Roof Construction

CONSTRUCTION GUIDE

LIMIT STATES DESIGN FOR USE IN CANADA

Engineered Wood Builds Dependable Roofs

Plywood, oriented strand board (OSB) and other engineered wood products offer dependable performance and design flexibility in a variety of structural roof systems. When choosing the products and design for roof construction, it is important to 1) define the predicted loads and the structural requirements for the roof and 2) select appropriate roof sheathing and installation details.

This guide from *APA – The Engineered Wood Association* provides specification recommendations for plywood and OSB roof systems. Installation recommendations for panel roof are also covered.

METRIC CONVERSIONS

Panel thicknesses indicated in this document are in metric as the primary units and represent the nominal panel thickness. Support and fastener spacing in this document follows common construction practice in Canada and is based on Imperial measurements. "Nominal" or rounded values have been used to indicate the metric equivalents for support and fastener spacing. Actual measurements for support spacing are listed below. The nominal metric equivalents of the Imperial measurements are shown in text, figures and tables in this document.

METRIC CONVERSIONS

Nominal Support Spacing, mm	Actual Support Spacing, mm (inches)
400	406 (16)
500	488 (19.2)
600	610 (24)
800	813 (32)
1200	1219 (48)

PANEL PERFORMANCE CATEGORIES

Imperial	Metric (mm) Nominal	Span Rating (CSA O325)
3/8	9.5	2R24, W24
7/16	11	1R24/2F16
15/32	12	2R32/2F16
1/2	12.5	
19/32	15	2R40/2F20, 1F16, 1F20
5/8	15.5	
23/32	18	2R48/2F24, 1F24
3/4	18.5	
13/16	20.5	
7/8	22	1F32
1	25	
1 1/8	28.5	1F48

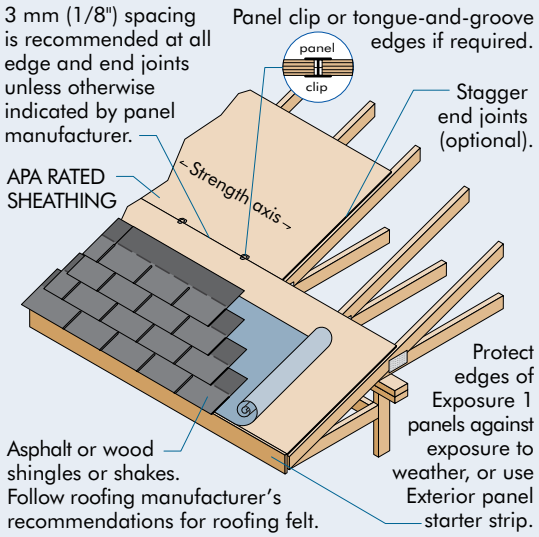
ROOF CONSTRUCTION

APA Panel Roof Sheathing

Roof construction details using APA wood structural panels are illustrated in Figure R1. The recommendations for roof sheathing in Tables R1 and R2 apply to APA RATED SHEATHING Exposure 1 or Exterior, APA STRUCTURAL I RATED SHEATHING Exposure 1 or Exterior and APA RATED STURD-I-FLOOR Exposure 1 or Exterior. Uniform load deflection limits for roof not used as a walking deck are 1/180 of span under snow/live load plus dead load and 1/240 of span under snow/live load only, as shown in Table R1. Uniform load deflection limits for roof used as a walking deck are 1/240 of span under snow/live load plus dead load and 1/360 of span under snow/live load only, as shown in Table R2. Special conditions, such as heavy concentrated loads, may require constructions in excess of these minimums, or allowable live loads may have to be decreased for dead loads greater than 0.5 kPa (10 psf), such as tile roofs. Panels are assumed continuous over two or more spans with the long dimension or strength axis perpendicular to supports.

FIGURE R1

APA PANEL ROOF SHEATHING



Notes:

1. Cover sheathing as soon as possible with roofing felt for extra protection against excessive moisture prior to roofing application.
2. For pitched roofs, place screened surface or side with skid-resistant coating up if OSB panels are used. Keep roof surface free of dirt, sawdust and debris, and wear skid-resistant shoes when installing roof sheathing.
3. For buildings with conventionally framed roofs (trusses or rafters), limit the length of continuous sections of roof area to 24 m (80 feet) maximum during construction to allow for accumulated expansion in wet weather conditions. Omit roof sheathing panels in each course of sheathing between sections and install "fill in" panels later to complete roof deck installation prior to applying roofing.

Good performance of built-up, single-ply or modified bitumen roofing applied on low slope roofs requires a stiffer deck than does prepared roofing applied on pitched roofs. Although APA span-rated panels used as roof sheathing at maximum span are adequate structurally, an upgraded system is recommended for low slope roofs. Table R3 provides recommended maximum spacings for APA rated wood structural panels used in low-slope roof decks. The minimum fastener requirements are provided in Table R4.

Notes: Gluing of roof sheathing to framing is not recommended, except when recommended by the engineer of record in factory-prefabricated roof systems with roof sheathing that already has been permanently protected by roofing.

TABLE R1

RECOMMENDED UNIFORM ROOF LIVE/SNOW LOADS FOR APA RATED PANELS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS[1,2,3] – ROOF NOT USED AS A WALKING DECK

Panel Mark	APA Panel Mark	Panel Minimum Nominal Thickness	Maximum Joist Spacing		Maximum Specified Live/Snow Load[4,5,6,7] – Roof Not Used as a Walking Deck					
					Support Spacing					
			Edges Sup ported	Edges Unsup ported	300 mm (12")	400 mm (16")	500 mm (19.2")	600 mm (24")	800 mm (32")	1200 mm (48")
2R24	APA Rated Sheathing Exposure 1 - CSA O325	9.5 mm (3/8")	600 mm (24")	400 mm (16")	11.8 kPa (247 psf)	6.5 kPa (136 psf)	3.8 kPa (79 psf)	1.8 kPa (38 psf)		
1R24/2F16		11 mm (7/16")	600 mm (24")	500 mm (19.2")	15.9 kPa (332 psf)	8.8 kPa (184 psf)	4.9 kPa (103 psf)	2.4 kPa (50 psf)		
2R32/2F16		12 mm (15/32")	800 mm (32")	600 mm (24")	17.9 kPa (375 psf)	9.9 kPa (208 psf)	6.7 kPa (141 psf)	3.6 kPa (75 psf)	1.4 kPa (30 psf)	
2R40/2F20		15 mm (19/32")	800 mm (32")	600 mm (24")	23.7 kPa (495 psf)	17.1 kPa (357 psf)	11.8 kPa (247 psf)	6.9 kPa (144 psf)	2.7 kPa (57 psf)	
2R48/2F24		18 mm (23/32")	1200 mm (48")	600 mm (24")	30.4 kPa (634 psf)	22.0 kPa (459 psf)	16.4 kPa (342 psf)	10.3 kPa (215 psf)	5.0 kPa (104 psf)	
1F20		15 mm (19/32")	800 mm (32")	500 mm (19.2")	23.7 kPa (495 psf)	13.4 kPa (280 psf)	9.1 kPa (191 psf)	5.7 kPa (119 psf)	2.6 kPa (55 psf)	
1F24		18 mm (23/32")	1200 mm (48")	600 mm (24")	30.4 kPa (635 psf)	18.0 kPa (376 psf)	12.3 kPa (258 psf)	7.7 kPa (162 psf)	3.6 kPa (77 psf)	1.2 kPa (25 psf)
1F32		22 mm (7/8")	1200 mm (48")	600 mm (24")	35.9 kPa (751 psf)	24.1 kPa (505 psf)	16.6 kPa (347 psf)	10.4 kPa (219 psf)	5.7 kPa (119 psf)	1.8 kPa (38 psf)
1F48		28.5 mm (1-1/8")	1200 mm (48")	600 mm (24")	54.9 kPa (1,148 psf)	39.7 kPa (830 psf)	31.5 kPa (658 psf)	20.0 kPa (418 psf)	11.0 kPa (231 psf)	3.8 kPa (79 psf)
DFP	APA Rated Sheathing Exterior Plywood - CSA O121	9.5 mm (3/8")	600 mm (24")	400 mm (16")	15.0 kPa (313 psf)	9.9 kPa (208 psf)	5.7 kPa (119 psf)	2.7 kPa (57 psf)		
		12.5 mm (1/2")	800 mm (32")	600 mm (24")	21.3 kPa (445 psf)	15.3 kPa (321 psf)	10.7 kPa (224 psf)	5.6 kPa (117 psf)	2.2 kPa (46 psf)	
		15.5 mm (5/8")	800 mm (32")	600 mm (24")	36.7 kPa (768 psf)	26.5 kPa (554 psf)	20.0 kPa (419 psf)	9.9 kPa (206 psf)	3.9 kPa (82 psf)	
		18.5 mm (3/4")	1200 mm (48")	600 mm (24")	33.2 kPa (693 psf)	23.9 kPa (501 psf)	19.5 kPa (408 psf)	15.1 kPa (317 psf)	6.0 kPa (126 psf)	2.6 kPa (55 psf)
		20.5 mm (13/16")*	1200 mm (48")	600 mm (24")	32.4 kPa (677 psf)	23.4 kPa (489 psf)	19.0 kPa (398 psf)	14.9 kPa (311 psf)	7.6 kPa (160 psf)	3.3 kPa (69 psf)
		22.5 mm (7/8")	1200 mm (48")	600 mm (24")	47.0 kPa (982 psf)	34.0 kPa (710 psf)	27.7 kPa (579 psf)	21.7 kPa (453 psf)	10.0 kPa (209 psf)	4.1 kPa (87 psf)
		25.5 mm (1")	1200 mm (48")	600 mm (24")	43.1 kPa (900 psf)	31.1 kPa (650 psf)	25.4 kPa (530 psf)	19.9 kPa (415 psf)	14.5 kPa (303 psf)	5.2 kPa (109 psf)
		28.5 mm (1-1/8")	1200 mm (48")	600 mm (24")	62.8 kPa (1,313 psf)	45.5 kPa (950 psf)	37.1 kPa (775 psf)	29.1 kPa (608 psf)	18.4 kPa (386 psf)	6.6 kPa (138 psf)

Continued on next page

TABLE R1 (Continued)

RECOMMENDED UNIFORM ROOF LIVE/SNOW LOADS FOR APA RATED PANELS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS[1,2,3] – ROOF NOT USED AS A WALKING DECK

Panel Mark	APA Panel Mark	Panel Minimum Nominal Thickness	Maximum Joist Spacing		Maximum Specified Live/Snow Load[4,5,6,7] – Roof Not Used as a Walking Deck					
					Support Spacing					
			Edges Sup ported	Edges Unsup ported	300 mm (12")	400 mm (16")	500 mm (19.2")	600 mm (24")	800 mm (32")	1200 mm (48")
CSP	APA Rated Sheathing Exterior Plywood - CSA O151	9.5 mm (3/8")	600 mm (24")	400 mm (16")	15.0 kPa (313 psf)	7.6 kPa (159 psf)	4.1 kPa (86 psf)	2.0 kPa (42 psf)		
		12.5 mm (1/2")	800 mm (32")	600 mm (24")	20.5 kPa (429 psf)	14.8 kPa (309 psf)	8.8 kPa (185 psf)	4.2 kPa (89 psf)	1.7 kPa (35 psf)	
		15.5 mm (5/8")	800 mm (32")	600 mm (24")	35.5 kPa (743 psf)	22.6 kPa (473 psf)	15.5 kPa (324 psf)	7.5 kPa (158 psf)	3.0 kPa (63 psf)	
		18.5 mm (3/4")	1200 mm (48")	600 mm (24")	32.4 kPa (677 psf)	23.4 kPa (489 psf)	19.0 kPa (398 psf)	11.8 kPa (248 psf)	4.7 kPa (99 psf)	2.0 kPa (43 psf)
		20.5 mm (13/16")*	1200 mm (48")	600 mm (24")	32.4 kPa (677 psf)	23.4 kPa (489 psf)	19.0 kPa (398 psf)	13.8 kPa (290 psf)	6.0 kPa (126 psf)	2.5 kPa (53 psf)
		22.5 mm (7/8")	1200 mm (48")	600 mm (24")	47.0 kPa (982 psf)	34.0 kPa (710 psf)	26.1 kPa (547 psf)	16.6 kPa (347 psf)	7.5 kPa (157 psf)	3.1 kPa (65 psf)
		25.5 mm (1")	1200 mm (48")	600 mm (24")	39.1 kPa (817 psf)	28.2 kPa (590 psf)	23.0 kPa (481 psf)	18.0 kPa (377 psf)	10.5 kPa (220 psf)	4.1 kPa (87 psf)
		28.5 mm (1-1/8")	1200 mm (48")	600 mm (24")	58.9 kPa (1,230 psf)	42.6 kPa (890 psf)	34.7 kPa (726 psf)	25.1 kPa (524 psf)	13.9 kPa (291 psf)	4.8 kPa (101 psf)

** Check with supplier for availability.*

Notes:

1. APA Rated Wood Structural Panels installed with face grain or major strength axis perpendicular to supports.
2. 38 mm (1-1/2 in.) of support width, except for 1200 mm (48 in.) of span, which assumes 89 mm (3-1/2 in.) wide framing.
3. Panels 600 mm (24 in.) or wider applied over three spans for support spacing up to and including 800 mm (32 in.), or two spans for support spacing greater than 800 mm (32 in.), fully loaded.
4. Standard-term duration of load and dry service conditions.
5. 0.5 kPa (10 psf) dead load assumed.
6. Live/Snow load deflection criteria = **L/240**; Total load deflection criteria = **L/180**.
7. Specified load = Unfactored load.

TABLE R2

RECOMMENDED UNIFORM ROOF LIVE/SNOW LOADS FOR APA RATED PANELS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS[1,2,3] – ROOF USED AS A WALKING DECK

Panel Mark	APA Panel Mark	Panel Minimum Nominal Thickness	Maximum Joist Spacing (edges supported or unsupported)	Maximum Specified Live/Snow Load[4,5,6,7] – Roof Used as a Walking Deck					
				Support Spacing					
				300 mm (12")	400 mm (16")	500 mm (19.2")	600 mm (24")	800 mm (32")	1200 mm (48")
2R40/2F20	APA Rated Sheathing Exposure 1 - CSA O325	15 mm (19/32")	500 mm (19.2")	23.7 kPa (495 psf)	17.1 kPa (357 psf)	9.5 kPa (199 psf)			
2R48/2F24		18 mm (11/16")	600 mm (24")	30.4 kPa (634 psf)	22 kPa (459 psf)	16.4 kPa (342 psf)	8.4 kPa (175 psf)		
1F20		15 mm (19/32")	500 mm (19.2")	23.7 kPa (495 psf)	13.4 kPa (280 psf)	9.0 kPa (189 psf)			
1F24		18 mm (23/32")	600 mm (24")	30.4 kPa (635 psf)	18.0 kPa (376 psf)	12.3 kPa (258 psf)	6.1 kPa (128 psf)		
1F32		22 mm (7/8")	800 mm (32")	35.9 kPa (751 psf)	24.1 kPa (505 psf)	16.6 kPa (347 psf)	10.4 kPa (219 psf)	5.3 kPa (112 psf)	
1F48		28.5 mm (1-1/8")	1200 mm (48")	54.9 kPa (1148 psf)	39.7 kPa (830 psf)	31.5 kPa (658 psf)	20.0 kPa (418 psf)	9.7 kPa (204 psf)	3.8 kPa (79 psf)
DFP	APA Rated Sheathing Exterior Plywood - CSA O121	15.5 mm (5/8")	500 mm (19.2")	36.7 kPa (768 psf)	25.0 kPa (523 psf)	13.6 kPa (284 psf)			
		18.5 mm (3/4")	600 mm (24")	33.2 kPa (693 psf)	23.9 kPa (501 psf)	19.5 kPa (408 psf)	10.1 kPa (211 psf)		
		20.5 mm (13/16")*	800 mm (32")	32.4 kPa (677 psf)	23.4 kPa (489 psf)	19.0 kPa (398 psf)	12.7 kPa (266 psf)	5.1 kPa (106 psf)	
		22.5 mm (7/8")	800 mm (32")	47.0 kPa (982 psf)	34.0 kPa (710 psf)	27.7 kPa (579 psf)	16.7 kPa (349 psf)	6.6 kPa (139 psf)	
		25.5 mm (1")	800 mm (32")	43.1 kPa (900 psf)	31.1 kPa (650 psf)	25.4 kPa (530 psf)	19.9 kPa (415 psf)	9.6 kPa (202 psf)	
		28.5 mm (1-1/8")	1200 mm (48")	62.8 kPa (1313 psf)	45.5 kPa (950 psf)	37.1 kPa (775 psf)	29.1 kPa (608 psf)	12.3 kPa (257 psf)	5.3 kPa (111 psf)
CSP	APA Rated Sheathing Exterior Plywood - CSA O151	15.5 mm (5/8")	500 mm (19.2")	35.5 kPa (743 psf)	19.2 kPa (401 psf)	10.4 kPa (218 psf)			
		18.5 mm (3/4")	600 mm (24")	32.4 kPa (677 psf)	23.4 kPa (489 psf)	16.3 kPa (341 psf)	7.9 kPa (165 psf)		
		20.5 mm (13/16")*	800 mm (32")	32.4 kPa (677 psf)	23.4 kPa (489 psf)	19.0 kPa (398 psf)	10.1 kPa (211 psf)	4.0 kPa (84 psf)	
		22.5 mm (7/8")	800 mm (32")	47.0 kPa (982 psf)	34.0 kPa (710 psf)	25.9 kPa (540 psf)	12.5 kPa (262 psf)	5.0 kPa (104 psf)	
		25.5 mm (1")	800 mm (32")	39.1 kPa (817 psf)	28.2 kPa (590 psf)	23.0 kPa (481 psf)	17.6 kPa (367 psf)	7.0 kPa (147 psf)	
		28.5 mm (1-1/8")	1200 mm (48")	58.9 kPa (1230 psf)	42.6 kPa (890 psf)	34.7 kPa (726 psf)	24.2 kPa (505 psf)	9.6 kPa (202 psf)	4.2 kPa (87 psf)

** Check with supplier for availability.*

Notes:

1. APA Rated Wood Structural Panels installed with face grain or major strength axis perpendicular to supports.
2. 38 mm (1-1/2 in.) of support width, except for 1200 mm (48 in.) of span, which assumes 89 mm (3-1/2 in.) wide framing.
3. Panels 600 mm (24 in.) or wider applied over three spans for support spacing up to and including 800 mm (32 in.), or two spans for support spacing greater than 800 mm (32 in.), fully loaded.
4. Standard-term duration of load and dry service conditions.
5. 0.5 kPa (10 psf) dead load assumed.
6. Live/Snow load deflection criteria = **L/360**; Total load deflection criteria = **L/240**.
7. Specified load = Unfactored load.

TABLE R3

ROOF SHEATHING REQUIREMENTS[1]

APA Panel Mark	Maximum Spacing of Supports[2]	Minimum Panel Thickness, mm (inches)	Panel Clips Per Spacing of Supports[3] (number)
Flat roof used as a walking deck			
OSB - APA Rated Sheathing Exposure 1, CSA O325 **DFP (Douglas Fir Plywood)** - APA Rated Sheathing Exterior Plywood, CSA O121	400 mm (16")	15.5 mm (5/8")	1
CSP (Canadian Softwood Plywood) - APA Rated Sheathing Exterior Plywood, CSA O151	500 mm (19.2") or 600 mm (24")	18.5 mm (3/4")	

Flat roof not used as a walking deck		Edges Supported	Edges Unsupported	Panel Clips Per Span (number)
DFP (Douglas Fir Plywood) - APA Rated Sheathing Exterior Plywood, CSA O121	400 mm (16")	9.5 mm (3/8")	9.5 mm (3/8")	1
CSP (Canadian Softwood Plywood) - APA Rated Sheathing Exterior Plywood, CSA O151	500 mm (19.2") or 600 mm (24")		12.5 mm (1/2")	
OSB - APA Rated Sheathing Exposure 1, CSA O325	400 mm (16")	9.5 mm (3/8")	9.5 mm (3/8")	
	500 mm (19.2") or 600 mm (24")		12.5 mm (1/2")	

Notes:
1. Roof sheathing requirements are in accordance with NBCC 9.23.16.
2. Roof sheathing shall be installed with the surface grain perpendicular to the roof framing.
3. Edge support may also be provided by tongue-and-groove edges or solid blocking.

TABLE R4

FASTENING SCHEDULE FOR APA PANEL ROOF SHEATHING[1,2]

APA Panel Mark	Minimum Length of Fasteners[3,4]	Recommended Fasteners (Common Nails)[5,6]	Recommended Panel Thickness	Maximum Fasteners Spacing[7]	
				Supported Panel Edges[8,9]	Intermediate Supports
	1-in-50 HWP < 0.8 kPa (16.7 psf) and $S_a(0.2) \leq 0.70$				
OSB - APA Rated Sheathing Exposure 1, CSA O325	51 mm (2")	8d	9.5 mm to 12.5 mm (3/8" to 1")	150 mm (6")	300 mm (12")
	0.8 kPa (16.7 psf) ≤ 1-in-50 HWP < 1.2 kPa (25 psf) and $0.70 < S_a(0.2) \leq 0.90$				
DFP (Douglas Fir Plywood) - APA Rated Sheathing Exterior Plywood, CSA O121	65 mm (2-1/2")	8d or 10d	15 mm to 28.5 mm (19/32" to 1-1/8")	150 mm (6")	300 mm (12")
	0.8 kPa (16.7 psf) ≤ 1-in-50 HWP < 1.2 kPa (25 psf) and $0.90 < S_a(0.2) \leq 1.8$				
CSP (Canadian Softwood Plywood) - APA Rated Sheathing Exterior Plywood, CSA O151	65 mm (2-1/2")	8d or 10d	15 mm to 28.5 mm (19/32" to 1-1/8")	75 mm (3")	300 mm (12")

Notes:
1. Fastening requirements are as in accordance with NBCC 9.23.3.5 and CSA O86.
2. Where 1-in-50 Hourly Wind Pressure (HWP) ≥ 1.2 kPa (25 psf) and seismic spectral response acceleration $S_a(0.2) > 1.8$, the fastening and sheathing shall conform to Part 4 of NBCC.
3. Fasteners shall comply with CSA B111 or ASTM F1667 for Common Nails. Other code approved fasteners with equivalent capacities are also allowed.
4. Based on NBCC 9.26.2.3, nails shall have sufficient length to penetrate through, or 12 mm (1/2 in.), into the roof sheathing.
5. Roofing nails for the attachment of fiberboard or gypsum sheathing shall not be less than 3.2 mm (0.126 in.) in diameter with a minimum-head diameter of 11.1 mm (0.437 in.).
6. Nails shall be corrosion-resistant roofing nails.
7. Fasteners maximum distance of 50 mm (2 in.) o.c. within 1 m (3.3 ft.) of the edge, ridge or hip of the roof.
8. Where roof sheathing requires edge support, the support shall consist of metal H clips or not less than 38 mm by 65 mm (2x3 nominal) blocking securely nailed between framing members.
9. Supported panel joints shall occur approximately along the centerline of framing with a minimum bearing of 12 mm (1/2 in.). Fasteners shall be located 9.5 mm (3/8 in.) from panel edges.

The span rating in the trademark of OSB in accordance with CSA O325 applies when the long panel dimension or strength axis is perpendicular to supports unless the strength axis is otherwise identified on the OSB panel.

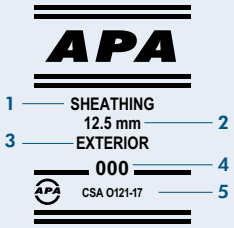
APA RATED SHEATHING is equally effective under built-up roofing, asphalt or fiberglass shingles, tile roofing, or wood shingles or shakes. Roof trusses spaced 600 mm (24 inches) on center are widely recognized as the most economical construction for residential roofs. However, using fewer supports with thicker panels, e.g., Performance Category 23/32 panels with a span rating of 2R48/2F24 over roof framing 48 inches on center, is also cost effective for long-span flat or pitched roofs. Recommended live/snow loads are given in Tables R5 and R6 for the APA rated sheathing with the axis parallel to the supports. Nailing recommendations are given in Table R4.

When support spacing exceeds the maximum length of an unsupported edge (see Tables R1 and R2), provide adequate blocking, tongue-and-groove edges or other edge support such as panel clips. Some types of panel clips, in addition to edge support, provide an additional function of proper panel spacing. When required, use one panel clip per span, except use two clips for 1200-mm (48-inch) or longer spans.

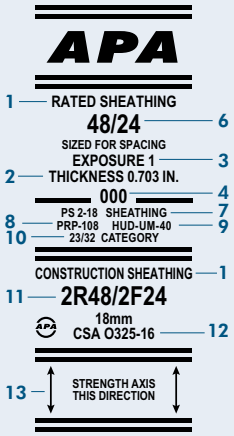
See APA's *Build A Better Home: Roofs*, Form A535, for additional recommendations to prevent moisture infiltration in roofs.

TYPICAL APA PANEL TRADEMARKS

PLYWOOD TRADEMARK



OSB TRADEMARK



1. Panel Grade
2. Nominal Panel Thickness (Optional for standard panel thicknesses)
3. Bond Classification
4. Mill Number
5. Canadian Plywood Standard
6. Span Rating (U.S. Format)
7. Product Standard and Grade
8. APA's Performance Rated Panel Standard
9. HUD Recognition
10. Performance Category
11. Panel Mark — Rating and End-Use Designation in Accordance with CSA O325
12. Canadian OSB Standard
13. Panel Face Orientation Indicator

Preframed Roof Panels

Preframed, or "panelized," wood roof systems are common on warehouse and other commercial buildings in some parts of North America, due to their cost-effectiveness and speed of construction. Spans of 2.5 m to 3.6 m (8 to 12 feet) for roof purlins are usually the most practical with preframed panel construction, although spans to 9 m (30 feet) are not uncommon. APA panels with stiffeners preframed at 400 mm or 600 mm (16 or 24 inches) on center (Figure R2) are common. The long dimension or strength axis of the panel typically runs parallel to supports. Stiffeners and roof purlins provide support for all panel edges. Minimum nailing requirements for preframed panels are the same as for roof sheathing.

FIGURE R2

PREFRAMED ROOF PANEL (1200 mm x 2400 mm [4' x 8']—APA Structural Panels Strength Axis Parallel to Supports)

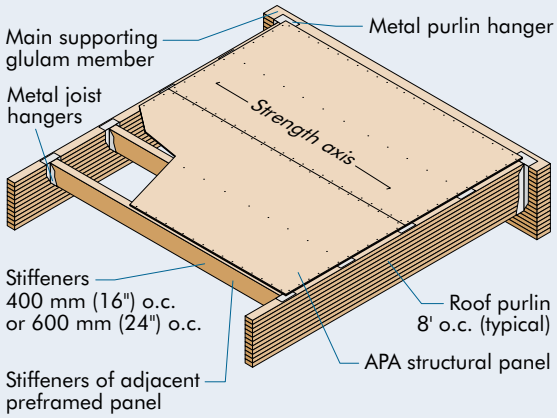
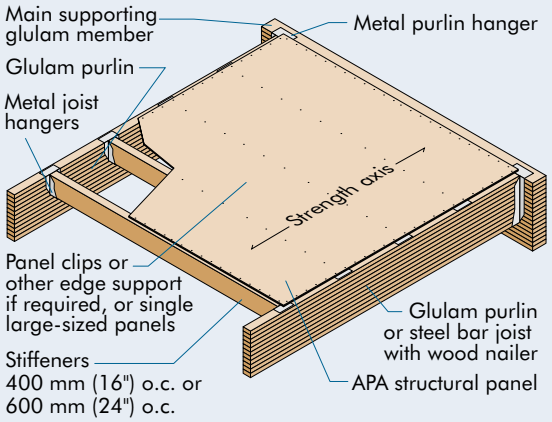


FIGURE R3

PREFRAMED ROOF PANEL (2400 mm x 2400 mm [8' x 8'] or larger—APA Structural Panels Strength Axis Perpendicular to Supports)



In preframed panels 2400 mm x 2400 mm (8x8 feet) or larger (Figure R3), the panel strength axis may run either parallel or perpendicular to stiffeners spaced 400 mm or 600 mm (16 or 24 inches) on center. Stiffeners and roof purlins provide support for all panel edges.

See Tables R7 and R8 for design information on stiffeners for preframed panels. Nailing requirements for preframed panels are the same as for roof sheathing.

TABLE R5

RECOMMENDED ROOF LIVE/SNOW LOADS FOR APA RATED SHEATHING WITH STRENGTH AXIS PARALLEL TO SUPPORTS[1,2,3] – ROOF NOT USED AS A WALKING DECK

Panel Mark	APA Panel Mark	Panel Minimum Nominal Thickness	Maximum Joist Spacing	Maximum Specified Live/Snow Load[4,5,6,7] – Roof Not Used as a Walking Deck
2R32/2F16	APA Rated Sheathing Exposure 1, CSA O325	12 mm (15/32")	600 mm (24")[8]	0.7 kPa (15 psf)
2R40/2F20		15 mm (19/32")	600 mm (24")	1.7 kPa (37 psf)
2R48/2F24		18 mm (23/32")	600 mm (24")	2.8 kPa (59 psf)
1F20		15 mm (19/32")	600 mm (24")	1.5 kPa (31 psf)
1F24		18 mm (23/32")	600 mm (24")	2.7 kPa (57 psf)
1F32		22 mm (7/8")	600 mm (24")	5.0 kPa (105 psf)
1F48		28.5 mm (1-1/8")	600 mm (24")	9.4 kPa (196 psf)
DFP	APA Rated Sheathing Exterior Plywood, CSA O121	12.5 mm (1/2")	600 mm (24")[8]	0.5 kPa (12 psf)
		15.5 mm (5/8")	600 mm (24")	2.6 kPa (55 psf)
		18.5 mm (3/4")	600 mm (24")	5.4 kPa (113 psf)
		20.5 mm (13/16")*	600 mm (24")	7.0 kPa (148 psf)
		22.5 mm (7/8")	600 mm (24")	8.3 kPa (173 psf)
		25.5 mm (1")	600 mm (24")	9.5 kPa (199 psf)
		28.5 mm (1-1/8")	600 mm (24")	13.2 kPa (276 psf)
CSP	APA Rated Sheathing Exterior Plywood, CSA O151	12.5 mm (1/2")	600 mm (24")[8]	0.5 kPa (12 psf)
		15.5 mm (5/8")	600 mm (24")	2.6 kPa (55 psf)
		18.5 mm (3/4")	600 mm (24")	5.4 kPa (113 psf)
		20.5 mm (13/16")*	600 mm (24")	7.0 kPa (148 psf)
		22.5 mm (7/8")	600 mm (24")	7.4 kPa (156 psf)
		25.5 mm (1")	600 mm (24")	8.9 kPa (187 psf)
		28.5 mm (1-1/8")	600 mm (24")	12.8 kPa (267 psf)

** Check with supplier for availability.*

Notes:

1. For guaranteed or warranteed roofs, contact membrane manufacturer for acceptable deck.
2. APA Rated Wood Structural Panels installed with face grain or major strength axis parallel to supports and applied over three spans for support spacing up to and including 400 mm (16 in.), two spans for support spacing greater than 400 mm (16 in.) up to 600 mm (24 in.), fully loaded.
3. Provide edge support.
4. Standard-term duration of load and dry service conditions.
5. 0.5 kPa (10 psf) dead load assumed.
6. Live/Snow load deflection criteria = **L/240**; Total load deflection criteria = **L/180**.
7. Specified load = Unfactored load.
8. Solid blocking recommended at panel ends for 600 mm (24 in.) span.

TABLE R6

RECOMMENDED ROOF LIVE/SNOW LOADS FOR APA RATED SHEATHING WITH STRENGTH AXIS PARALLEL TO SUPPORTS[1,2,3] – ROOF USED AS A WALKING DECK

Panel Mark	APA Panel Mark	Panel Minimum Nominal Thickness	Maximum Joist Spacing	Maximum Specified Live/Snow Load[4,5,6,7] – Roof Used as a Walking Deck
2R48/2F24	APA Rated Sheathing Exposure 1, CSA O325	18 mm (23/32")	600 mm (24")	2.2 kPa (48 psf)
1F24		18 mm (23/32")	600 mm (24")	2.0 kPa (42 psf)
1F32		22 mm (7/8")	600 mm (24")	5.0 kPa (105 psf)
1F48		28.5 mm (1-1/8")	600 mm (24")	9.4 kPa (196 psf)
DSP	APA Rated Sheathing Exterior Plywood, CSA O121	18.5 mm (3/4")	600 mm (24")	3.6 kPa (76 psf)
		20.5 mm (13/16")	600 mm (24")	5.3 kPa (111 psf)
		22.5 mm (7/8")*	600 mm (24")	7.0 kPa (146 psf)
		25.5 mm (1")	600 mm (24")	9.5 kPa (199 psf)
		28.5 mm (1-1/8")	600 mm (24")	13.2 kPa (276 psf)
CSP	APA Rated Sheathing Exterior Plywood, CSA O151	18.5 mm (3/4")	600 mm (24")	3.6 kPa (76 psf)
		20.5 mm (13/16")*	600 mm (24")	5.3 kPa (111 psf)
		22.5 mm (7/8")	600 mm (24")	6.1 kPa (128 psf)
		25.5 mm (1")	600 mm (24")	8.9 kPa (187 psf)
		28.5 mm (1-1/8")	600 mm (24")	12.8 kPa (267 psf)

** Check with supplier for availability.*

Notes:

1. For guaranteed or warranteed roofs, contact membrane manufacturer for acceptable deck.
2. APA Rated Wood Structural Panels installed with face grain or major strength axis parallel to supports and applied over three spans for support spacing up to and including 400 mm (16 in.), two spans for support spacing greater than 400 mm (16 in.) up to 600 mm (24 in.), fully loaded.
3. Provide edge support.
4. Standard-term duration of load and dry service conditions.
5. 0.5 kPa (10 psf) dead load assumed.
6. Live/Snow load deflection criteria = **L/360**; Total load deflection criteria = **L/240**.
7. Specified load = Unfactored load.

TABLE R7

STIFFNER LOAD-SPAN TABLES FOR PREFRAMED APA PANEL ROOF DECKS – ROOF NOT USED AS A WALKING DECK

DOUGLAS FIR-LARCH		Maximum Specified Snow/Live Load[2,3,4,5] – Roof Not Used as a Walking Deck		
Center-to-Center Purlin Spacing	Stiffener Size and Spacing[1]	Select Structural	No. 1/No. 2	No. 3/Stud
2.4 m (8 ft)	38 mm x 89 mm @ 400 mm (2x4 @ 16")	1.6 kPa (35 psf)	1.4 kPa (31 psf)	0.5 kPa (10 psf)
	38 mm x 89 mm @ 600 mm (2x4 @ 24")	1.0 kPa (21 psf)	0.8 kPa (17 psf)	0.2 kPa (4 psf)
	38 mm x 140 mm @ 400 mm (2x6 @ 16")	6.3 kPa (132 psf)	3.6 kPa (76 psf)	1.4 kPa (30 psf)
	38 mm x 140 mm @ 600 mm (2x6 @ 24")	4.0 kPa (85 psf)	2.3 kPa (48 psf)	0.8 kPa (17 psf)
	38 mm x 140 mm @ 800 mm (2x6 @ 32")	2.9 kPa (62 psf)	1.6 kPa (34 psf)	0.5 kPa (11 psf)
SPRUCE-PINE-FIR		**Maximum Specified Snow/Live Load[2,3,4,5] – Roof Not Used as a Walking Deck**		
Center-to-Center Purlin Spacing	Stiffener Size and Spacing[1]	Select Structural	No. 1/No. 2	No. 3/Stud
2.4 m (8 ft)	38 mm x 89 mm @ 400 mm (2x4 @ 16")	1.4 kPa (29 psf)	1.2 kPa (25 psf)	1.0 kPa (21 psf)
	38 mm x 89 mm @ 600 mm (2x4 @ 24")	0.7 kPa (16 psf)	0.6 kPa (13 psf)	0.5 kPa (11 psf)
	38 mm x 140 mm @ 400 mm (2x6 @ 16")	5.5 kPa (115 psf)	4.4 kPa (92 psf)	2.4 kPa (51 psf)
	38 mm x 140 mm @ 600 mm (2x6 @ 24")	3.6 kPa (76 psf)	2.8 kPa (58 psf)	1.5 kPa (31 psf)
	38 mm x 140 mm @ 800 mm (2x6 @ 32")	2.7 kPa (57 psf)	2.0 kPa (41 psf)	1.0 kPa (21 psf)

Notes:
1. Actual span of stiffeners taken as the center-to-center purlin spacing less 89 mm (3-1/2 in.).
2. Deflections limitations: **L/240** for the live load deflection; **L/180** for the total load deflection assuming a dead load of 0.5 kPa (10 psf).
3. Standard-term duration of load and dry service conditions.
4. Douglas-Fir-Larch and Spruce-Pine-Fir design properties are in accordance with CSA O86, Table 6.3.1A.
5. Specified load = Unfactored load.

TABLE R8

STIFFNER LOAD-SPAN TABLES FOR PREFRAMED APA PANEL ROOF DECKS – ROOF USED AS A WALKING DECK

DOUGLAS FIR-LARCH		Maximum Specified Snow/Live Load[2,3,4,5] – Roof Used as a Walking Deck		
Center-to-Center Purlin Spacing	Stiffener Size and Spacing[1]	Select Structural	No. 1/No. 2	No. 3/Stud
2.4 m (8 ft)	38 mm x 140 mm @ 400 mm (2x6 @ 16")	4.3 kPa (91 psf)	3.6 kPa (76 psf)	N/A
	38 mm x 140 mm @ 600 mm (2x6 @ 24")	2.9 kPa (60 psf)	2.3 kPa (48 psf)	N/A
	38 mm x 140 mm @ 800 mm (2x6 @ 32")	2.1 kPa (45 psf)	1.6 kPa (34 psf)	N/A
SPRUCE-PINE-FIR		**Maximum Specified Snow/Live Load[2,3,4,5] – Roof Used as a Walking Deck**		
Center-to-Center Purlin Spacing	Stiffener Size and Spacing[1]	Select Structural	No. 1/No. 2	No. 3/Stud
2.4 m (8 ft)	38 mm x 140 mm @ 400 mm (2x6 @ 16")	3.6 kPa (76 psf)	3.3 kPa (69 psf)	2.4 kPa (51 psf)
	38 mm x 140 mm @ 600 mm (2x6 @ 24")	2.4 kPa (51 psf)	2.2 kPa (46 psf)	N/A
	38 mm x 140 mm @ 800 mm (2x6 @ 32")	1.8 kPa (38 psf)	1.6 kPa (34 psf)	N/A

Notes:
1. Actual span of stiffeners taken as the center-to-center purlin spacing less 89 mm (3-1/2 in.).
2. Deflections limitations: **L/360** for the live load deflection; **L/240** for the total load deflection assuming a dead load of 0.5 kPa (10 psf).
3. Standard-term duration of load and dry service conditions.
4. Douglas-Fir-Larch and Spruce-Pine-Fir design properties are in accordance with CSA O86, Table 6.3.1A.
5. Specified load = Unfactored load.

Long Span Systems

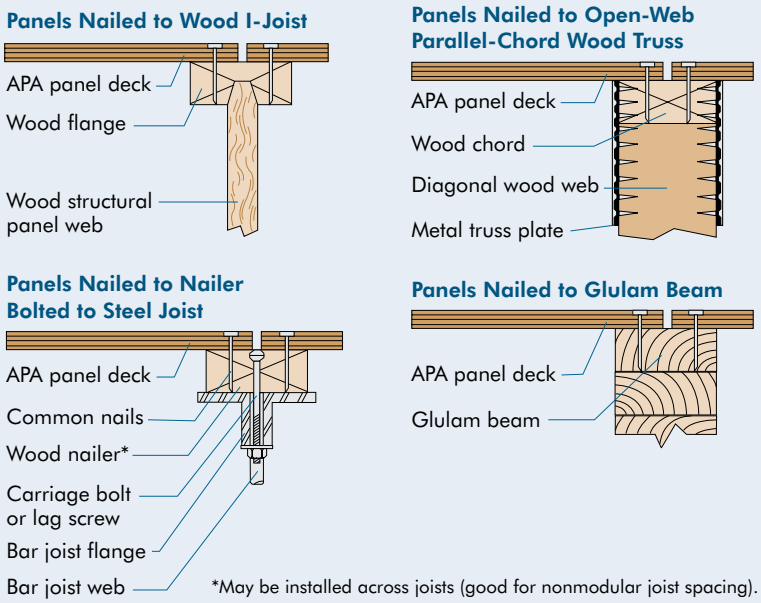
Both preframed panel systems and direct application of sheathing to secondary or primary framing are common approaches in long span roof construction. Bay spacing and type of framing govern the choice.

Experience shows that panels over supports of 1200 mm (48 inches) on center often yield maximum economy. APA Rated Panels with a min. thickness of 18 mm (23/32 inch) or 18.5 mm (3/4 inch) are good for at least 1.4 kPa (30 psf) snow/live load plus 0.5kPa (10 psf) dead load for support spacing less or equal to 800 mm (32 inches) and meet the requirements for most guaranteed or warranted roofs.

Panels are assumed continuous over two spans with long dimension or strength axis perpendicular to supports.

FIGURE R4

TYPICAL CONNECTIONS TO ENGINEERED FLAT ROOF MEMBERS



*May be installed across joists (good for nonmodular joist spacing).

Figure R4 illustrates typical connections for engineered flat roof members.

APA Panel Soffits

Recommended spans for open and closed APA panel soffits are given in Tables R9 and R10. The recommendations in Table R9 for open soffits also apply to combined roof/ceiling construction. Panels are assumed continuous over two or more spans with the long dimension or strength axis perpendicular to supports for both applications. For appearance purposes in open soffit construction, provide blocking, tongue-and-groove edges or other suitable edge support. Panels will support at least 1.4 kPa (30 psf) live load plus 0.5kPa (10 psf) dead load for support spacing less or equal to 800 mm (32 inches).

FIGURE R5
OPEN SOFFIT

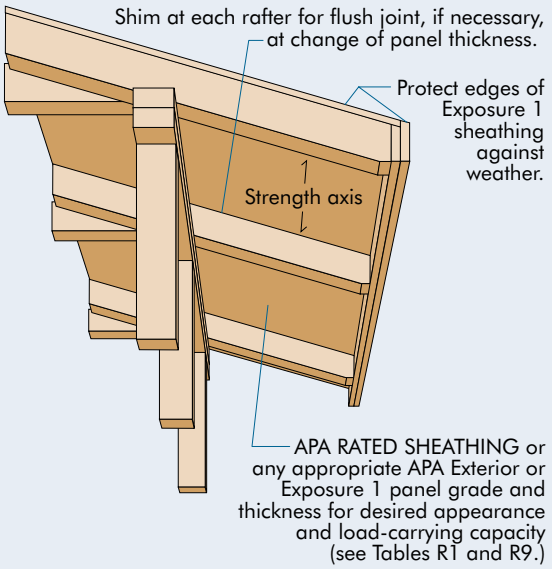
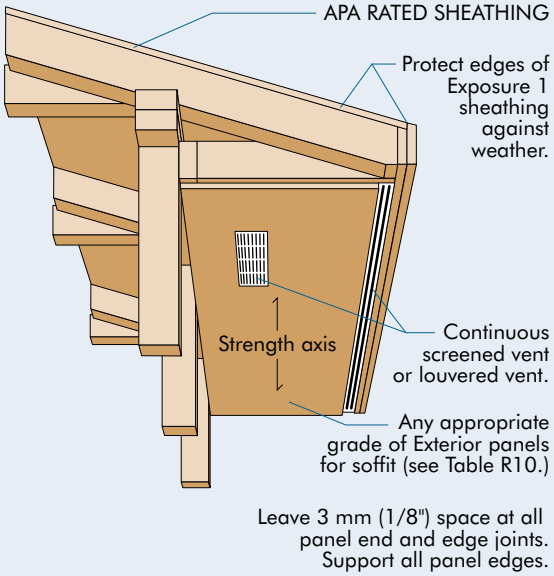


FIGURE R6
CLOSED SOFFIT



For open soffit and nonstructural ceiling construction, panels designated Exposure 1 are recommended as a minimum where appearance is not a major consideration (check with local building code). Only Exterior panels should be used for closed soffits.

As referenced in NBCC A-9.27.13.2.(2)(a) the following substrates for exterior insulation finish systems are generally considered acceptable:

- minimum 11 mm (7/16-inch) thick Exposure 1 OSB classified as PS 2 exterior wall sheathing
- minimum 11 mm (7/16-inch) thick Exterior plywood sheathing

At eaves where Exposure 1 sheathing is used for roof decking, protect panel edges against direct exposure to the weather with fascia trim.

Although unsanded and touch-sanded grades of plywood are often used for applications such as soffits, optimum appearance and finish performance is attained by using panels with textured or sanded A-grade faces. Top-quality acrylic latex house paint systems provide best performance. Face-checking (separations between fibers parallel to the grain of the face veneer) can be expected on non-overlaid plywood which is exposed to the outdoors, even when finished. If a smooth, check-free surface is desired, use Medium Density Overlay (MDO) plywood.

TABLE R9

APA PANEL FOR OPEN SOFFIT OR FOR COMBINED ROOF DECKING-CEILING[1,2]
(Strength axis perpendicular to supports. For APA RATED SHEATHING, where appearance is not a major concern, see Tables R1 and R2.)

Maximum Span	Panel Description (All panels Exterior or Exposure 1)	Minimum Panel Thickness
400 mm (16 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB)	12 mm (15/32 in.)
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)	12.5 mm (1/2 in.)
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)	
600 mm (24 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB)	12 mm (15/32 in.)
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)	12.5 mm (1/2 in.)
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)	
800 mm (32 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB)	15 mm (19/32 in.)
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)	15.5 mm (5/8 in.)
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)	
1200 mm (48 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB)	18 mm (23/32 in.)
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)	18.5 mm (3/4 in.)
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)	

Notes:
1. All panels will support at least 1.4 kPa (30 psf) snow/live load plus 0.5kPa (10 psf) dead load at maximum span for supports spacing less or equal to 800 mm (32 in.).
2. For appearance purpose, blocking, tongue-and-groove edges or other suitable edge supports should be provided.

TABLE R10

APA PANELS FOR CLOSED SOFFIT OR FOR NONSTRUCTURAL CEILING[1,2]
(Strength axis perpendicular to supports)

Maximum Span	Panel Description (All panels Exterior or Exposure 1)	Minimum Panel Thickness[3]	Nail Size and Type[4]
600 mm (24 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB)	9.5 mm (3/8 in.)	6d nonstaining common or casing
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)		
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)		
800 mm (32 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB	12 mm (15/32 in.)	8d nonstaining common or casing
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)	12.5 mm (1/2 in.)	
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)		
1200 mm (48 in.)	APA Rated Panel Exposure 1, CSA O325 (OSB)	15.0 mm (19/32 in.)	8d nonstaining common or casing
	APA Rated Panel Exterior Plywood, CSA O121 (DFP)	15.5 mm (5/8 in.)	
	APA Rated Panel Exterior Plywood, CSA O151 (CSP)		

Notes:
1. Space nails maximum 150 mm (6 in.) at panel edges and 300 mm (12 in.) at intermediate supports for spans less than 1200 mm (48 in.); 150 mm (6 in.) at all supports for 1200 mm (48 in.) spans.
2. For appearance purposes, blocking, tongue-and-groove edges or other suitable edge supports should be provided.
3. Any suitable grade panel which meets appearance requirements – Exterior panels for closed soffit, Exposure 1 or Exterior panels for nonstructural ceiling.
4. Fasteners should comply with CSA B111 or ASTM F1667.

APA Panel Roof Diaphragms

With only slight design modifications, any APA panel roof deck system described in the previous sections will also function as an engineered diaphragm to resist high wind and seismic loading. A diaphragm's ability to function effectively as a beam, transferring lateral loads to shear walls, is related to the quality of the connections. Nailing is critical since shear loads are transmitted through these fasteners. Common nails provide required strength. Other nail types may be used when their lateral bearing values are considered in the design. Load-carrying capacity is highest when the diaphragm is blocked.

Roofs in heavy timber construction shall be of tongued and grooved wood structural panel sheathing not less than 28 mm (1-1/8 inches) in thickness, as referenced in NBCC Section 3.1.4.7.

Table R11 gives panel and fastening recommendations for roof diaphragms. Panels and framing are assumed already designed for gravity loads. To design a diaphragm, follow these steps:

1. Determine lateral loads and resulting shear.
2. Determine nailing schedule (Table R11). Consider load direction with respect to joints.
3. Compute chord stress due to bending moment. Provide adequate splices. Check deflection. Check anchorage of boundary framing (e.g., chords) to walls.

TABLE R11

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL DIAPHRAGMS[1,2,3,4,5,6] WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

CSA Panel Mark	APA Panel Mark	Common Nail Size	Min. Nail Penetration in Framing	Panel Thickness[9]	Min. Width of Framing Members at Adjoining Panel Edges and Boundaries[10]	Factored Lateral Resistance of Sheathing-to-Framing Connection, kN/m (lbf/ft)							
						Blocked Diaphragms					Unblocked Diaphragms		
						Nail Spacing at Diaphragm Boundaries, at Continuous Panel Edges Parallel to Load and at all Panel Edges (all Cases)[11]					Nails Spaced 150 mm (6") max. at Supported Edges		
						150 mm (6")	100 mm (4")	75 mm (3")	65 mm (2-1/2")[12]	50 mm (2")[12]	Case 1 (No unlocked edges or continuous joints parallel to loads)	All other configurations (Cases 2, 3, 4, 5 & 6)	Panel Buckling Strength, kN/m (lbf/ft)
2R24	APA Rated Sheathing Exposure 1, CSA O325	8d	35 mm (1-3/8")	9.5 mm (3/8")	38 mm (1-1/2")	4.49 kN/m (308 lbf/ft)	6.67 kN/m (457 lbf/ft)	8.50 kN/m (582 lbf/ft)	9.51 kN/m (652 lbf/ft)	11.02 kN/m (755 lbf/ft)	4.00 kN/m (274 lbf/ft)	3.01 kN/m (206 lbf/ft)	10.30 kN/m (706 lbf/ft)
					65 mm (2-1/2")	5.05 kN/m (346 lbf/ft)	7.50 kN/m (514 lbf/ft)	9.55 kN/m (654 lbf/ft)	10.69 kN/m (732 lbf/ft)	12.39 kN/m (849 lbf/ft)	4.49 kN/m (308 lbf/ft)	3.38 kN/m (231 lbf/ft)	
1R24/2F16				11 mm (7/16")	38 mm (1-1/2")	4.73 kN/m (324 lbf/ft)	7.03 kN/m (482 lbf/ft)	8.95 kN/m (613 lbf/ft)	10.02 kN/m (687 lbf/ft)	11.62 kN/m (796 lbf/ft)	4.21 kN/m (288 lbf/ft)	3.17 kN/m (217 lbf/ft)	15.10 kN/m (1,035 lbf/ft)
					65 mm (2-1/2")	5.32 kN/m (364 lbf/ft)	7.90 kN/m (541 lbf/ft)	10.06 kN/m (689 lbf/ft)	11.26 kN/m (772 lbf/ft)	13.05 kN/m (894 lbf/ft)	4.73 kN/m (324 lbf/ft)	3.56 kN/m (244 lbf/ft)	
2R32/2F16		10d	38 mm (1-1/2")	12 mm (15/32")	38 mm (1-1/2")	5.70 kN/m (390 lbf/ft)	8.46 kN/m (580 lbf/ft)	10.78 kN/m (738 lbf/ft)	12.07 kN/m (827 lbf/ft)	13.99 kN/m (958 lbf/ft)	5.07 kN/m (347 lbf/ft)	3.82 kN/m (261 lbf/ft)	18.53 kN/m (1,270 lbf/ft)
					65 mm (2-1/2")	6.40 kN/m (439 lbf/ft)	9.51 kN/m (652 lbf/ft)	12.11 kN/m (830 lbf/ft)	13.56 kN/m (929 lbf/ft)	15.72 kN/m (1077 lbf/ft)	5.70 kN/m (390 lbf/ft)	4.29 kN/m (294 lbf/ft)	
2R40/2F20				15 mm (19/32")	38 mm (1-1/2")	6.21 kN/m (425 lbf/ft)	9.22 kN/m (632 lbf/ft)	11.74 kN/m (805 lbf/ft)	13.15 kN/m (901 lbf/ft)	15.24 kN/m (1,044 lbf/ft)	5.52 kN/m (378 lbf/ft)	4.16 kN/m (285 lbf/ft)	31.76 kN/m (2,176 lbf/ft)
					65 mm (2-1/2")	6.97 kN/m (478 lbf/ft)	10.36 kN/m (710 lbf/ft)	13.20 kN/m (904 lbf/ft)	14.77 kN/m (1,012 lbf/ft)	17.12 kN/m (1,173 lbf/ft)	6.21 kN/m (425 lbf/ft)	4.67 kN/m (320 lbf/ft)	
1F20					38 mm (1-1/2")	6.21 kN/m (425 lbf/ft)	9.22 kN/m (632 lbf/ft)	11.74 kN/m (805 lbf/ft)	13.15 kN/m (901 lbf/ft)	15.24 kN/m (1,044 lbf/ft)	5.52 kN/m (378 lbf/ft)	4.16 kN/m (285 lbf/ft)	29.88 kN/m (2,048 lbf/ft)
					65 mm (2-1/2")	6.97 kN/m (478 lbf/ft)	10.36 kN/m (710 lbf/ft)	13.20 kN/m (904 lbf/ft)	14.77 kN/m (1,012 lbf/ft)	17.12 kN/m (1,173 lbf/ft)	6.21 kN/m (425 lbf/ft)	4.67 kN/m (320 lbf/ft)	

See notes on page 18.

Continued on next page

TABLE R11 (Continued)

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL DIAPHRAGMS[1,2,3,4,5,6] WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

CSA Panel Mark	APA Panel Mark	Common Nail Size	Min. Nail Penetration in Framing	Panel Thickness[9]	Min. Width of Framing Members at Adjoining Panel Edges and Boundaries[10]	Factored Lateral Resistance of Sheathing-to-Framing Connection, kN/m (lbf/ft)							
						Blocked Diaphragms					Unblocked Diaphragms		
						Nail Spacing at Diaphragm Boundaries, at Continuous Panel Edges Parallel to Load and at all Panel Edges (all Cases)[11]					Nails Spaced 150 mm (6") max. at Supported Edges		
						150 mm (6")	100 mm (4")	75 mm (3")	65 mm (2-1/2")[12]	50 mm (2")[12]	Case 1 (No unlocked edges or continuous joints parallel to loads)	All other configurations (Cases 2, 3, 4, 5 & 6)	Panel Buckling Strength, kN/m (lbf/ft)
DFP	APA Rated Sheathing Exterior Plywood, CSA O121	6d[13]	32 mm (1-1/4")	7.5 mm (5/16")	38 mm (1-1/2")	3.38 kN/m (232 lbf/ft)	5.03 kN/m (344 lbf/ft)	6.40 kN/m (439 lbf/ft)	7.17 kN/m (491 lbf/ft)	8.31 kN/m (569 lbf/ft)	3.01 kN/m (206 lbf/ft)	2.26 kN/m (155 lbf/ft)	5.21 kN/m (357 lbf/ft)
					65 mm (2-1/2")	3.80 kN/m (260 lbf/ft)	5.65 kN/m (387 lbf/ft)	7.19 kN/m (493 lbf/ft)	8.05 kN/m (552 lbf/ft)	9.33 kN/m (639 lbf/ft)	3.38 kN/m (232 lbf/ft)	2.55 kN/m (174 lbf/ft)	
		8d	35 mm (1-3/8")	9.5 mm (3/8")	38 mm (1-1/2")	4.49 kN/m (308 lbf/ft)	6.67 kN/m (457 lbf/ft)	8.50 kN/m (582 lbf/ft)	9.51 kN/m (652 lbf/ft)	11.02 kN/m (755 lbf/ft)	4.00 kN/m (274 lbf/ft)	3.01 kN/m (206 lbf/ft)	9.36 kN/m (641 lbf/ft)
					65 mm (2-1/2")	5.05 kN/m (346 lbf/ft)	7.50 kN/m (514 lbf/ft)	9.55 kN/m (654 lbf/ft)	10.69 kN/m (732 lbf/ft)	12.39 kN/m (849 lbf/ft)	4.49 kN/m (308 lbf/ft)	3.38 kN/m (231 lbf/ft)	
		10d	38 mm (1-1/2")	12.5 mm (1/2")	38 mm (1-1/2")	5.78 kN/m (396 lbf/ft)	8.59 kN/m (588 lbf/ft)	10.94 kN/m (749 lbf/ft)	12.25 kN/m (839 lbf/ft)	14.20 kN/m (973 lbf/ft)	5.15 kN/m (352 lbf/ft)	3.87 kN/m (265 lbf/ft)	25.11 kN/m (1,721 lbf/ft)
					65 mm (2-1/2")	6.50 kN/m (445 lbf/ft)	9.65 kN/m (661 lbf/ft)	12.29 kN/m (842 lbf/ft)	13.76 kN/m (943 lbf/ft)	15.95 kN/m (1,093 lbf/ft)	5.78 kN/m (396 lbf/ft)	4.35 kN/m (298 lbf/ft)	
				15.5 mm (5/8")	38 mm (1-1/2")	6.29 kN/m (431 lbf/ft)	9.35 kN/m (640 lbf/ft)	11.90 kN/m (816 lbf/ft)	13.33 kN/m (913 lbf/ft)	15.45 kN/m (1,058 lbf/ft)	5.60 kN/m (384 lbf/ft)	4.21 kN/m (289 lbf/ft)	38.68 kN/m (2,650 lbf/ft)
					65 mm (2-1/2")	7.07 kN/m (484 lbf/ft)	10.50 kN/m (720 lbf/ft)	13.38 kN/m (916 lbf/ft)	14.97 kN/m (1,026 lbf/ft)	17.35 kN/m (1,189 lbf/ft)	6.29 kN/m (431 lbf/ft)	4.74 kN/m (324 lbf/ft)	

See notes on page 18.

Continued on next page

TABLE R11 (Continued)

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL DIAPHRAGMS[1,2,3,4,5,6] WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

CSA Panel Mark	APA Panel Mark	Common Nail Size	Min. Nail Penetration in Framing	Panel Thickness[9]	Min. Width of Framing Members at Adjoining Panel Edges and Boundaries[10]	Factored Lateral Resistance of Sheathing-to-Framing Connection, kN/m (lbf/ft)							
						Blocked Diaphragms					Unblocked Diaphragms		
						Nail Spacing at Diaphragm Boundaries, at Continuous Panel Edges Parallel to Load and at all Panel Edges (all Cases)[11]					Nails Spaced 150 mm (6") max. at Supported Edges		
						150 mm (6")	100 mm (4")	75 mm (3")	65 mm (2-1/2")[12]	50 mm (2")[12]	Case 1 (No unlocked edges or continuous joints parallel to loads)	All other configurations (Cases 2, 3, 4, 5 & 6)	Panel Buckling Strength, kN/m (lbf/ft)
CSP	APA Rated Sheathing Exterior Plywood, CSA O151	6d[13]	32 mm (1-1/4")	7.5 mm (5/16")	38 mm (1-1/2")	3.38 kN/m (232 lbf/ft)	5.03 kN/m (344 lbf/ft)	6.40 kN/m (439 lbf/ft)	7.17 kN/m (491 lbf/ft)	8.31 kN/m (569 lbf/ft)	3.01 kN/m (206 lbf/ft)	2.26 kN/m (155 lbf/ft)	4.66 kN/m (319 lbf/ft)
					65 mm (2-1/2")	3.80 kN/m (260 lbf/ft)	5.65 kN/m (387 lbf/ft)	7.19 kN/m (493 lbf/ft)	8.05 kN/m (552 lbf/ft)	9.33 kN/m (639 lbf/ft)	3.38 kN/m (232 lbf/ft)	2.55 kN/m (174 lbf/ft)	
		8d	35 mm (1-3/8")	9.5 mm (3/8")	38 mm (1-1/2")	4.49 kN/m (308 lbf/ft)	6.67 kN/m (457 lbf/ft)	8.50 kN/m (582 lbf/ft)	9.51 kN/m (652 lbf/ft)	11.02 kN/m (755 lbf/ft)	4.00 kN/m (274 lbf/ft)	3.01 kN/m (206 lbf/ft)	8.42 kN/m (577 lbf/ft)
					65 mm (2-1/2")	5.05 kN/m (346 lbf/ft)	7.50 kN/m (514 lbf/ft)	9.55 kN/m (654 lbf/ft)	10.69 kN/m (732 lbf/ft)	12.39 kN/m (849 lbf/ft)	4.49 kN/m (308 lbf/ft)	3.38 kN/m (231 lbf/ft)	
		10d	38 mm (1-1/2")	12.5 mm (1/2")	38 mm (1-1/2")	5.78 kN/m (396 lbf/ft)	8.59 kN/m (588 lbf/ft)	10.94 kN/m (749 lbf/ft)	12.25 kN/m (839 lbf/ft)	14.20 kN/m (973 lbf/ft)	5.15 kN/m (352 lbf/ft)	3.87 kN/m (265 lbf/ft)	22.89 kN/m (1,569 lbf/ft)
					65 mm (2-1/2")	6.50 kN/m (445 lbf/ft)	9.65 kN/m (661 lbf/ft)	12.29 kN/m (842 lbf/ft)	13.76 kN/m (943 lbf/ft)	15.95 kN/m (1093 lbf/ft)	5.78 kN/m (396 lbf/ft)	4.35 kN/m (298 lbf/ft)	
				15.5 mm (5/8")	38 mm (1-1/2")	6.29 kN/m (431 lbf/ft)	9.35 kN/m (640 lbf/ft)	11.90 kN/m (816 lbf/ft)	13.33 kN/m (913 lbf/ft)	15.45 kN/m (1,058 lbf/ft)	5.60 kN/m (384 lbf/ft)	4.21 kN/m (289 lbf/ft)	35.89 kN/m (2,459 lbf/ft)
					65 mm (2-1/2")	7.07 kN/m (484 lbf/ft)	10.50 kN/m (720 lbf/ft)	13.38 kN/m (916 lbf/ft)	14.97 kN/m (1,026 lbf/ft)	17.35 kN/m (1,189 lbf/ft)	6.29 kN/m (431 lbf/ft)	4.74 kN/m (324 lbf/ft)	

See notes on page 18.

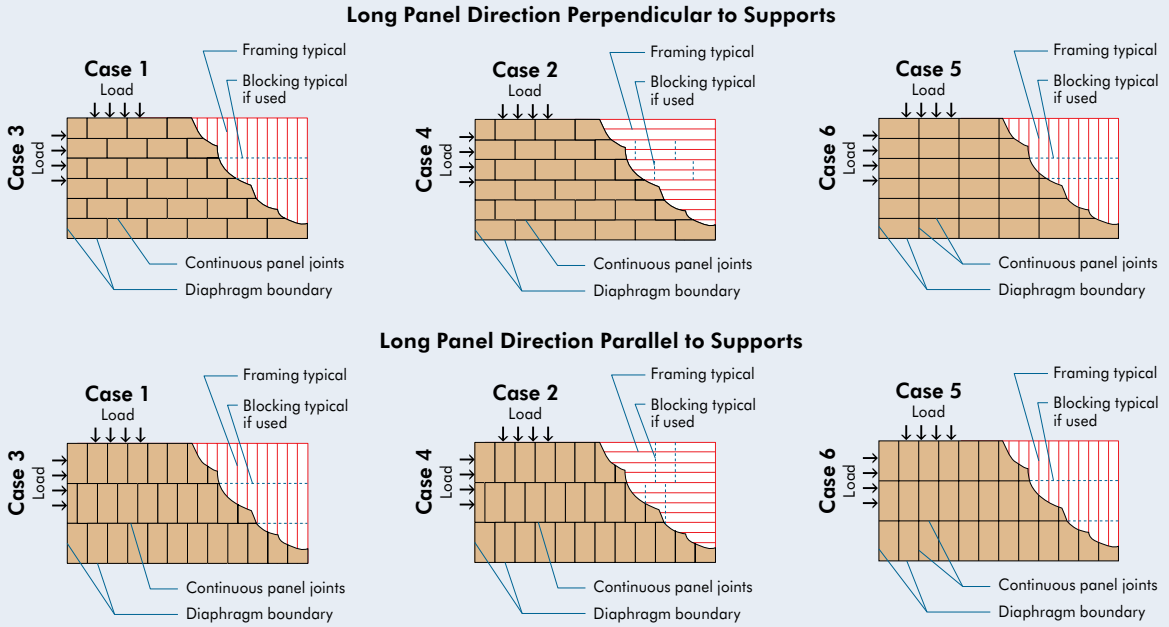
Continued on next page

TABLE R11 (Continued)

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL DIAPHRAGMS[1,2,3,4,5,6] WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

Notes:

1. The factored shear resistance of diaphragms shall be the smaller of the factored lateral resistance of sheathing-to-framing connection and the panel buckling strength.
2. Tabulated values could be used for both wind and seismic design when the panel buckling does not govern the design. If the panel buckling governs the design, the diaphragm is only appropriate for wind design.
3. Panel size is assumed to be 2400 mm (8 ft.) x 1200 mm (4 ft.).
4. Tabulated values are based on short term loading (K_D = 1.15), SPF framing (SG = 0.42), lumber must be seasoned prior to fabrication (moisture content ≤ 19 %) and used in dry service conditions (K_{SF} = 1.0).
5. For plywood sheathing used for wet service conditions, tabulated values shall be multiplied by 0.8. APA Rated OSB Sheathing Exposure 1 (CSA O325) shall be only used for dry service conditions.
6. Tabulated values assume no treatment (K_T = 1.0)
7. For DF (or equivalent) framing, multiply the factored lateral resistance of sheathing-to-framing connection tabulated values by 1.05.
8. For permanent load duration, multiply the tabulated values by 0.565. For standard load duration, multiply the tabulated values by 0.870.
9. For thicker sheathing, the values for the thickest sheathing available in the table shall be used assuming the minimum fastener penetration is satisfied.
10. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 50 mm (2 in.).
11. Space nails maximum 300 mm (12 in.) o.c. along intermediate framing members and 150 mm (6 in.) o.c. when supports are spaced 1200 mm (48 in.). Fasteners shall be located at least 9 mm (3/8 in.) from panel edges.
12. Framing at adjoining panels shall be 65 mm (2-1/2 in.) or wider, and nails shall be staggered when spaced 50 mm (2 in.) or 65 mm (2-1/2 in.).
13. 8d common is minimum recommended for roofs due to negative pressure of high winds.



Note: Design for diaphragm stresses depends on direction of continuous panel joints with reference to load, not on direction of long dimension or strength axis of sheet. Continuous framing may be in either direction for blocked diaphragms.

High-Load Diaphragms

Table R11 presents the factored shear resistance for which applies to most diaphragm designs. Occasionally, due to the higher lateral load or the building geometry or layout, higher factored shear resistances are required. Calculations by principles of mechanics could be used as indicated in CSA O86. Table R12 shows factored shear resistance for horizontal blocked diaphragms utilizing multiple rows of fasteners. Alternatively, according to CSA O86, structural panels may be applied to both faces of framing and the factored shear resistance for the diaphragm may be taken as twice the tabulated values from Table R11 or R12. Where the shear capacities of each side are not equal, the factored shear resistance may be either the factored shear resistance for the side with the higher capacity, or twice the factored shear resistance for the side with the lower capacity, whichever is greater. If nail spacing is less than 150 mm (6 inches) o.c. on either side, panel joints shall be offset to fall on different framing members or framing shall be 65 mm (2-1/2 inches) or greater and nails on each side should be staggered.

TABLE R12

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL BLOCKED DIAPHRAGMS[1,2,3,4,5,6] UTILIZING MULTIPLE ROWS OF FASTENERS (HIGH-LOAD DIAPHRAGMS) WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

CSA Panel Mark	APA Panel Mark	Common Nail Size	Min. Nail Penetration in Framing	Panel Thickness[9]	Min. Width of Framing Members at Adjoining Panel Edges and Boundaries [10,11]	Lines of fasteners	Factored Lateral Resistance of Sheathing-to-Framing Connection, kN/m (lbf/ft)				Panel Buckling Strength, kN/m (lbf/ft)
							Blocked Diaphragms				
							Nail Spacing at Diaphragm Boundaries, at Continuous Panel Edges Parallel to Load, and at all Panel Edges (all Cases)[12]				
							150 mm (6")	100 mm (4")	75 mm (3")	65 mm (2-1/2")	
2R32/2F16	APA Rated Sheathing Exposure 1, CSA O325	10d	38 mm (1-1/2")	12 mm (15/32")	65 mm (2-1/2")	2	11.40 kN/m (781 lbf/ft)	16.93 kN/m (1,160 lbf/ft)	21.56 kN/m (1,477 lbf/ft)	24.14 kN/m (1,654 lbf/ft)	18.53 kN/m (1,270 lbf/ft)
					89 mm (3-1/2")	2	12.81 kN/m (878 lbf/ft)	19.03 kN/m (1,304 lbf/ft)	24.23 kN/m (1,660 lbf/ft)	27.13 kN/m (1,859 lbf/ft)	
						3	17.10 kN/m (1,172 lbf/ft)	25.40 kN/m (1,740 lbf/ft)	32.35 kN/m (2,216 lbf/ft)	36.22 kN/m (2,481 lbf/ft)	
2R40/2F20				15 mm (19/32")	65 mm (2-1/2")	2	12.42 kN/m (851 lbf/ft)	18.45 kN/m (1,264 lbf/ft)	23.49 kN/m (1,610 lbf/ft)	26.30 kN/m (1,802 lbf/ft)	31.76 kN/m (2,176 lbf/ft)
					89 mm (3-1/2")	2	13.95 kN/m (956 lbf/ft)	20.73 kN/m (1,420 lbf/ft)	26.40 kN/m (1,809 lbf/ft)	29.55 kN/m (2,025 lbf/ft)	
						3	18.63 kN/m (1,276 lbf/ft)	27.67 kN/m (1,896 lbf/ft)	35.24 kN/m (2,415 lbf/ft)	39.45 kN/m (2,703 lbf/ft)	
2R48/2F24				18 mm (23/32")	65 mm (2-1/2")	2	13.44 kN/m (921 lbf/ft)	19.96 kN/m (1,368 lbf/ft)	25.42 kN/m (1,742 lbf/ft)	28.46 kN/m (1,950 lbf/ft)	52.15 kN/m (3,573 lbf/ft)
					89 mm (3-1/2")	2	15.10 kN/m (1,034 lbf/ft)	22.43 kN/m (1,537 lbf/ft)	28.56 kN/m (1,957 lbf/ft)	31.97 kN/m (2,191 lbf/ft)	
						3	20.16 kN/m (1,381 lbf/ft)	29.94 kN/m (2,052 lbf/ft)	38.13 kN/m (2,613 lbf/ft)	42.69 kN/m (2,925 lbf/ft)	
1F20				15 mm (19/32")	65 mm (2-1/2")	2	12.42 kN/m (851 lbf/ft)	18.45 kN/m (1,264 lbf/ft)	23.49 kN/m (1,610 lbf/ft)	26.30 kN/m (1,802 lbf/ft)	29.88 kN/m (2,048 lbf/ft)
					89 mm (3-1/2")	2	13.95 kN/m (956 lbf/ft)	20.73 kN/m (1,420 lbf/ft)	26.40 kN/m (1,809 lbf/ft)	29.55 kN/m (2,025 lbf/ft)	
						3	18.63 kN/m (1,276 lbf/ft)	27.67 kN/m (1,896 lbf/ft)	35.24 kN/m (2,415 lbf/ft)	39.45 kN/m (2,703 lbf/ft)	
1F24				18 mm (23/32")	65 mm (2-1/2")	2	13.44 kN/m (921 lbf/ft)	19.96 kN/m (1,368 lbf/ft)	25.42 kN/m (1,742 lbf/ft)	28.46 kN/m (1,950 lbf/ft)	50.82 kN/m (3,482 lbf/ft)
					89 mm (3-1/2")	2	15.10 kN/m (1,034 lbf/ft)	22.43 kN/m (1,537 lbf/ft)	28.56 kN/m (1,957 lbf/ft)	31.97 kN/m (2,191 lbf/ft)	
						3	20.16 kN/m (1,381 lbf/ft)	29.94 kN/m (2,052 lbf/ft)	38.13 kN/m (2,613 lbf/ft)	42.69 kN/m (2,925 lbf/ft)	

Continued on next page

TABLE R12 (Continued)

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL BLOCKED DIAPHRAGMS[1,2,3,4,5,6] UTILIZING MULTIPLE ROWS OF FASTENERS (HIGH-LOAD DIAPHRAGMS) WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

CSA Panel Mark	APA Panel Mark	Common Nail Size	Min. Nail Penetration in Framing	Panel Thickness[9]	Min. Width of Framing Members at Adjoining Panel Edges and Boundaries[10,11]	Lines of fasteners	Factored Lateral Resistance of Sheathing-to-Framing Connection, kN/m (lbf/ft)				Panel Buckling Strength, kN/m (lbf/ft)
							Blocked Diaphragms				
							Nail Spacing at Diaphragm Boundaries, at Continuous Panel Edges Parallel to Load, and at all Panel Edges (all Cases)[12]				
							150 mm (6")	100 mm (4")	75 mm (3")	65 mm (2-1/2")	
DFP	APA Rated Sheathing Exterior Plywood, CSA O121	10d	38 mm (1-1/2")	12.5 mm (1/2")	65 mm (2-1/2")	2	11.57 kN/m (793 lbf/ft)	17.19 kN/m (1,177 lbf/ft)	21.89 kN/m (1,499 lbf/ft)	24.50 kN/m (1,679 lbf/ft)	25.11 kN/m (1,721 lbf/ft)
					89 mm (3-1/2")	2	13.00 kN/m (891 lbf/ft)	19.31 kN/m (1,323 lbf/ft)	24.59 kN/m (1,685 lbf/ft)	27.53 kN/m (1,886 lbf/ft)	
						3	17.36 kN/m (1,189 lbf/ft)	25.78 kN/m (1,766 lbf/ft)	32.83 kN/m (2,249 lbf/ft)	36.75 kN/m (2,518 lbf/ft)	
				15.5 mm (5/8")	65 mm (2-1/2")	2	12.59 kN/m (862 lbf/ft)	18.70 kN/m (1,281 lbf/ft)	23.81 kN/m (1,632 lbf/ft)	26.66 kN/m (1,827 lbf/ft)	38.68 kN/m (2,650 lbf/ft)
					89 mm (3-1/2")	2	14.15 kN/m (969 lbf/ft)	21.01 kN/m (1,440 lbf/ft)	26.76 kN/m (1,833 lbf/ft)	29.95 kN/m (2,052 lbf/ft)	
						3	18.89 kN/m (1,294 lbf/ft)	28.05 kN/m (1,922 lbf/ft)	35.72 kN/m (2,448 lbf/ft)	39.99 kN/m (2,740 lbf/ft)	
				18.5 mm (3/4")	65 mm (2-1/2")	2	13.61 kN/m (932 lbf/ft)	20.21 kN/m (1,385 lbf/ft)	25.74 kN/m (1,764 lbf/ft)	28.82 kN/m (1,974 lbf/ft)	56.54 kN/m (3,874 lbf/ft)
					89 mm (3-1/2")	2	15.29 kN/m (1,048 lbf/ft)	22.71 kN/m (1,556 lbf/ft)	28.92 kN/m (1,982 lbf/ft)	32.38 kN/m (2,218 lbf/ft)	
						3	20.41 kN/m (1,399 lbf/ft)	30.32 kN/m (2,077 lbf/ft)	38.61 kN/m (2,646 lbf/ft)	43.23 kN/m (2,962 lbf/ft)	

Continued on next page

TABLE R12 (Continued)

FACTORED SHEAR RESISTANCE FOR HORIZONTAL APA PANEL BLOCKED DIAPHRAGMS[1,2,3,4,5,6] UTILIZING MULTIPLE ROWS OF FASTENERS (HIGH-LOAD DIAPHRAGMS) WITH SPF FRAMING[7] FOR WIND OR SEISMIC LOADING[8]

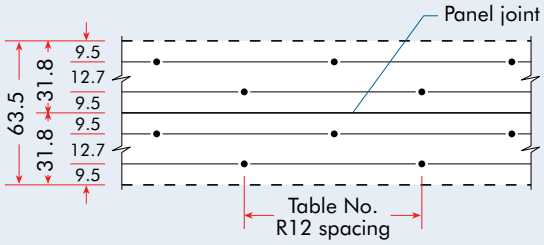
CSA Panel Mark	APA Panel Mark	Common Nail Size	Min. Nail Penetration in Framing	Panel Thickness[9]	Min. Width of Framing Members at Adjoining Panel Edges and Boundaries [10,11]	Lines of fasteners	Factored Lateral Resistance of Sheathing-to-Framing Connection, kN/m (lbf/ft)				Panel Buckling Strength, kN/m (lbf/ft)
							Blocked Diaphragms				
							Nail Spacing at Diaphragm Boundaries, at Continuous Panel Edges Parallel to Load, and at all Panel Edges (all Cases)[12]				
							150 mm (6")	100 mm (4")	75 mm (3")	65 mm (2-1/2")	
CSP	APA Rated Sheathing Exterior Plywood, CSA O151	10d	38 mm (1-1/2")	12.5 mm (1/2")	65 mm (2-1/2")	2	11.57 kN/m (793 lbf/ft)	17.19 kN/m (1,177 lbf/ft)	21.89 kN/m (1,499 lbf/ft)	24.50 kN/m (1,679 lbf/ft)	22.89 kN/m (1,569 lbf/ft)
					89 mm (3-1/2")	2	13.00 kN/m (891 lbf/ft)	19.31 kN/m (1,323 lbf/ft)	24.59 kN/m (1,685 lbf/ft)	27.53 kN/m (1,886 lbf/ft)	
						3	17.36 kN/m (1,189 lbf/ft)	25.78 kN/m (1,766 lbf/ft)	32.83 kN/m (2,249 lbf/ft)	36.75 kN/m (2,518 lbf/ft)	
				15.5 mm (5/8")	65 mm (2-1/2")	2	12.59 kN/m (862 lbf/ft)	18.70 kN/m (1,281 lbf/ft)	23.81 kN/m (1,632 lbf/ft)	26.66 kN/m (1,827 lbf/ft)	35.89 kN/m (2,459 lbf/ft)
					89 mm (3-1/2")	2	14.15 kN/m (969 lbf/ft)	21.01 kN/m (1,440 lbf/ft)	26.76 kN/m (1,833 lbf/ft)	29.95 kN/m (2,052 lbf/ft)	
						3	18.89 kN/m (1,294 lbf/ft)	28.05 kN/m (1,922 lbf/ft)	35.72 kN/m (2,448 lbf/ft)	39.99 kN/m (2,740 lbf/ft)	
				18.5 mm (3/4")	65 mm (2-1/2")	2	13.61 kN/m (932 lbf/ft)	20.21 kN/m (1,385 lbf/ft)	25.74 kN/m (1,764 lbf/ft)	28.82 kN/m (1,974 lbf/ft)	52.70 kN/m (3,611 lbf/ft)
					89 mm (3-1/2")	2	15.29 kN/m (1,048 lbf/ft)	22.71 kN/m (1,556 lbf/ft)	28.92 kN/m (1,982 lbf/ft)	32.38 kN/m (2,218 lbf/ft)	
						3	20.41 kN/m (1,399 lbf/ft)	30.32 kN/m (2,077 lbf/ft)	38.61 kN/m (2,646 lbf/ft)	43.23 kN/m (2,962 lbf/ft)	

Notes:

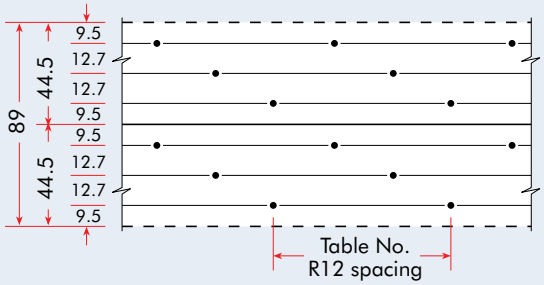
1. The factored shear resistance of diaphragms shall be the smaller of the factored lateral resistance of sheathing-to-framing connection and the panel buckling strength.
2. Tabulated values could be used for both wind and seismic design when the panel buckling does not govern the design. If the panel buckling governs the design, the diaphragm is only appropriate for wind design.
3. Panel size is assumed to be 2400 mm (8 ft.) x 1200 mm (4 ft.).
4. Tabulated values are based on short term loading (K_D = 1.15), SPF framing (SG = 0.42), lumber must be seasoned prior to fabrication (moisture content ≤ 19 %) and used in dry service conditions (K_{SF} = 1.0)
5. For plywood sheathing used for wet service conditions, tabulated values shall be multiplied by 0.8. APA Rated OSB Sheathing Exposure 1 (CSA O325) shall be only used for dry service conditions.
6. Tabulated values assume no treatment (K_T = 1.0)
7. For DF (or equivalent) framing, multiply the factored lateral resistance of sheathing-to-framing connection tabulated values by 1.05.
8. For permanent load duration, multiply the tabulated values by 0.565. For standard load duration, multiply the tabulated values by 0.870.
9. For thicker sheathing, the values for the thickest sheathing available in the table shall be used assuming the minimum fastener penetration is satisfied.
10. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be as specified.
11. For multiple rows of fasteners, the actual framing members thickness shall be at least 65 mm (2-1/2 in.) and at least 65 mm (2-1/2 in.) wide at boundaries and/or adjoining panel edges. Fasteners shall be placed along all edges of each panel not less than 65 mm (2-1/2 in.) on center, staggered, and the min. distance between rows of fasteners shall not be less than 9 mm (3/8 in.).
12. Space nails maximum 300 mm (12 in.) o.c. along intermediate framing members and 150 mm (6 in.) o.c. when supports are spaced 1200 mm (48 in.). Fasteners shall be located at least 9 mm (3/8 in.) from panel edges.

FIGURE R7

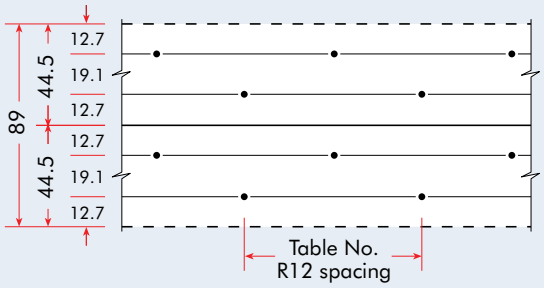
FASTENER PATTERNS FOR USE WITH TABLE R12 (ALL DIMENSIONS ARE IN MM)



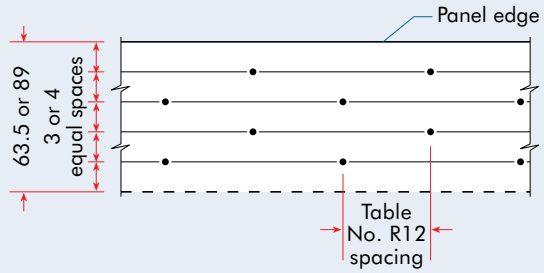
3x Nominal – Two Lines



4x Nominal – Three Lines



4x Nominal – Two Lines



Typical Boundary Fastening (Illustration of two lines, staggered)

Note: Space panel end and edge joints 3.2 mm (1/8 in.). Reduce spacing between lines of nails as necessary to maintain minimum 3.2 mm (1/8-in.) fastener edge margins. Minimum spacing between lines is 9.5 mm (3/8 in.).
For Imperial: 1 mm = 0.0394 in.

Roof Construction

We have field representatives in many major U.S. cities and in Canada
who can help answer questions involving APA trademarked products.
For additional assistance in specifying engineered wood products, contact us:

APA HEADQUARTERS

7011 So. 19th St. ▪ Tacoma, Washington 98466
(253) 565-6600 ▪ Fax: (253) 565-7265

PRODUCT SUPPORT HELP DESK

(253) 620-7400 ▪ help@apawood.org

DISCLAIMER

The information contained herein is based on APA – The Engineered Wood Association's continuing programs of laboratory testing, product research, and comprehensive field experience. Neither APA, nor its members make any warranty, expressed or implied, or assume any legal liability or responsibility for the use, application of, and/or reference to opinions, findings, conclusions, or recommendations included in this publication. Consult your local jurisdiction or design professional to assure compliance with code, construction, and performance requirements. Because APA has no control over quality of workmanship or the conditions under which engineered wood products are used, it cannot accept responsibility for product performance or designs as actually constructed.

www.apawood.org

Form No. R305/Issued February 2022

APA

REPRESENTING THE ENGINEERED WOOD INDUSTRY