

HP-1, *The American National Standard for Hardwood and Decorative Plywood*.

### 2304.7 Floor and roof sheathing.

**2304.7.1 Structural floor sheathing.** Structural floor sheathing shall be designed in accordance with the general provisions of this code and the special provisions in this section.

Floor sheathing conforming to the provisions of Table 2304.7(1), 2304.7(2), 2304.7(3) or 2304.7(4) shall be deemed to meet the requirements of this section.

**2304.7.2 Structural roof sheathing.** Structural roof sheathing shall be designed in accordance with the general provisions of this code and the special provisions in this section.

Roof sheathing conforming to the provisions of Table 2304.7(1), 2304.7(2), 2304.7(3) or 2304.7(5) shall be deemed to meet the requirements of this section. Wood structural panel roof sheathing shall be bonded by exterior glue.

### 2304.8 Mechanically laminated floors and decks.

**2304.8.1 General.** A laminated lumber floor or deck built up of wood members set on edge, when meeting the following requirements, is permitted to be designed as a solid floor or roof deck of the same thickness, and continuous spans are permitted to be designed on the basis of the full cross section using the simple span moment coefficient.

Nail lengths shall not be less than two and one-half times the net thickness of each lamination. Where deck supports are 4 feet (1219 mm) on center (o.c.) or less, side nails shall be spaced not more than 30 inches (762 mm) o.c. alternately

near top and bottom edges, and staggered one-third of the spacing in adjacent laminations. Where supports are spaced more than 4 feet (1219 mm) o.c., side nails shall be spaced not more than 18 inches (457 mm) o.c. alternately near top and bottom edges, and staggered one-third of the spacing in adjacent laminations. Two side nails shall be used at each end of butt-jointed pieces.

Laminations shall be toenailed to supports with 20d or larger common nails. Where the supports are 4 feet (1219 mm) o.c. or less, alternate laminations shall be toenailed to alternate supports; where supports are spaced more than 4 feet (1219 mm) o.c., alternate laminations shall be toenailed to every support. A single-span deck shall have all laminations full length. A continuous deck of two spans shall not have more than every fourth lamination spliced within quarter points adjoining supports. Joints shall be closely butted over supports or staggered across the deck but within the adjoining quarter spans. No lamination shall be spliced more than twice in any span.

### 2304.9 Connections and fasteners.

**2304.9.1 Fastener requirements.** Connections for wood members shall be designed in accordance with the appropriate methodology in Section 2301.2. The number and size of nails connecting wood members shall not be less than that set forth in Table 2304.9.1.

**2304.9.2 Sheathing fasteners.** Sheathing nails or other approved sheathing connectors shall be driven so that their head or crown is flush with the surface of the sheathing.

**2304.9.3 Joist hangers and framing anchors.** Connections depending on joist hangers or framing anchors, ties

TABLE 2304.7(1)  
ALLOWABLE SPANS FOR LUMBER FLOOR AND ROOF SHEATHING<sup>a,b</sup>

SPAN (inches)	MINIMUM NET THICKNESS (inches) OF LUMBER PLACED			
	Perpendicular to supports		Diagonally to supports	
	Surfaced dry <sup>c</sup>	Surfaced unseasoned	Surfaced dry <sup>c</sup>	Surfaced unseasoned
<b>Floors</b>				
24	$\frac{3}{4}$	$\frac{25}{32}$	$\frac{3}{4}$	$\frac{25}{32}$
16	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{11}{16}$
<b>Roofs</b>				
24	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{25}{32}$

For SI: 1 inch = 25.4 mm.

a. Installation details shall conform to Sections 2304.6.1 and 2304.6.2 for floor and roof sheathing, respectively.

b. Floor or roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2304.6.

c. Maximum 19-percent moisture content.

TABLE 2304.7(2)  
SHEATHING LUMBER, MINIMUM GRADE REQUIREMENTS: BOARD GRADE

SOLID FLOOR OR ROOF SHEATHING	SPACED ROOF SHEATHING	GRADING RULES
Utility	Standard	NLGA, WCLIB, WWPA
4 common or utility	3 common or standard	NLGA, WCLIB, WWPA, NSLB or NELMA
No. 3	No. 2	SPIB
Merchantable	Construction common	RIS

**TABLE 2304.7(3)**  
**ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANEL SHEATHING AND**  
**SINGLE-FLOOR GRADES CONTINUOUS OVER TWO OR MORE SPANS WITH**  
**STRENGTH AXIS PERPENDICULAR TO SUPPORTS<sup>a,b</sup>**

SHEATHING GRADES		ROOF <sup>c</sup>				FLOOR <sup>d</sup>
Panel span rating roof/floor span	Panel thickness (inches)	Maximum span (inches)		Load <sup>e</sup> (psf)		Maximum span (inches)
		With edge support <sup>f</sup>	Without edge support	Total load	Live load	
12/0	$5/16$	12	12	40	30	0
16/0	$5/16, 3/8$	16	16	40	30	0
20/0	$5/16, 3/8$	20	20	40	30	0
24/0	$3/8, 7/16, 1/2$	24	20 <sup>g</sup>	40	30	0
24/16	$7/16, 1/2$	24	24	50	40	16
32/16	$15/32, 1/2, 5/8$	32	28	40	30	16 <sup>h</sup>
40/20	$19/32, 5/8, 3/4, 7/8$	40	32	40	30	20 <sup>h,i</sup>
48/24	$23/32, 3/4, 7/8$	48	36	45	35	24
54/32	$7/8, 1$	54	40	45	35	32
60/32	$7/8, 1 1/8$	60	48	45	35	32
SINGLE FLOOR GRADES		ROOF <sup>c</sup>				FLOOR <sup>d</sup>
Panel span rating	Panel thickness (inches)	Maximum span (inches)		Load <sup>e</sup> (psf)		Maximum span (inches)
		With edge support <sup>f</sup>	Without edge support	Total load	Live load	
16 o.c.	$1/2, 19/32, 5/8$	24	24	50	40	16 <sup>h</sup>
20 o.c.	$19/32, 5/8, 3/4$	32	32	40	30	20 <sup>h,i</sup>
24 o.c.	$23/32, 3/4$	48	36	35	25	24
32 o.c.	$7/8, 1$	48	40	50	40	32
48 o.c.	$1 3/32, 1 1/8$	60	48	50	40	48

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

- Applies to panels 24 inches or wider.
- Floor and roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2304.7.
- Uniform load deflection limitations  $1/180$  of span under live load plus dead load,  $1/240$  under live load only.
- Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking unless  $1/4$ -inch minimum thickness underlayment or  $1 1/2$  inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is  $3/4$ -inch wood strip. Allowable uniform load based on deflection of  $1/360$  of span is 100 pounds per square foot except the span rating of 48 inches on center is based on a total load of 65 pounds per square foot.
- Allowable load at maximum span.
- Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking or other. Only lumber blocking shall satisfy blocked diaphragm requirements.
- For  $1/2$ -inch panel, maximum span shall be 24 inches.
- Span is permitted to be 24 inches on center where  $3/4$ -inch wood strip flooring is installed at right angles to joist.
- Span is permitted to be 24 inches on center for floors where  $1 1/2$  inches of cellular or lightweight concrete is applied over the panels.

**TABLE 2304.7(4)**  
**ALLOWABLE SPAN FOR WOOD STRUCTURAL PANEL COMBINATION SUBFLOOR-UNDERLAYMENT (SINGLE FLOOR)<sup>a,b</sup>**  
**(Panels Continuous Over Two or More Spans and Strength Axis Perpendicular to Supports)**

IDENTIFICATION	MAXIMUM SPACING OF JOISTS (inches)				
	16	20	24	32	48
Species group <sup>c</sup>	Thickness (inches)				
1	1/2	5/8	3/4	—	—
2, 3	5/8	3/4	7/8	—	—
4	3/4	7/8	1	—	—
Single floor span rating <sup>d</sup>	16 o.c.	20 o.c.	24 o.c.	32 o.c.	48 o.c.

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

- a. Spans limited to value shown because of possible effects of concentrated loads. Allowable uniform loads based on deflection of  $1/360$  of span is 100 pounds per square foot except allowable total uniform load for  $1\frac{1}{8}$ -inch wood structural panels over joists spaced 48 inches on center is 65 pounds per square foot. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless  $1/4$ -inch minimum thickness underlayment or  $1\frac{1}{2}$  inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is  $3/4$ -inch wood strip.
- b. Floor panels conforming with this table shall be deemed to meet the design criteria of Section 2304.7.
- c. Applicable to all grades of sanded exterior-type plywood. See DOC PS 1 for plywood species groups.
- d. Applicable to Underlayment grade, C-C (Plugged) plywood, and Single Floor grade wood structural panels.

**TABLE 2304.7(5)**  
**ALLOWABLE LOAD (PSF) FOR WOOD STRUCTURAL PANEL ROOF SHEATHING CONTINUOUS OVER**  
**TWO OR MORE SPANS AND STRENGTH AXIS PARALLEL TO SUPPORTS**  
**(Plywood Structural Panels Are Five-Ply, Five-Layer Unless Otherwise Noted)<sup>a,b</sup>**

PANEL GRADE	THICKNESS (inch)	MAXIMUM SPAN (inches)	LOAD AT MAXIMUM SPAN (psf)	
			Live	Total
Structural I sheathing	7/16	24	20	30
	15/32	24	35 <sup>c</sup>	45 <sup>c</sup>
	1/2	24	40 <sup>c</sup>	50 <sup>c</sup>
	19/32, 5/8	24	70	80
	23/32, 3/4	24	90	100
Sheathing, other grades covered in DOC PS 1 or DOC PS 2	7/16	16	40	50
	15/32	24	20	25
	1/2	24	25	30
	19/32	24	40 <sup>c</sup>	50 <sup>c</sup>
	5/8	24	45 <sup>c</sup>	55 <sup>c</sup>
	23/32, 3/4	24	60 <sup>c</sup>	65 <sup>c</sup>

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

- a. Roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2304.7.
- b. Uniform load deflection limitations  $1/180$  of span under live load plus dead load,  $1/240$  under live load only. Edges shall be blocked with lumber or other approved type of edge supports.
- c. For composite and four-ply plywood structural panel, load shall be reduced by 15 pounds per square foot.

**TABLE 2304.9.1—continued  
FASTENING SCHEDULE**

CONNECTION	FASTENING <sup>a,m</sup>	LOCATION
30. Ledger strip	3 - 16d common 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
31. Wood structural panels and particleboard: <sup>b</sup> Subfloor, roof and wall sheathing (to framing):	1/2" and less 19/32" to 3/4"	6d <sup>c,1</sup> 2 3/8" × 0.113" nail <sup>n</sup> 1 3/4" 16 gage <sup>o</sup> 8d <sup>d</sup> or 6d <sup>e</sup> 2 3/8" × 0.113" nail <sup>p</sup> 2" 16 gage <sup>p</sup>
Single Floor (combination subfloor-underlayment to framing):	7/8" to 1" 1 1/8" to 1 1/4" 3/4" and less 7/8" to 1" 1 1/8" to 1 1/4"	8d <sup>c</sup> 10d <sup>d</sup> or 8d <sup>e</sup> 6d <sup>e</sup> 8d <sup>e</sup> 10d <sup>d</sup> or 8d <sup>e</sup>
32. Panel siding (to framing)	1/2" or less 5/8"	6d <sup>f</sup> 8d <sup>f</sup>
33. Fiberboard sheathing: <sup>g</sup>	1/2" 25/32"	No. 11 gage roofing nail <sup>h</sup> 6d common nail No. 16 gage staple <sup>i</sup> No. 11 gage roofing nail <sup>h</sup> 8d common nail No. 16 gage staple <sup>i</sup>
34. Interior paneling	1/4" 3/8"	4d <sup>j</sup> 6d <sup>k</sup>

For SI: 1 inch = 25.4 mm.

- Common or box nails are permitted to be used except where otherwise stated.
- Nails spaced at 6 inches on center at edges, 12 inches at intermediate supports except 6 inches at supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.
- Common or deformed shank.
- Common.
- Deformed shank.
- Corrosion-resistant siding or casing nail.
- Fasteners spaced 3 inches on center at exterior edges and 6 inches on center at intermediate supports.
- Corrosion-resistant roofing nails with 7/16-inch-diameter head and 1 1/2-inch length for 1/2-inch sheathing and 1 3/4-inch length for 25/32-inch sheathing.
- Corrosion-resistant staples with nominal 7/16-inch crown and 1 1/8-inch length for 1/2-inch sheathing and 1 1/2-inch length for 25/32-inch sheathing. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).
- Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- Panel supports at 24 inches. Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- For roof sheathing applications, 8d nails are the minimum required for wood structural panels.
- Staples shall have a minimum crown width of 7/16 inch.
- For roof sheathing applications, fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports.
- Fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports for subfloor and wall sheathing and 3 inches on center at edges, 6 inches at intermediate supports for roof sheathing.
- Fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports.