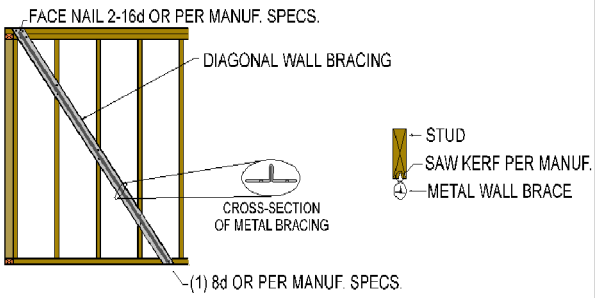
191

Wall Bracing



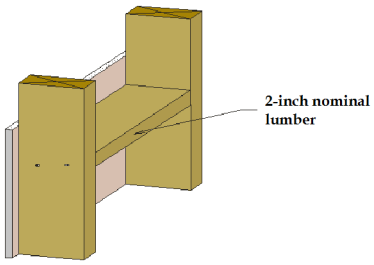
202

Wall Bracing



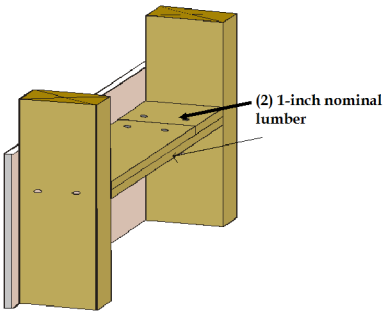
202

Fireblocking



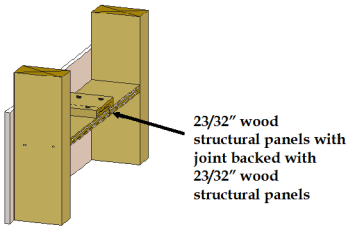
205

Fireblocking



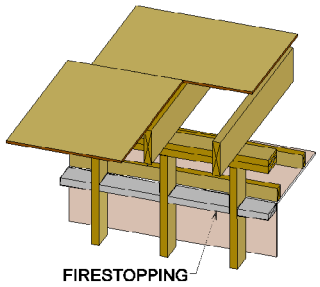
205

Fireblocking



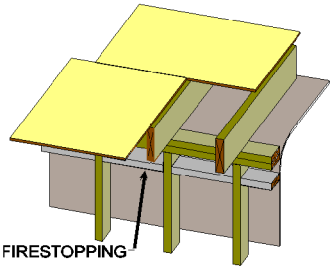
205

Fireblocking



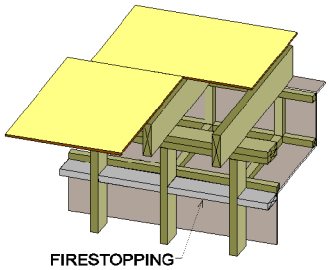
206

Fireblocking



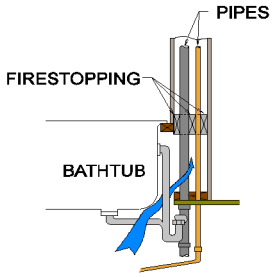
206

Fireblocking



206

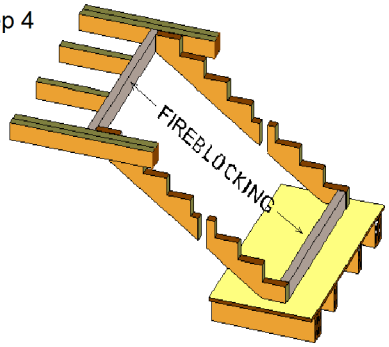
Fireblocking



206

Fireblocking

- Step 4



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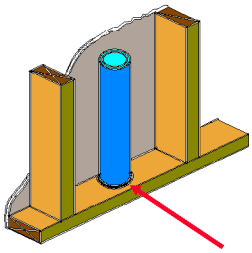
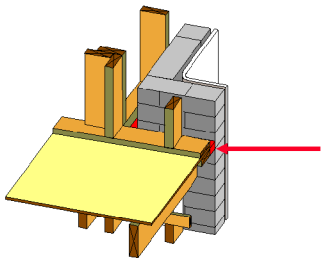
Fireblocking



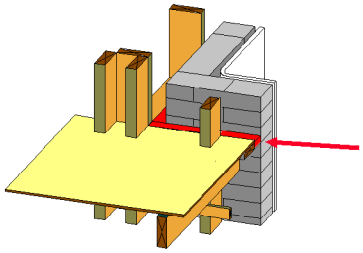
208

Fireblocking



208

Firestopping



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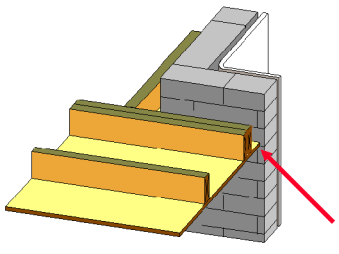
Firestopping



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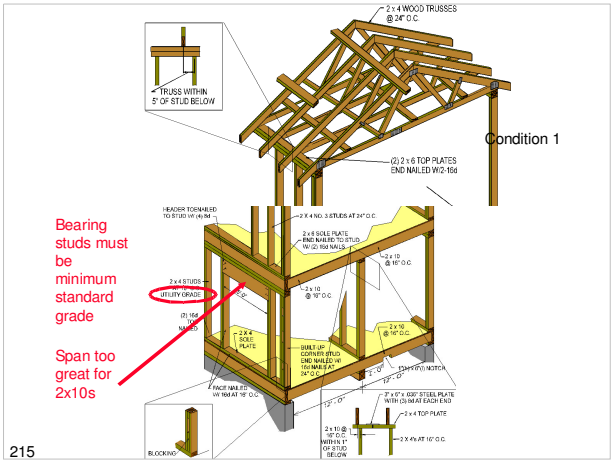
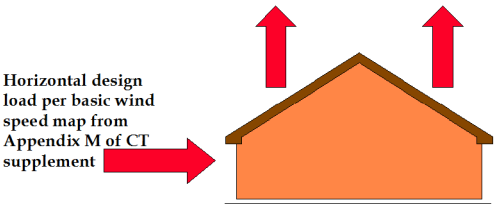


215

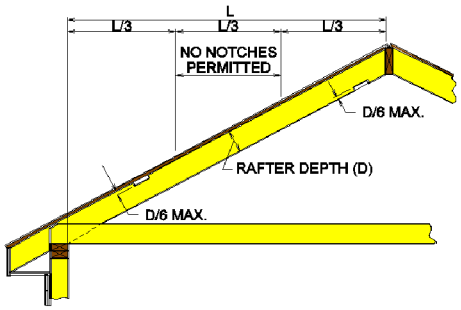
Rafter Materials & Allowable Spans Inspection

Definitions: loads



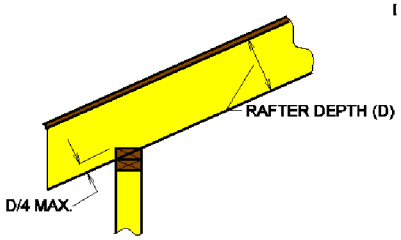
224

Rafter Cutting, Notching & Bored Holes Inspection



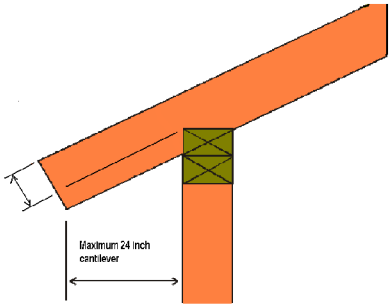
231

Rafter Cutting, Notching & Bored Holes Inspection



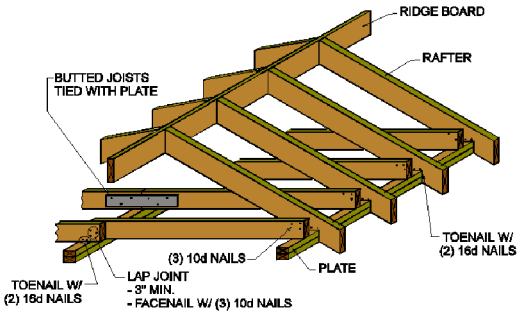
231

Rafter Cutting, Notching & Bored Holes



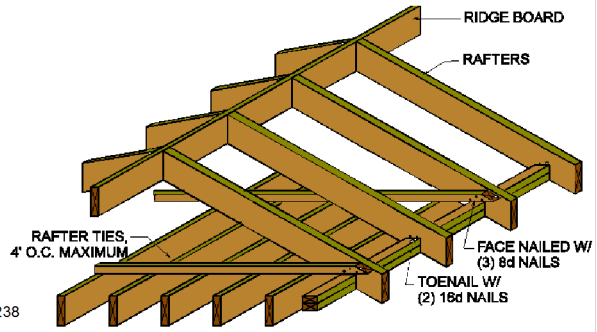
234

Roof Framing Construction



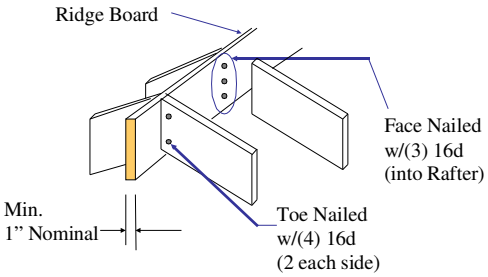
237

Roof Framing Construction



238

Roof Framing Construction



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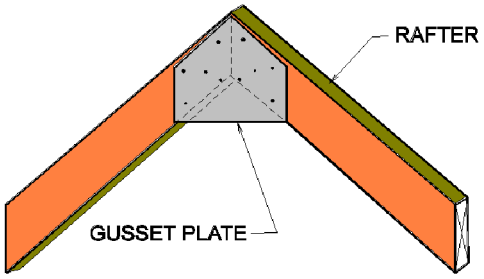
Roof Framing Construction



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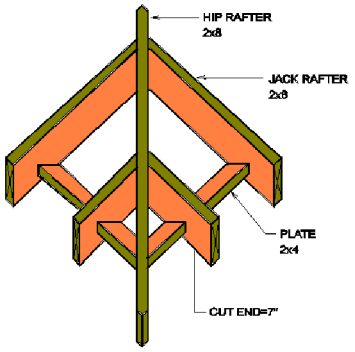
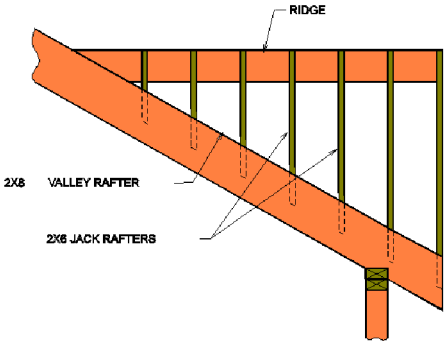
Roof Framing Construction



240

Roof Framing Construction



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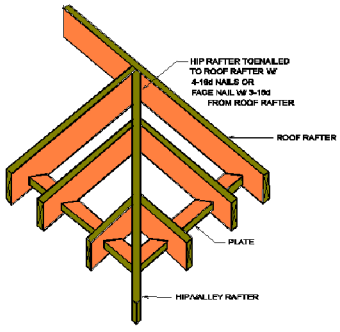
Roof Framing Construction



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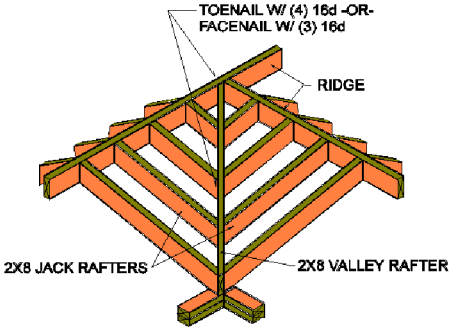
Roof Framing Construction



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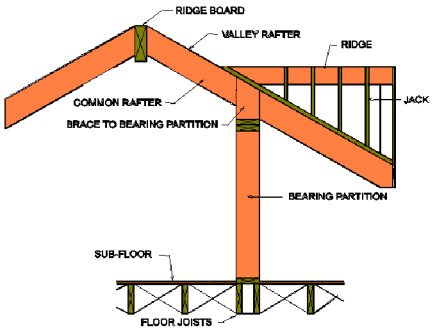
Roof Framing Construction



241

Questions?

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