

**2003 International Residential Code for One- and Two-Family Dwellings / Part III —  
Building Planning and Construction / CHAPTER 5 FLOORS / R502 WOOD FLOOR  
FRAMING**

**R502  
WOOD FLOOR FRAMING**

**502.1 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 DOCPS 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.

**502.1.1 Preservatively treated lumber.**

Preservatively treated dimension lumber shall also be identified as required by Section R319.1.

**502.1.2 Blocking and subflooring.**

Blocking shall be a minimum of utility grade lumber. Subflooring may be a minimum of utility grade lumber or No. 4 common grade boards.

**502.1.3 End-jointed lumber.**

Approved end-jointed lumber identified by a grade mark conforming to Section R501.2 may be used interchangeably with solid-sawn members of the same species and grade.

**502.1.4 Prefabricated wood I-joists.**

Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D 5055.

**502.1.5 Structural glued laminated timbers.**

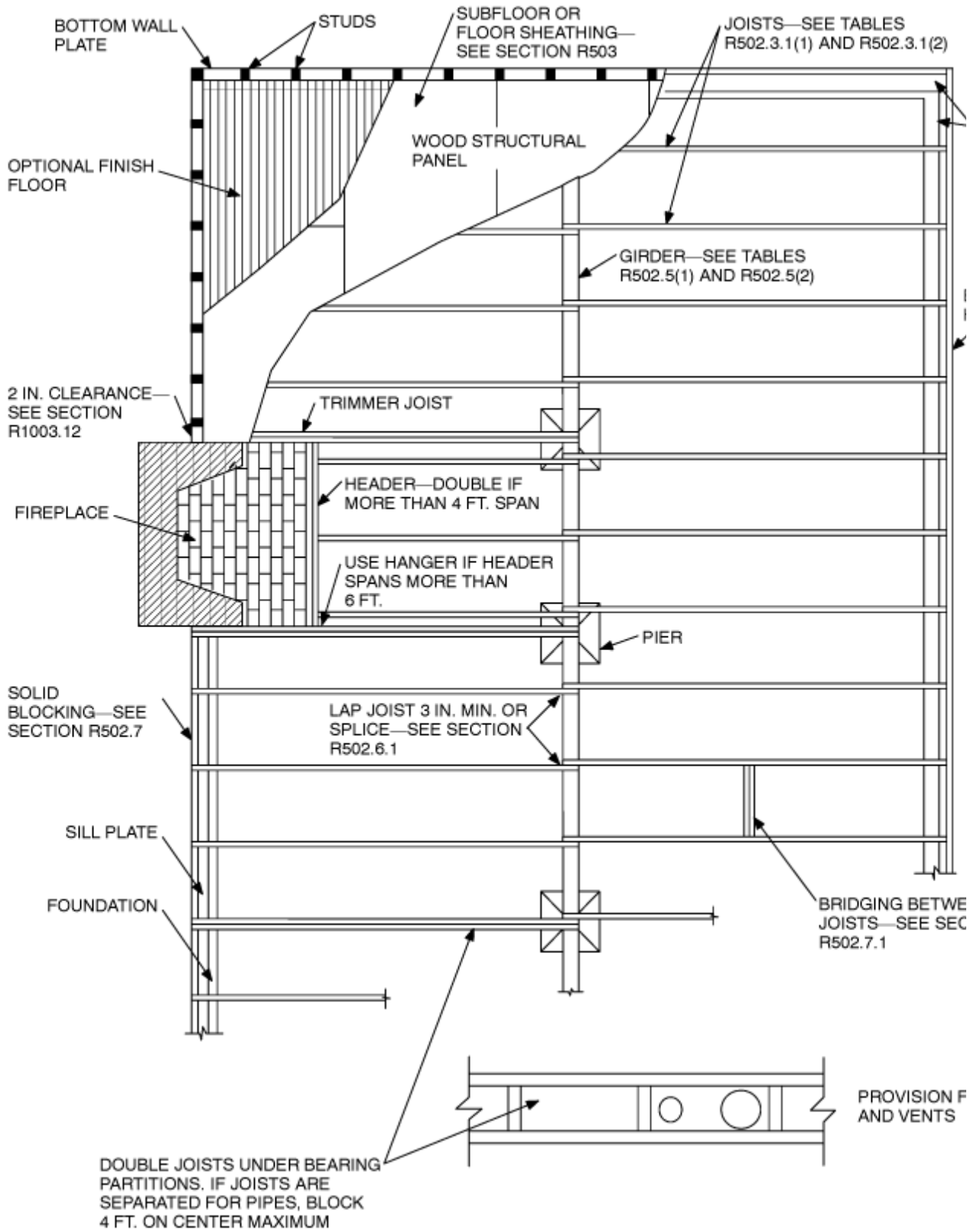
Glued laminated timbers shall be manufactured and identified as required in AITC A190.1 and ASTM D3737.

**502.2 Design and construction.**

Floors shall be designed and constructed in accordance with the provisions of this chapter, Figure R502.2 and Sections R319 and R320 or in accordance with AF&PA/NDS.

**FIGURE R502.2  
FLOOR CONSTRUCTION**

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For SI: 1 inch = 25.4 mm, 1 foot = 304.8

### **502.2.1 Decks.**

Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting.

For decks with cantilevered framing members, connections to exterior walls or other framing members, shall be designed and constructed to resist uplift resulting from the full live load specified in Table R301.4 acting on the cantilevered portion of the deck.

### **502.3 Allowable joist spans.**

Spans for floor joists shall be in accordance with Tables R502.3.1(1) and R502.3.1(2). For other grades and species and for other loading conditions, refer to the AF&PA Span Tables for Joists and Rafters.

#### **502.3.1 Sleeping areas and attic joists.**

Table R502.3.1(1) shall be utilized to determine the maximum allowable span of floor joists that support sleeping areas and attics that are accessed by means of a fixed stairway provided that the design live load does not exceed 30 psf (1.44 kN/m<sup>2</sup>) and the design dead load does not exceed 10 psf (0.48 kN/m<sup>2</sup>). The allowable span of ceiling joists that support attics utilized for limited storage or no storage shall be determined in accordance with Section R802.4.

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**TABLE R502.3.1(1)**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
**(Residential sleeping areas, live load=30 psf,  $L/\Delta = 360$ )**

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			DEAD LOAD = 10 psf				DEAD LOAD = 20 psf		
			2x6	2x8	2x10	2x12	2x6	2x8	2x10
			Maximum floor joist spans						
JOIST SPACING (inches)	SPECIE AND GRADE		(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	
12	Douglas fir-larch	SS	12- 6	16- 6	21- 0	25- 7	12- 6	16- 6	21- 0
	Douglas fir-larch	#1	12- 0	15-10	20- 3	24- 8	12- 0	15- 7	19- 0
	Douglas fir-larch	#2	11-10	15- 7	19-10	23- 0	11- 6	14- 7	17- 9
	Douglas fir-larch	#3	9- 8	12- 4	15- 0	17- 5	8- 8	11- 0	13- 5
	Hem-fir	SS	11-10	15- 7	19-10	24- 2	11-10	15- 7	19-10
	Hem-fir	#1	11- 7	15- 3	19- 5	23- 7	11- 7	15- 2	18- 6
	Hem-fir	#2	11- 0	14- 6	18- 6	22- 6	11- 0	14- 4	17- 6
	Hem-fir	#3	9- 8	12- 4	15- 0	17- 5	8- 8	11- 0	13- 5
	Southern pine	SS	12- 3	16- 2	20- 8	25- 1	12- 3	16- 2	20- 8
	Southern pine	#1	12- 0	15-10	20- 3	24- 8	12- 0	15-10	20- 3
	Southern pine	#2	11-10	15- 7	19-10	24- 2	11-10	15- 7	18- 7
	Southern pine	#3	10- 5	13- 3	15- 8	18- 8	9- 4	11-11	14- 0
	Spruce-pine-fir	SS	11- 7	15- 3	19- 5	23- 7	11- 7	15- 3	19- 5
	Spruce-pine-fir	#1	11- 3	14-11	19- 0	23- 0	11- 3	14- 7	17- 9
	Spruce-pine-fir	#2	11- 3	14-11	19- 0	23- 0	11- 3	14- 7	17- 9
	Spruce-pine-fir	#3	9- 8	12- 4	15- 0	17- 5	8- 8	11- 0	13- 5
16	Douglas fir-larch	SS	11- 4	15- 0	19- 1	23- 3	11- 4	15- 0	19- 1
	Douglas fir-larch	#1	10-11	14- 5	18- 5	21- 4	10- 8	13- 6	16- 5
	Douglas fir-larch	#2	10- 9	14- 1	17- 2	19-11	9-11	12- 7	15- 5
	Douglas fir-larch	#3	8- 5	10- 8	13- 0	15- 1	7- 6	9- 6	11- 8
	Hem-fir	SS	10- 9	14- 2	18- 0	21-11	10- 9	14- 2	18- 0
	Hem-fir	#1	10- 6	13-10	17- 8	20- 9	10- 4	13- 1	16- 0
	Hem-fir	#2	10- 0	13- 2	16-10	19- 8	9-10	12- 5	15- 2
	Hem-fir	#3	8- 5	10- 8	13- 0	15- 1	7- 6	9- 6	11- 8
	Southern pine	SS	11- 2	14- 8	18- 9	22-10	11- 2	14- 8	18- 9
	Southern pine	#1	10-11	14- 5	18- 5	22- 5	10-11	14- 5	17-11
	Southern pine	#2	10- 9	14- 2	18- 0	21- 1	10- 5	13- 6	16- 1
	Southern pine	#3	9- 0	11- 6	13- 7	16- 2	8- 1	10- 3	12- 2
	Spruce-pine-fir	SS	10- 6	13-10	17- 8	21- 6	10- 6	13-10	17- 8
	Spruce-pine-fir	#1	10- 3	13- 6	17- 2	19-11	9-11	12- 7	15- 5
	Spruce-pine-fir	#2	10- 3	13- 6	17- 2	19-11	9-11	12- 7	15- 5
	Spruce-pine-fir	#3	8- 5	10- 8	13- 0	15- 1	7- 6	9- 6	11- 8
19.2	Douglas fir-larch	SS	10- 8	14- 1	18- 0	21-10	10- 8	14- 1	18- 0
	Douglas fir-larch	#1	10- 4	13- 7	16- 9	19- 6	9- 8	12- 4	15- 0
	Douglas fir-larch	#2	10- 1	12-10	15- 8	18- 3	9- 1	11- 6	14- 1
	Douglas fir-larch	#3	7- 8	9- 9	11-10	13- 9	6-10	8- 8	10- 7
	Hem-fir	SS	10- 1	13- 4	17- 0	20- 8	10- 1	13- 4	17- 0
	Hem-fir	#1	9-10	13- 0	16- 4	19- 0	9- 6	12- 0	14- 8
	Hem-fir	#2	9- 5	12- 5	15- 6	17- 1	8-11	11- 4	13-10
	Hem-fir	#3	7- 8	9- 9	11- 10	13- 9	6-10	8- 8	10- 7
	Southern pine	SS	10- 6	13-10	17- 8	21- 6	10- 6	13-10	17- 8
	Southern pine	#1	10- 4	13- 7	17- 4	21- 1	10- 4	13- 7	16- 4
	Southern pine	#2	10- 1	13- 4	16- 5	19- 3	9- 6	12- 4	14- 8
	Southern pine	#3	8- 3	10- 6	12- 5	14- 9	7- 4	9- 5	11- 1
	Spruce-pine-fir	SS	9- 10	13- 0	16- 7	20- 2	9-10	13- 0	16- 7
	Spruce-pine-fir	#1	9- 8	12- 9	15- 8	18- 3	9- 1	11- 6	14- 1
	Spruce-pine-fir	#2	9- 8	12- 9	15- 8	18- 3	9- 1	11- 6	14- 1
	Spruce-pine-fir	#3	7- 8	9- 9	11-10	13- 9	6-10	8- 8	10- 7
24	Douglas fir-larch	SS	9-11	13- 1	16- 8	20- 3	9-11	13- 1	16- 2
	Douglas fir-larch	#1	9- 7	12- 4	15- 0	17- 5	8- 8	11- 0	13- 5
	Douglas fir-larch	#2	9- 1	11- 6	14- 1	16- 3	8- 1	10- 3	12- 7
	Douglas fir-larch	#3	6-10	8- 8	10- 7	12- 4	6- 2	7- 9	9- 6
	Hem-fir	SS	9- 4	12- 4	15- 9	19- 2	9- 4	12- 4	15- 9
	Hem-fir	#1	9- 2	12- 0	14- 8	17- 0	8- 6	10- 9	13- 1
	Hem-fir	#2	8- 9	11- 4	13-10	16- 1	8- 0	10- 2	12- 5
	Hem-fir	#3	6-10	8- 8	10- 7	12- 4	6- 2	7- 9	9- 6
	Southern pine	SS	9- 9	12-10	16- 5	19-11	9- 9	12-10	16- 5
	Southern pine	#1	9- 7	12- 7	16- 1	19- 6	9- 7	12- 4	14- 7
	Southern pine	#2	9- 4	12- 4	14- 8	17- 2	8- 6	11- 0	13- 1
	Southern pine	#3	7- 4	9- 5	11- 1	13- 2	6- 7	8- 5	9-11
	Spruce-pine-fir	SS	9- 2	12- 1	15- 5	18- 9	9- 2	12- 1	15- 0
	Spruce-pine-fir	#1	8-11	11- 6	14- 1	16- 3	8- 1	10- 3	12- 7
	Spruce-pine-fir	#2	8-11	11- 6	14- 1	16- 3	8- 1	10- 3	12- 7
	Spruce-pine-fir	#3	8-11	11- 6	14- 1	16- 3	8- 1	10- 3	12- 7

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For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

NOTE: Check sources for availability of lumber in lengths greater than 20 feet.

### **TABLE R502.3.1(2)** **FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES (Residential living areas,** **live load=40 psf, L/Δ =360)**

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JOIST SPACING (inches)			DEAD LOAD = 10 psf				DEAD LOAD = 20 psf		
			2x6	2x8	2x10	2x12	2x6	2x8	2x10
			Maximum floor joist spans						
SPECIE AND GRADE			(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)
12	Douglas fir-larch	SS	11- 4	15- 0	19- 1	23- 3	11- 4	15- 0	19- 1
	Douglas fir-larch	#1	10-11	14- 5	18- 5	22- 0	10-11	14- 2	17- 4
	Douglas fir-larch	#2	10- 9	14- 2	17- 9	20- 7	10- 6	13- 3	16- 3
	Douglas fir-larch	#3	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3
	Hem-fir	SS	10- 9	14- 2	18- 0	21-11	10- 9	14- 2	18- 0
	Hem-fir	#1	10- 6	13-10	17- 8	21- 6	10- 6	13-10	16-11
	Hem-fir	#2	10- 0	13- 2	16-10	20- 4	10- 0	13- 1	16- 0
	Hem-fir	#3	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3
	Southern pine	SS	11- 2	14- 8	18- 9	22-10	11- 2	14- 8	18- 9
	Southern pine	#1	10-11	14- 5	18- 5	22- 5	10-11	14- 5	18- 5
	Southern pine	#2	10- 9	14- 2	18- 0	21- 9	10- 9	14- 2	16-11
	Southern pine	#3	9- 4	11-11	14- 0	16- 8	8- 6	10-10	12-10
	Spruce-pine-fir	SS	10- 6	13-10	17- 8	21- 6	10- 6	13-10	17- 8
	Spruce-pine-fir	#1	10- 3	13- 6	17- 3	20- 7	10- 3	13- 3	16- 3
	Spruce-pine-fir	#2	10- 3	13- 6	17- 3	20- 7	10- 3	13- 3	16- 3
	Spruce-pine-fir	#3	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3
16	Douglas fir-larch	SS	10- 4	13- 7	17- 4	21- 1	10- 4	13- 7	17- 4
	Douglas fir-larch	#1	9-11	13- 1	16- 5	19- 1	9- 8	12- 4	15- 0
	Douglas fir-larch	#2	9- 9	12- 7	15- 5	17-10	9- 1	11- 6	14- 1
	Douglas fir-larch	#3	7- 6	9- 6	11- 8	13- 6	6-10	8- 8	10- 7
	Hem-fir	SS	9- 9	12-10	16- 5	19-11	9- 9	12-10	16- 5
	Hem-fir	#1	9- 6	12- 7	16- 0	18- 7	9- 6	12- 0	14- 8
	Hem-fir	#2	9- 1	12- 0	15- 2	17- 7	8-11	11- 4	13-10
	Hem-fir	#3	7- 6	9- 6	11- 8	13- 6	6-10	8- 8	10- 7
	Southern pine	SS	10- 2	13- 4	17- 0	20- 9	10- 2	13- 4	17- 0
	Southern pine	#1	9-11	13- 1	16- 9	20- 4	9-11	13- 1	16- 4
	Southern pine	#2	9- 9	12-10	16- 1	18-10	9- 6	12- 4	14- 8
	Southern pine	#3	8- 1	10- 3	12- 2	14- 6	7- 4	9- 5	11- 1
	Spruce-pine-fir	SS	9- 6	12- 7	16- 0	19- 6	9- 6	12- 7	16- 0
	Spruce-pine-fir	#1	9- 4	12- 3	15- 5	17-10	9- 1	11- 6	14- 1
	Spruce-pine-fir	#2	9- 4	12- 3	15- 5	17-10	9- 1	11- 6	14- 1
	Spruce-pine-fir	#3	7- 6	9- 6	11- 8	13- 6	6-10	8- 8	10- 7
19.2	Douglas fir-larch	SS	9- 8	12-10	16- 4	19-10	9- 8	12-10	16- 4
	Douglas fir-larch	#1	9- 4	12- 4	15- 0	17- 5	8-10	11- 3	13- 8
	Douglas fir-larch	#2	9- 1	11- 6	14- 1	16- 3	8- 3	10- 6	12-10
	Douglas fir-larch	#3	6-10	8- 8	10- 7	12- 4	6- 3	7-11	9- 8
	Hem-fir	SS	9- 2	12- 1	15- 5	18- 9	9- 2	12- 1	15- 5
	Hem-fir	#1	9- 0	11-10	14- 8	17- 0	8- 8	10-11	13- 4
	Hem-fir	#2	8- 7	11- 3	13-10	16- 1	8- 2	10- 4	12- 8
	Hem-fir	#3	6-10	8- 8	10- 7	12- 4	6- 3	7-11	9- 8
	Southern pine	SS	9- 6	12- 7	16- 0	19- 6	9- 6	12- 7	16- 0
	Southern pine	#1	9- 4	12- 4	15- 9	19- 2	9- 4	12- 4	14-11
	Southern pine	#2	9- 2	12- 1	14- 8	17- 2	8- 8	11- 3	13- 5
	Southern pine	#3	7- 4	9- 5	11- 1	13- 2	6- 9	8- 7	10- 1
	Spruce-pine-fir	SS	9- 0	11-10	15- 1	18- 4	9- 0	11-10	15- 1
	Spruce-pine-fir	#1	8- 9	11- 6	14- 1	16- 3	8- 3	10- 6	12-10
	Spruce-pine-fir	#2	8- 9	11- 6	14- 1	16- 3	8- 3	10- 6	12-10
	Spruce-pine-fir	#3	6-10	8- 8	10- 7	12- 4	6- 3	7-11	9- 8
24	Douglas fir-larch	SS	9- 0	11-11	15- 2	18- 5	9- 0	11-11	14- 9
	Douglas fir-larch	#1	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3
	Douglas fir-larch	#2	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6
	Douglas fir-larch	#3	6- 2	7- 9	9- 6	11- 0	5- 7	7- 1	8- 8
	Hem-fir	SS	8- 6	11- 3	14- 4	17- 5	8- 6	11- 3	14- 4
	Hem-fir	#1	8- 4	10- 9	13- 1	15- 2	7- 9	9- 9	11-11
	Hem-fir	#2	7-11	10- 2	12- 5	14- 4	7- 4	9- 3	11- 4
	Hem-fir	#3	6- 2	7- 9	9- 6	11- 0	5- 7	7- 1	8- 8
	Southern pine	SS	8-10	11- 8	14-11	18- 1	8-10	11- 8	14-11
	Southern pine	#1	8- 8	11- 5	14- 7	17- 5	8- 8	11- 3	13- 4
	Southern pine	#2	8- 6	11- 0	13- 1	15- 5	7- 9	10- 0	12- 0
	Southern pine	#3	6- 7	8- 5	9-11	11-10	6- 0	7- 8	9- 1
	Spruce-pine-fir	SS	8- 4	11- 0	14- 0	17- 0	8- 4	11- 0	13- 8
	Spruce-pine-fir	#1	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6
	Spruce-pine-fir	#2	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6
	Spruce-pine-fir	#3	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6

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For SI: 1 inch = 25.4 mm, 1 foot = 308.4 mm, 1 pound per square foot = 0.0479 kN/m.

a. End bearing length shall be increased to 2 inches.

### **502.3.2 Other floor joists.**

Table R502.3.1(2) shall be utilized to determine the maximum allowable span of floor joists that support all areas of the building, other than sleeping and attics, provided that the design live load does not exceed 40 psf (1.92 kN/m<sup>2</sup>) and the design dead does not exceed 10 psf (0.48 kN/m<sup>2</sup>).

### **502.3.3 Floor cantilevers.**

Floor cantilever spans shall not exceed the nominal depth of the wood floor joist. Floor cantilevers constructed in accordance with Table R502.3.3(1) shall be permitted when supporting a light-frame bearing wall and roof only. Floor cantilevers supporting an exterior balcony are permitted to be constructed in accordance with Table R502.3.3(2).

**TABLE R502.3.3(1)**  
**CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME**  
**EXTERIOR**  
**BEARING WALL AND ROOF ONLY** <sup>a, b, c, f, g, h</sup>  
**(Floor Live Load \_ 40 psf, Roof Live Load \_ 20 psf)**

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Member & Spacing	Maximum Cantilever Span (Uplift Force at Backspan Support in Lbs.) <sup>d, e</sup>										
	Ground Snow Load										
	≤ 20 psf			30 psf			50 psf			70 psf	
	Roof Width			Roof Width			Roof Width			Roof Width	
	24 ft.	32 ft.	40 ft.	24 ft.	32 ft.	40 ft.	24 ft.	32 ft.	40 ft.	24 ft.	32 ft.
2 × 8 @ 12"	20" (177)	15" (227)	—	18" (209)	—	—	—	—	—	—	—
2 × 10 @ 16"	29" (228)	21" (297)	16" (364)	26" (271)	18" (354)	—	20" (375)	—	—	—	—
2 × 10 @ 12"	36" (166)	26" (219)	20" (270)	34" (198)	22" (263)	16" (324)	26" (277)	—	—	19" (356)	—
2 × 12 @ 16"	—	32" (287)	25" (356)	36" (263)	29" (345)	21" (428)	29" (367)	20" (484)	—	23" (471)	—
2 × 12 @ 12"	—	42" (209)	31" (263)	—	37" (253)	27" (317)	36" (271)	27" (358)	17" (447)	31" (348)	19" (462)
2 × 12 @ 8"	—	48" (136)	45" (169)	—	48" (164)	38" (206)	—	40" (233)	26" (294)	36" (230)	29" (304)

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- Tabulated values are for clear-span roof supported solely by exterior bearing walls.
- Spans are based on No. 2 Grade lumber of Douglas fir-larch, hem-fir, southern pine, and spruce-pine-fir for repetitive (3 or more) members.
- Ratio of backspan to cantilever span shall be at least 3:1.
- Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
- Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).
- See Section R301.2.2.7.1 for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Categories D1 and D2 and townhouses in Seismic Design Categories C, D1, and D2.
- A full-depth rim joist shall be provided at the cantilevered end of the joists. Solid blocking shall be provided at the cantilever support.
- Linear interpolation shall be permitted for building widths and ground snow loads other than shown.

**TABLE R502.3.3(2)**  
**CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY** <sup>a, b,</sup>  
<sup>e, f</sup>

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Member Size	Spacing	Maximum Cantilever Span (Uplift Force at Backspan Support in Lbs.) <sup>c, d</sup>		
		Ground Snow Load		
		≤ 30 psf	50 psf	70 psf
2 × 8	12"	42" (139)	39" (156)	34" (107)
2 × 8	16"	36" (151)	34" (171)	29" (91)
2 × 10	12"	61" (164)	57" (189)	49" (151)
2 × 10	16"	53" (180)	49" (208)	42" (128)
2 × 10	24"	43" (212)	40" (241)	34" (104)
2 × 12	16"	72" (228)	67" (260)	57" (174)
2 × 12	24"	58" (279)	54" (319)	47" (143)

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. Spans are based on No. 2 Grade lumber of Douglas fir-larch, hem-fir, southern pine, and spruce-pine-fir for repetitive (3 or more) members.
- b. Ratio of backspan to cantilever span shall be at least 2:1.
- c. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
- d. Uplift force is for a backspan to cantilever span ratio of 2:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 2 divided by the actual backspan ratio provided (2/backspan ratio).
- e. A full-depth rim joist shall be provided at the cantilevered end of the joists. Solid blocking shall be provided at the cantilevered support.
- f. Linear interpolation shall be permitted for ground snow loads other than shown.

### 502.4 Joists under bearing partitions.

Joists under parallel bearing partitions shall be of adequate size to support the load. Double joists, sized to adequately support the load, that are separated to permit the installation of piping or vents shall be full depth solid blocked with lumber not less than 2 inches (51 mm) in nominal thickness spaced not more than 4 feet (1219 mm) on center. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth unless such joists are of sufficient size to carry the additional load.

### 502.5 Allowable girder spans.

The allowable spans of girders fabricated of dimension lumber shall not exceed the values set forth in Tables R502.5(1) and R502.5(2).

**TABLE R502.5(1)**  
**GIRDER SPANS<sup>a</sup> AND HEADER SPANS<sup>a</sup> FOR EXTERIOR BEARING WALLS**  
**(Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir b**  
**and required number of jack studs)**

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GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) <sup>a</sup>										
		30						50				
		Building width <sup>c</sup> (feet)										
		20		28		36		20		28		S <sub>f</sub>
Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>			
Roof and ceiling	2-2x4	3-6	1	3-2	1	2-10	1	3-2	1	2-9	1	2
	2-2x6	5-5	1	4-8	1	4-2	1	4-8	1	4-1	1	3
	2-2x8	6-10	1	5-11	2	5-4	2	5-11	2	5-2	2	4
	2-2x10	8-5	2	7-3	2	6-6	2	7-3	2	6-3	2	5
	2-2x12	9-9	2	8-5	2	7-6	2	8-5	2	7-3	2	6
	3-2x8	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5
	3-2x10	10-6	1	9-1	2	8-2	2	9-1	2	7-10	2	7
	3-2x12	12-2	2	10-7	2	9-5	2	10-7	2	9-2	2	8
	4-2x8	9-2	1	8-4	1	7-8	1	8-4	1	7-5	1	6
	4-2x10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8
Roof, ceiling and one center-bearing floor	2-2x4	3-1	1	2-9	1	2-5	1	2-9	1	2-5	1	2
	2-2x6	4-6	1	4-0	1	3-7	2	4-1	1	3-7	2	3
	2-2x8	5-9	2	5-0	2	4-6	2	5-2	2	4-6	2	4
	2-2x10	7-0	2	6-2	2	5-6	2	6-4	2	5-6	2	5
	2-2x12	8-1	2	7-1	2	6-5	2	7-4	2	6-5	2	5
	3-2x8	7-2	1	6-3	2	5-8	2	6-5	2	5-8	2	5
	3-2x10	8-9	2	7-8	2	6-11	2	7-11	2	6-11	2	6
	3-2x12	10-2	2	8-11	2	8-0	2	9-2	2	8-0	2	7
	4-2x8	8-1	1	7-3	1	6-7	1	7-5	1	6-6	1	5
	4-2x10	10-1	1	8-10	2	8-0	2	9-1	2	8-0	2	7
Roof, ceiling and one clear span floor	2-2x4	2-8	1	2-4	1	2-1	1	2-7	1	2-3	1	2
	2-2x6	3-11	1	3-5	2	3-0	2	3-10	2	3-4	2	3
	2-2x8	5-0	2	4-4	2	3-10	2	4-10	2	4-2	2	3
	2-2x10	6-1	2	5-3	2	4-8	2	5-11	2	5-1	2	4
	2-2x12	7-1	2	6-1	3	5-5	3	6-10	2	5-11	3	5
	3-2x8	6-3	2	5-5	2	4-10	2	6-1	2	5-3	2	4
	3-2x10	7-7	2	6-7	2	5-11	2	7-5	2	6-5	2	5
	3-2x12	8-10	2	7-8	2	6-10	2	8-7	2	7-5	2	6
	4-2x8	7-2	1	6-3	2	5-7	2	7-0	1	6-1	2	5
	4-2x10	8-9	2	7-7	2	6-10	2	8-7	2	7-5	2	6
Roof, ceiling and two center-bearing floors	2-2x4	2-7	1	2-3	1	2-0	1	2-6	1	2-2	1	1
	2-2x6	3-9	2	3-3	2	2-11	2	3-8	2	3-2	2	2
	2-2x8	4-9	2	4-2	2	3-9	2	4-7	2	4-0	2	3
	2-2x10	5-9	2	5-1	2	4-7	3	5-8	2	4-11	2	4
	2-2x12	6-8	2	5-10	3	5-3	3	6-6	2	5-9	3	5
	3-2x8	5-11	2	5-2	2	4-8	2	5-9	2	5-1	2	4
	3-2x10	7-3	2	6-4	2	5-8	2	7-1	2	6-2	2	5
	3-2x12	8-5	2	7-4	2	6-7	2	8-2	2	7-2	2	6
	4-2x8	6-10	1	6-0	2	5-5	2	6-8	1	5-10	2	5
	4-2x10	8-4	2	7-4	2	6-7	2	8-2	2	7-2	2	6
4-2x12	9-8	2	8-6	2	7-8	2	9-5	2	8-3	2	7	

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GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) <sup>e</sup>										S
		30					50					
		Building width <sup>c</sup> (feet)										
		20		28		36		20		28		
Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	
Roof, ceiling and two clear span floor	2-2x4	2-1	1	1-8	1	1-6	2	2-0	1	1-8	1	1
	2-2x6	3-1	2	2-8	2	2-4	2	3-0	2	2-7	2	2
	2-2x8	3-10	2	3-4	3	3-0	3	3-10	2	3-4	2	2
	2-2x10	4-9	2	4-1	3	3-8	3	4-8	2	4-0	3	3
	2-2x12	5-6	3	4-9	3	4-3	3	5-5	3	4-8	3	4
	3-2x8	4-10	2	4-2	2	3-9	2	4-9	2	4-1	2	3
	3-2x10	5-11	2	5-1	2	4-7	3	5-10	2	5-0	2	4
	3-2x12	6-10	2	5-11	3	5-4	3	6-9	2	5-10	3	5
	4-2x8	5-7	2	4-10	2	4-4	2	5-6	2	4-9	2	4
	4-2x10	6-10	2	5-11	2	5-3	2	6-9	2	5-10	2	5
4-2x12	7-11	2	6-10	2	6-2	3	7-9	2	6-9	2	6	

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- Spans are given in feet and inches.
- Tabulated values assume #2 grade lumber.
- Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
- NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.
- Use 30 psf ground snow load for cases in which ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.

**TABLE R502.5(2)**  
**GIRDER SPANS<sup>a</sup> AND HEADER SPANS<sup>a</sup> FOR INTERIOR BEARING WALLS**  
**(Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir b**  
**and required number of jack studs)**

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HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING WIDTH <sup>c</sup> (feet)				
		20		28		Span
		Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	
One floor only	2-2x4	3-1	1	2-8	1	2-5
	2-2x6	4-6	1	3-11	1	3-6
	2-2x8	5-9	1	5-0	2	4-5
	2-2x10	7-0	2	6-1	2	5-5
	2-2x12	8-1	2	7-0	2	6-3
	3-2x8	7-2	1	6-3	1	5-7
	3-2x10	8-9	1	7-7	2	6-9
	3-2x12	10-2	2	8-10	2	7-10
	4-2x8	5-10	1	5-1	2	4-6
	4-2x10	10-1	1	8-9	1	7-10
	4-2x12	11-9	1	10-2	2	9-1
Two floors	2-2x4	2-2	1	1-10	1	1-7
	2-2x6	3-2	2	2-9	2	2-5
	2-2x8	4-1	2	3-6	2	3-2
	2-2x10	4-11	2	4-3	2	3-10
	2-2x12	5-9	2	5-0	3	4-5
	3-2x8	5-1	2	4-5	2	3-11
	3-2x10	6-2	2	5-4	2	4-10
	3-2x12	7-2	2	6-3	2	5-7
	4-2x8	4-2	2	3-7	2	3-2
	4-2x10	7-2	2	6-2	2	5-6
	4-2x12	8-4	2	7-2	2	6-5

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- Spans are given in feet and inches.
- Tabulated values assume #2 grade lumber.
- Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
- NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the headers are permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

**502.6 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.

**502.6.1 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.

**502.6.2 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).

**502.7 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 D1 and D2, lateral restraint shall also be provided at each intermediate support.

**502.7.1 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).

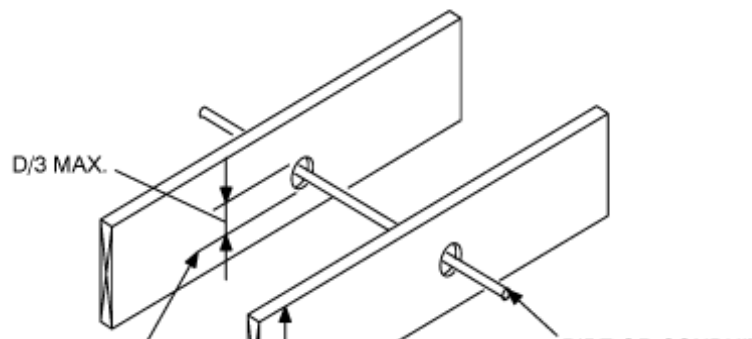
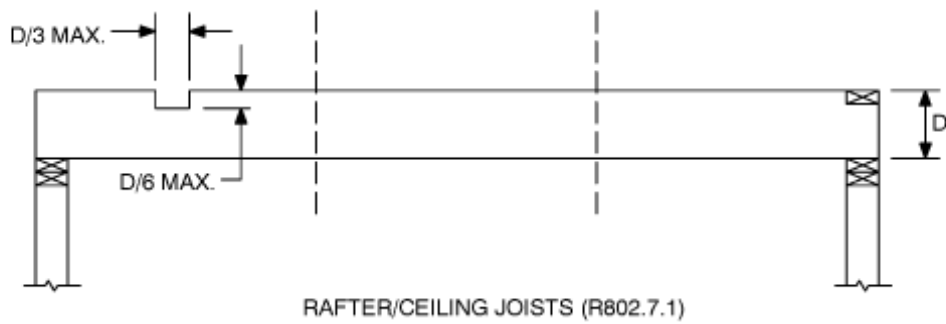
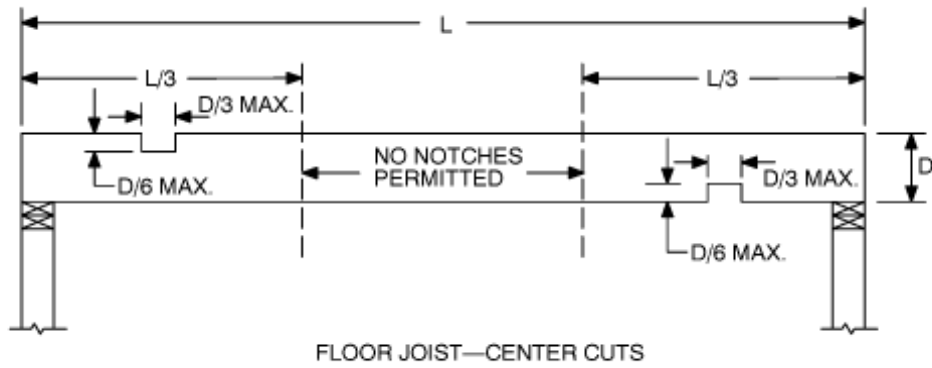
**502.8 Drilling and notching.**

Structural floor members shall not be cut, bored or notched in excess of the limitations specified

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in this section. See Figure R502.8.

**R502.8**  
**CUTTING, NOTCHING AND DRILLING**

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For SI: 1 inch = 25.4 mm

### **502.8.1 Sawn lumber.**

Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches (102 mm) or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches (51 mm) to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2 inches (51 mm) to the notch.

### **502.8.2 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.

### **502.9 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.

### **502.10 Framing of openings.**

Openings in floor framing shall be framed with a header and trimmer joists. When the header joist span does not exceed 4 feet (1219 mm), the header joist may be a single member the same size as the floor joist.

Single trimmer joists may be used to carry a single header joist that is located within 3 feet

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(914 mm) of the trimmer joist bearing. When the header joist span exceeds 4 feet (1219 mm), the trimmer joists and the header joist shall be doubled and of sufficient cross section to support the floor joists framing into the header. Approved hangers shall be used for the header joist to trimmer joist connections when the header joist span exceeds 6 feet (1829 mm). Tail joists over 12 feet (3658 mm) long shall be supported at the header by framing anchors or on ledger strips not less than 2 inches by 2 inches (51 mm by 51 mm).

### **502.11 Wood trusses.**

#### **502.11.1 Design.**

Wood trusses shall be designed in accordance with approved engineering practice. The design and manufacture of metal plate connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered professional where required by the statutes of the jurisdiction in which the project is to be constructed in accordance with Section R106.1.

#### **502.11.2 Bracing.**

Trusses shall be braced to prevent rotation and provide lateral stability in accordance with the requirements specified in the construction documents for the building and on the individual truss design drawings. In the absence of specific bracing requirements, trusses shall be braced in accordance with the TPI, HIB.

#### **502.11.3 Alterations to trusses.**

Truss members and components shall not be cut, notched, spliced or otherwise altered in any way without the approval of a registered design professional. Alterations resulting in the addition of load (e.g., HVAC equipment, water heater, etc.), that exceed the design load for the truss, shall not be permitted without verification that the truss is capable of supporting the additional loading.

**502.11.4 Truss design drawings.**

Truss design drawings, prepared in compliance with Section R502.11.1, shall be provided to the building official and approved prior to installation. Truss design drawing shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span, and spacing.
2. Location of all joints.
3. Required bearing widths.
4. Design loads as applicable.
  - 4.1. Top chord live load (including snow loads).
  - 4.2. Top chord dead load.
  - 4.3. Bottom chord live load.
  - 4.4. Bottom chord dead load.
  - 4.5. Concentrated loads and their points of application.
  - 4.6. Controlling wind and earthquake loads.
5. Adjustments to lumber and joint connector design values for conditions of use.
6. Each reaction force and direction.
7. Joint connector type and description (e.g., size, thickness or gauge); and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
8. Lumber size, species and grade for each member.
9. Connection requirements for:
  - 9.1. Truss-to-truss girder.
  - 9.2. Truss ply-to-ply.
  - 9.3. Field splices.
10. Calculated deflection ratio and/or maximum description for live and total load.
11. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents.
12. Required permanent truss member bracing location.

**502.12 Draft stopping required.**

When there is usable space both above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (92.9 m<sup>2</sup>). Draft stopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below Draft stopping shall be provided in floor/ceiling assemblies under the following circumstances:

1. Ceiling is suspended under the floor framing.
2. Floor framing is constructed of truss-type open-web or perforated members.

**502.12.1 Materials.**

Draft stopping materials shall not be less than 1/2-inch (12.7 mm) gypsum board, 3/8-inch (9.5 mm) wood structural panels, 3/8-inch (9.5 mm) Type 2-M-W particleboard or other approved materials adequately supported. Draft stopping shall be installed parallel to the floor framing members unless otherwise approved by the building official. The integrity of all draftstops shall be maintained.

**502.13 Fireblocking required.**

Fireblocking shall be provided in wood-frame floor construction and floor-ceiling assemblies in accordance with Section R602.8.