APA

Engineered Wood

CONSTRUCTION GUIDE

WOOD
The Natural Choice

Engineered wood products are a good choice for the environment. They are manufactured for years of trouble-free, dependable use. They help reduce waste by decreasing disposal costs and product damage. Wood is a renewable resource that is easily manufactured into a variety of viable products.

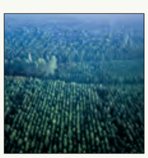
A few facts about wood.

- ***We're growing more wood every day.*** Forests fully cover one-third of the United States' and one-half of Canada's land mass. American landowners plant more than two billion trees every year. In addition, millions of trees seed naturally. The forest products industry, which comprises about 15 percent of forestland ownership, is responsible for 41 percent of replanted forest acreage. That works out to more than one billion trees a year, or about three million trees planted every day. This high rate of replanting accounts for the fact that each year, 27 percent more timber is grown than is harvested. Canada's replanting record shows a fourfold increase in the number of trees planted between 1975 and 1990.

- ***Life Cycle Assessment shows wood is the greenest building product.*** A 2004 Consortium for Research on Renewable Industrial Materials (CORRIM) study gave scientific validation to the strength of wood as a green building product. In examining building products' life cycles – from extraction of the raw material to demolition of the building at the end of its long lifespan – CORRIM found that wood was better for the environment than steel or concrete in terms of embodied energy, global warming potential, air emissions, water emissions and solid waste production. For the complete details of the report, visit www.CORRIM.org.

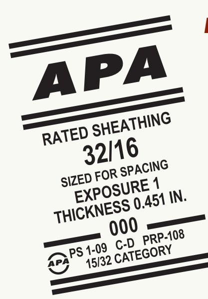
- ***Manufacturing wood is energy efficient.*** Wood products made up 47 percent of all industrial raw materials manufactured in the United States, yet consumed only 4 percent of the energy needed to manufacture all industrial raw materials, according to a 1987 study.

Material	Percent of Production	Percent of Energy Use
Wood	47	4
Steel	23	48
Aluminum	2	8

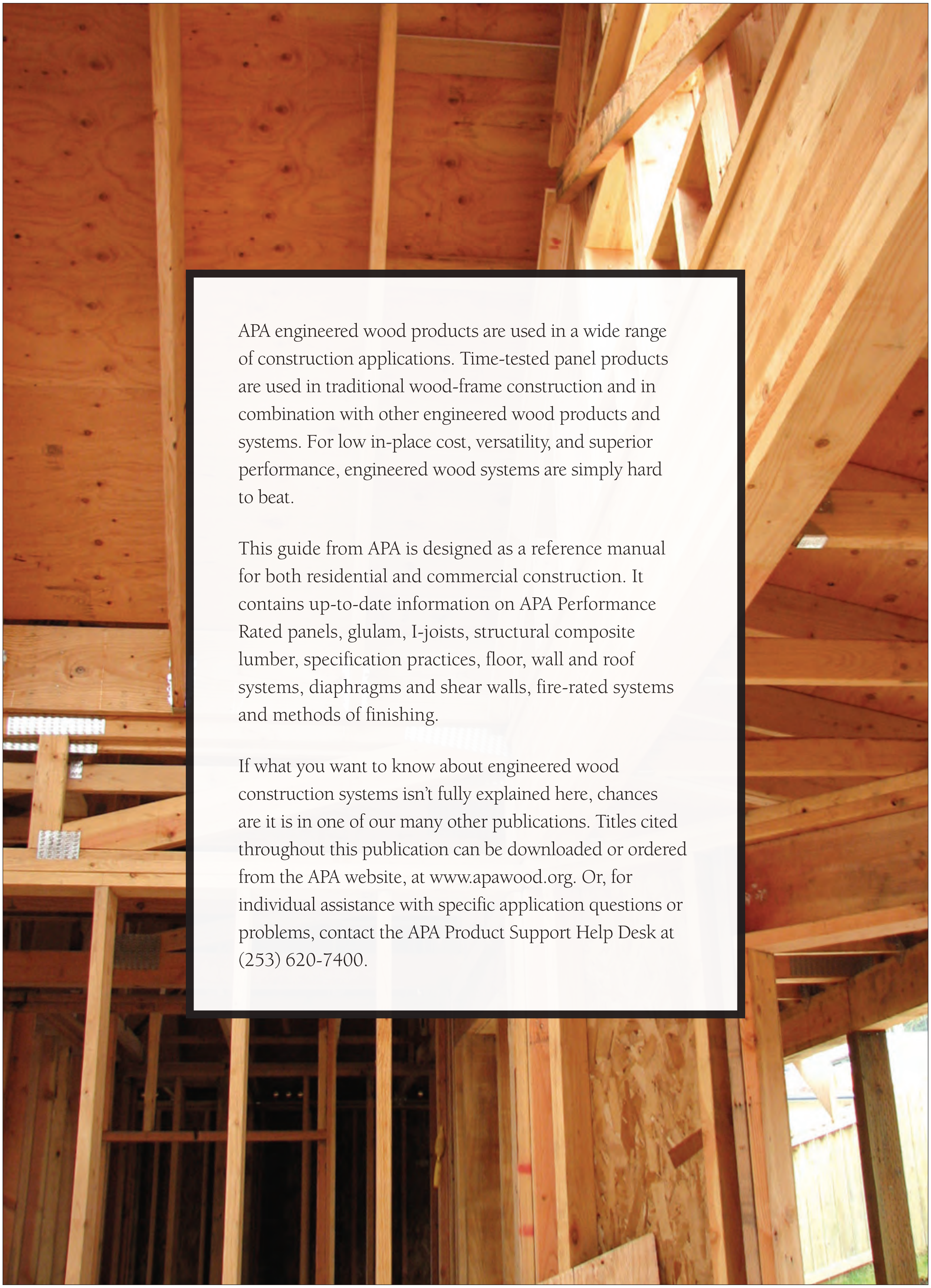


- ***Good news for a healthy planet.*** For every ton of wood grown, a young forest produces 1.07 tons of oxygen and absorbs 1.47 tons of carbon dioxide.

Wood: It's the natural choice for the environment, for design and for strong, lasting construction.



NOTICE:
The recommendations in this guide apply only to products that bear the APA trademark. Only products bearing the APA trademark are subject to the Association's quality auditing program.



APA engineered wood products are used in a wide range of construction applications. Time-tested panel products are used in traditional wood-frame construction and in combination with other engineered wood products and systems. For low in-place cost, versatility, and superior performance, engineered wood systems are simply hard to beat.

This guide from APA is designed as a reference manual for both residential and commercial construction. It contains up-to-date information on APA Performance Rated panels, glulam, I-joists, structural composite lumber, specification practices, floor, wall and roof systems, diaphragms and shear walls, fire-rated systems and methods of finishing.

If what you want to know about engineered wood construction systems isn't fully explained here, chances are it is in one of our many other publications. Titles cited throughout this publication can be downloaded or ordered from the APA website, at www.apawood.org. Or, for individual assistance with specific application questions or problems, contact the APA Product Support Help Desk at (253) 620-7400.

ROOF CONSTRUCTION

APA Panel Roof Sheathing

The recommendations for roof sheathing in Table 30 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 are 1/180 of span under live load plus dead load, and 1/240 under live load

TABLE 30

RECOMMENDED UNIFORM ROOF LIVE LOADS FOR APA RATED SHEATHING[a] AND APA RATED STURD-I-FLOOR WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS[b]

Panel Span Rating	Minimum Panel Performance Category	Maximum Span (in.)		Allowable Live Loads (psf)[d] Spacing of Supports Center-to-Center (in.)							
		With Edge Support[c]	Without Edge Support	12	16	20	24	32	40	48	60
APA RATED SHEATHING[a]											
12/0	3/8	12	12	30							
16/0	3/8	16	16	70	30						
20/0	3/8	19.2	19.2	120	50	30					
24/0	3/8	24	19.2[e]	190	100	60	30				
24/16	7/16	24	24	190	100	65	40				
32/16	15/32	32	28	300	165	110	65	30			
40/20	19/32	40	32	—	275	195	120	60	30		
48/24	23/32	48	36	—	—	270	175	95	45	30	
60/32[f]	7/8	60	40	—	—	—	305	165	100	70	35
60/48[f]	1-1/8	60	48	—	—	—	305	165	100	70	35
APA RATED STURD-I-FLOOR[g]											
16 oc	19/32	24	24	185	100	65	40				
20 oc	19/32	32	32	270	150	100	60	30			
24 oc	23/32	48	36	—	240	160	100	50	30	20	
32 oc	7/8	48	40	—	—	295	185	100	55	35	
48 oc	1-3/32	60	48	—	—	—	290	160	100	65	40

(a) Includes APA RATED SHEATHING/CEILING DECK.

(b) Applies to APA RATED SHEATHING and APA RATED STURD-I-FLOOR panels 24 inches or wider applied over two or more spans.

(c) Tongue-and-groove edges, panel edge clips (one midway* between each support, except two equally spaced between supports 48 inches on center or greater), lumber blocking, or other. For low slope roofs, see Table 31.

(d) 10 psf dead load assumed.

(e) 19.2 inches for Performance Category 3/8 and 7/16 panels. 24 inches for Performance Category 15/32 and 1/2 panels.

(f) Check with supplier for availability.

(g) Also applies to C-C Plugged grade plywood.

*No established tolerance.

only. 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 10 psf, such as tile roofs. **Panels are assumed continuous over two or more spans with the long dimension or strength axis across supports.**

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 31 provides recommended maximum spans for low slope roof decks. Recommended live loads can be determined

TABLE 31

RECOMMENDED MAXIMUM SPANS FOR APA PANEL ROOF DECKS FOR LOW SLOPE ROOFS[a] (Panel strength axis perpendicular to supports and continuous over two or more spans)

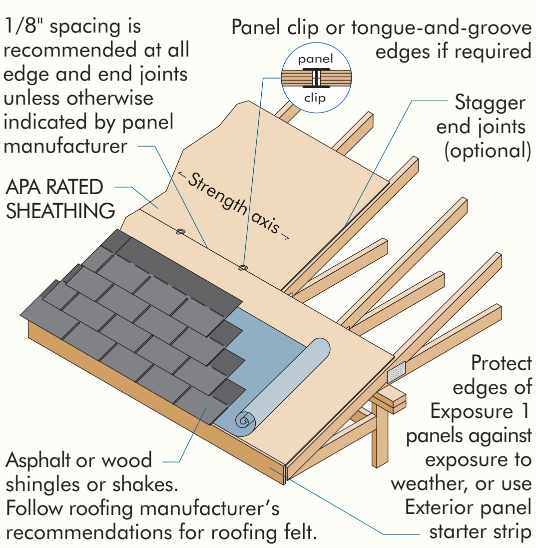
Grade	Minimum Panel Performance Category	Minimum Span Rating	Maximum Span (in.)	Panel Clips Per Span[b] (number)
APA RATED SHEATHING	15/32	32/16	24	1
	19/32	40/20	32	1
	23/32	48/24	48	2
	7/8	60/32	60	2
APA RATED STURD-I-FLOOR	19/32	20 oc	24	1
	23/32	24 oc	32	1
	7/8	32 oc	48	2

(a) Low slope roofs are applicable to built-up, single-ply and modified bitumen roofing systems. *For guaranteed or warranted roofs contact membrane manufacturer for acceptable deck.* Low-slope roofs have a slope that is less than 2/12 (2"/foot).

(b) Edge support may also be provided by tongue-and-groove edges or solid blocking.

FIGURE 21

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 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.

TABLE 32

RECOMMENDED MINIMUM FASTENING SCHEDULE FOR APA PANEL ROOF SHEATHING (Increased nail schedules may be required in high wind zones and where roof is engineered as a diaphragm.)

Panel Performance Category[c]	Nailing[a][b] Size[d]	Nailing[a][b] Maximum Spacing (in.) Supported Panel Edges[e]	Nailing[a][b] Maximum Spacing (in.) Intermediate
3/8 – 1	8d	6	12[f]
1-1/8	8d or 10d	6	12[f]

(a) Use common smooth or deformed shank nails for panels with Performance Category 1 or smaller. For 1-1/8 Performance Category panels, use 8d ring- or screw-shank or 10d common smooth-shank nails.

(b) Other code-approved fasteners may be used.

(c) For stapling asphalt shingles to Performance Category 3/8 and thicker panels, use staples with a 15/16-inch minimum crown width and a 1-inch leg length. Space according to shingle manufacturer's recommendations.

(d) See Table 5, page 14, for nail dimensions.

(e) Supported panel joints shall occur approximately along the centerline of framing with a minimum bearing of 1/2". Fasteners shall be located 3/8 inch from panel edges.

(f) For spans 48 inches or greater, space nails 6 inches at all supports.

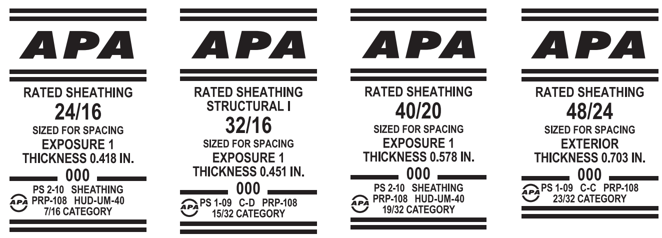
Notes: Gluing of roof sheathing to framing is not recommended, except when recommended by the adhesive manufacturer for roof sheathing that already has been permanently protected by roofing.

The Span Rating in the trademark applies when the long panel dimension or strength axis is across supports unless the strength axis is otherwise identified.

from Table 30, and minimum fastener requirements are given in Table 32. Increased nail schedules may be required in high wind zones. Recommended nail schedules for high wind zones are described in *APA Data File: Roof Sheathing Fastening Schedules for Wind Uplift*, Form T325.

APA RATED SHEATHING is equally effective under built-up roofing, asphalt or fiberglass shingles, tile roofing, or wood shingles or shakes. Roof trusses spaced 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 or 3/4 panels with a span rating of 48/24 over framing 48 inches on center – is also cost effective for long-span flat or pitched roofs. Recommended live loads are given in Table 30. Nailing recommendations are given in Table 32.

When support spacing exceeds the maximum length of an unsupported edge (see Table 30), 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, automatically assure proper panel spacing. When required, use one panel clip per span, except use two clips for 48-inch or longer spans.



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

Preframed Roof Panels

Spans of 8 to 12 feet are usually the most practical with preframed panel construction, although spans to 30 feet are not uncommon. APA panels with stiffeners preframed at 16 or 24 inches on center (Figure 22) 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.

In preframed panels 8x8 feet or larger (Figure 23), the panel strength axis may run either parallel or perpendicular to stiffeners spaced 16 or 24 inches on center. Stiffeners and roof purlins provide support for all panel edges. Recommendations in Table 33 are based on long dimension or strength axis of the panel parallel to supports. Deflection limits are 1/180 of the span for total load; 1/240 for live load only. See Table 34 for design information on stiffeners for preframed panels. Nailing requirements for preframed panels are the same as for roof sheathing.

FIGURE 22

PREFRAMED ROOF PANEL
(4' x 8' – APA Structural Panels
Strength Axis Parallel to Supports)

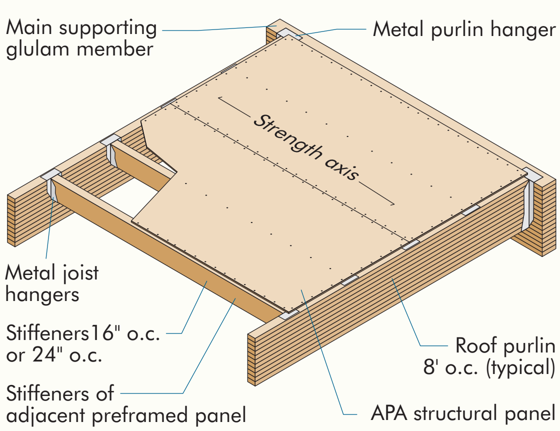


FIGURE 23

PREFRAMED ROOF PANEL
(8' x 8' or larger – APA Structural Panels
Strength Axis Perpendicular to Supports)

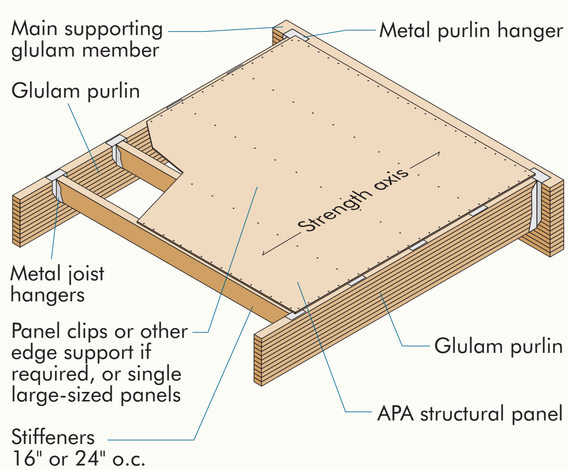


TABLE 33

RECOMMENDED ROOF LOADS (PSF) FOR APA RATED SHEATHING WITH STRENGTH AXIS PARALLEL TO SUPPORTS[a][b] (OSB and 5-ply/5-layer plywood panels unless otherwise noted)

Panel Grade	Panel Performance Category	Span Rating	Maximum Span (in.)	Load at Maximum Span	
				Live	Total
APA STRUCTURAL I RATED SHEATHING	7/16	24/16	24[c]	15	25
	15/32, 1/2	32/16	24	30[d]	40[d]
	19/32, 5/8	40/20	24	70[e]	80[e]
	23/32, 3/4	48/24	24	105[f]	115[f]
APA RATED SHEATHING	7/16	24/16	16	35	45
	15/32, 1/2	32/16	24[c]	15[g]	25[g]
	19/32, 5/8	40/20	24	40[h]	50[h]
	23/32, 3/4	48/24	24	70[e]	80[e]

(a) For guaranteed or warranted roofs, contact membrane manufacturer for acceptable deck.

(b) Provide edge support.

(c) Solid blocking recommended at panel ends for 24-inch span.

(d) For 4-ply plywood, reduce load by 10 psf.

(e) For 4-ply plywood, reduce load by 30 psf.

(f) For 4-ply plywood, reduce load by 45 psf.

(g) For 4-ply plywood, reduce load by 5 psf.

(h) For 4-ply plywood, reduce load by 15 psf.

TABLE 34

STIFFENER LOAD-SPAN TABLES FOR PREFRAMED APA PANEL ROOF DECKS

Douglas fir-Larch		Allowable Roof Live Load (psf)[a]											
Center-to-Center Purlin Spacing[b] (ft)	Stiffener Size and Spacing (in.)	Select Structural			No. 1 & Better			No. 1			No. 2		
			Strength[d]			Strength[d]			Strength[d]			Strength[d]	
		Defl.[c]	1.15	1.25	Defl.[c]	1.15	1.25	Defl.[c]	1.15	1.25	Defl.[c]	1.15	1.25
8	2x4@16	37	67	73	35	51	57	33	41	46	31	36	40
	2x4@24	25	41	46	23	31	34	22	24	27	21	21	23
	2x6@16	144	154	168	136	121	133	129	99	109	121	88	97
	2x6@24	96	99	109	91	78	85	86	63	69	81	56	61
	2x6@32	72	61	68	68	47	52	64	38	42	61	33	37

Southern Pine		Allowable Roof Live Load (psf)[a]											
Center-to-Center Purlin Spacing[b] (ft)	Stiffener Size and Spacing (in.)	Select Structural			No. 1 Dense			No. 1			No. 2		
			Strength[d]			Strength[d]			Strength[d]			Strength[d]	
		Defl.[c]	1.15	1.25	Defl.[c]	1.15	1.25	Defl.[c]	1.15	1.25	Defl.[c]	1.15	1.25
8	2x4@16	35	87	96	35	58	64	33	53	59	31	41	46
	2x4@24	23	55	60	23	35	39	22	32	36	21	24	27
	2x6@16	136	205	223	136	137	150	129	129	141	121	95	104
	2x6@24	91	133	146	91	88	97	86	83	91	81	60	66
	2x6@32	68	83	91	68	54	60	64	50	56	61	36	40

(a) Final allowable load is the lesser of the loads as determined by deflection and stress.

(b) Actual span of stiffeners taken as 3-1/2 inches less than center-to-center spacing of purlins.

(c) Deflection limitations: Span/240 under live load only; Span/180 under total load, assuming a dead load of 10 psf.

(d) Loads limited by stress are based on two conditions of duration of load: two months, such as for snow (1.15); and seven days (1.25); includes effects of 10 psf dead 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.

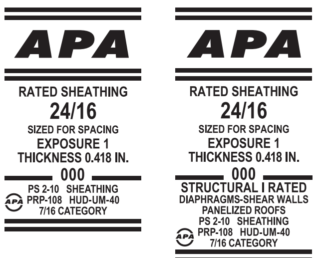
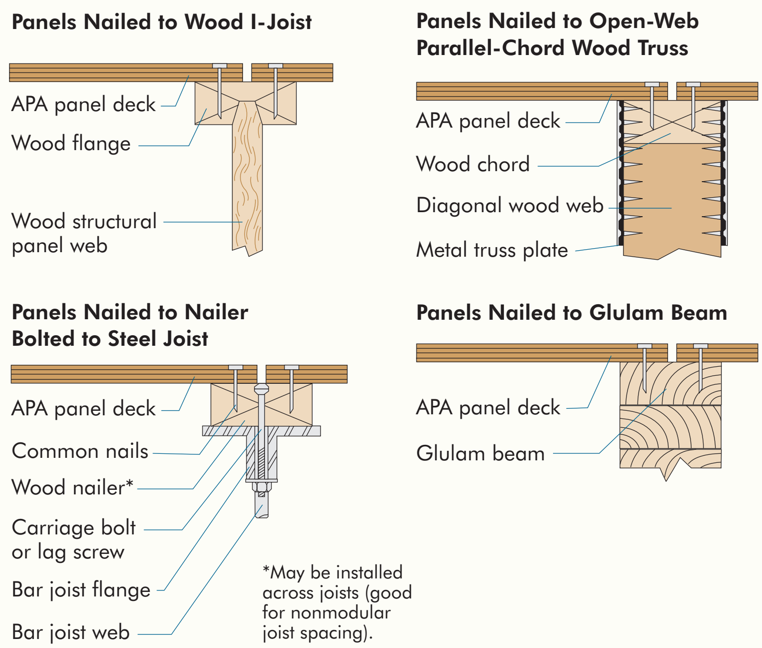


FIGURE 24

TYPICAL CONNECTIONS TO ENGINEERED FLAT ROOF MEMBERS



Experience shows that panels over supports 48 inches on center often yield maximum economy. Panels with a Span Rating of 48/24 are good for at least 35 psf snow load and meet the requirements for most guaranteed or warranted roofs. **Panels are assumed continuous over two spans with long dimension or strength axis across supports.**

Figure 24 illustrates typical connections for engineered flat roof members.

Plywood Under Special Coatings

Chemical coatings for roofs have increased the range of design possibilities, particularly in larger commercial structures with contoured or steeply pitched roof surfaces exposed to view.

The plywood thickness and span recommendations in Table 35 for plywood under special coatings assume installation with the **panel continuous over two or more spans with the long dimension or strength axis perpendicular to supports** and liquid coatings applied directly to the plywood. Check local building codes for any required deviations from these recommendations. Allowable roof live load is based on the same deflection criteria as described in Table 30 for APA panel roof sheathing.

TABLE 35

PLYWOOD THICKNESS AND MAXIMUM SPANS FOR ROOF DECKS UNDER SPECIAL COATINGS[a]

Grade	Minimum Plywood Performance Category	Maximum Support Spacing (in.)			Nail Type & Size[b][c]	Maximum Nail Spacing (in.)	
		Group 1	Groups 2 & 3	Group 4		Supported Panel Edges	Intermediate Supports
APA A-C EXT APA B-C EXT APA C-C PLUGGED EXT	11/32	16	—	—	8d common smooth[d] or ring- or screw-shank	6	12
	15/32, 1/2	24	24	16	8d common smooth[d] or ring- or screw-shank	6	12
	19/32, 5/8	32	24	24	8d ring- or screw-shank	6	12
	23/32, 3/4	40	32	32	8d ring- or screw-shank	6	12
	7/8	48	40	40	8d ring- or screw-shank	6	12[e]

(a) All panels will support at least 30 psf live load plus 10 psf dead load at maximum span.

(b) Nail type, size and spacing may vary for engineered diaphragm designs.

(c) See Table 5, page 14, for nail dimensions.

(d) Use only deformed-shank nails for curved surfaces.

(e) For spans 48 inches or greater, space nails maximum 6 inches at all supports.

Exterior plywood is recommended for use under special coatings for roofs. Where the coating requires a very smooth base, use APA A-C Exterior or APA B-C Exterior plywood. Where maximum smoothness is not essential, use APA C-C PLUGGED Exterior. Tongue-and-groove plywood (Performance Category 15/32 or larger) or lumber blocking at panel edges is recommended. A 1/8-inch space is recommended at all edge and end joints unless otherwise indicated by panel manufacturer. If high-performance coatings are to be used for finish, check coating manufacturer's recommendations for panel joint treatment. Nail size, type and spacing recommendations are also given in Table 35.

Grades recommended in Table 35 should also be specified for the top layer when the structural wood deck is to be overlaid with a separate plywood layer to serve as substrate for special roof coatings. A 1/8-inch space is recommended at all edge and end joints unless otherwise indicated by panel manufacturer. Although minimum 1/4-inch plywood may be used over structural decks, Performance Category 15/32 or larger panels should be considered for best performance over uneven surfaces or when rain or high humidity is anticipated prior to application of roof coating. Use corrosion-resistant fasteners sized and spaced as recommended in Table 35.

APA Panel Soffits

Recommended spans for open and closed APA panel soffits are given in Tables 36 and 37. The recommendations in Table 36 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 across 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 30 psf live load, plus 10 psf dead load.

For open soffit and nonstructural ceiling construction, panels designated Exposure 1 are recommended as a minimum (check local building code) where appearance is not a major consideration.

TABLE 36

APA PANELS FOR OPEN SOFFIT OR FOR COMBINED ROOF DECKING-CEILING[a][b]
(Strength axis across supports. For APA RATED SHEATHING, where appearance is not a major concern, see Table 30.)

Maximum Span (inches)	Panel Description (All panels Exterior or Exposure 1)	Species Group for Plywood
16	Performance Category 15/32 APA RATED SIDING 303	1, 2, 3, 4
	Performance Category 15/32 APA MDO, Sanded and Touch-Sanded Plywood	1, 2, 3, 4
24	Performance Category 15/32 APA RATED SIDING 303	1
	Performance Category 15/32 APA MDO, Sanded and Touch-Sanded Plywood	1, 2, 3
	Performance Category 19/32 APA RATED SIDING 303	1, 2, 3, 4
	Performance Category 19/32 APA MDO, Sanded and Touch-Sanded Plywood	1, 2, 3, 4
	APA RATED STURD-I-FLOOR 16 oc	—
32	Performance Category 19/32 APA RATED SIDING 303	1
	Performance Category 19/32 APA MDO, Sanded and Touch-Sanded Plywood	1
	Performance Category 23/32 APA Textured Plywood[c]	1, 2, 3, 4
	Performance Category 23/32 APA MDO, Sanded and Touch-Sanded Plywood	1, 2, 3, 4
	APA RATED STURD-I-FLOOR 20 oc	—
48	Performance Category 1-1/8 APA Textured Plywood[c]	1, 2, 3, 4
	APA RATED STURD-I-FLOOR 48 oc	—

(a) All panels will support at least 30 psf live load plus 10 psf dead load at maximum span.

(b) For appearance purposes, blocking, tongue-and-groove edges or other suitable edge supports should be provided.

(c) Also see Table 30 for APA RATED SHEATHING/CEILING DECK.

TABLE 37

APA PANELS FOR CLOSED SOFFIT OR FOR NONSTRUCTURAL CEILING[a][b] (Strength axis across supports)

Maximum Span (in.) All Edges Supported	Panel Performance Category	Species Group	Nail Size and Type[c]
24	11/32 APA[d]	All Species Groups	6d nonstaining box or casing
32	15/32 APA[d]		
48	19/32 APA[d]		8d nonstaining box or casing

(a) Space nails maximum 6 inches at panel edges and 12 inches at intermediate supports for spans less than 48 inches; 6 inches at all supports for 48-inch spans.

(b) For appearance purposes, blocking, tongue-and-groove edges or other suitable edge supports should be provided.

(c) See Table 5, page 14, for nail dimensions.

(d) Any suitable grade panel which meets appearance requirements – Exterior for closed soffits, Exposure 1 or Exterior for nonstructural ceiling.

Only Exterior panels should be used for closed soffits.

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. For panel grades other than APA RATED SIDING 303, top-quality acrylic latex house paint systems provide best performance (see page 55). 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.

FIGURE 25

OPEN SOFFIT

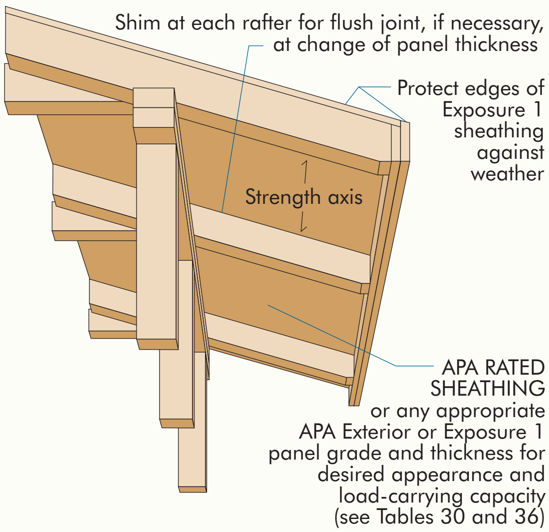
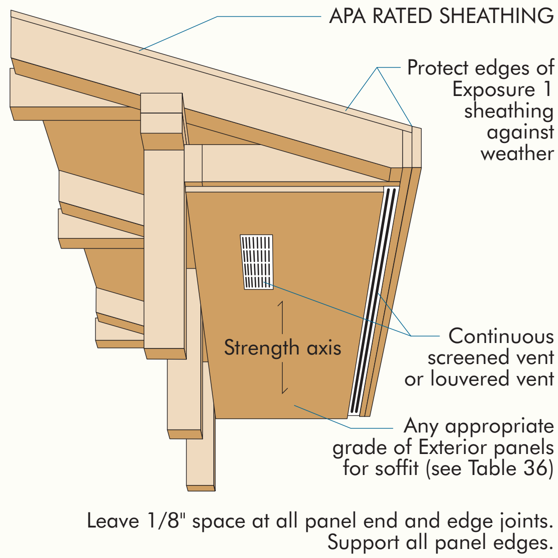


FIGURE 26

CLOSED SOFFIT



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.

Where Performance Category 1-1/8 roof panels are desired, such as for Heavy Timber construction (see page 75), shear values for Performance Category 19/32 panels are used. Blocked shear values for Performance Category 1-1/8 panels may be obtained by specifying stapled tongue-and-groove edges. Staples shall be 16 gauge, 1 inch long with a 3/8-inch crown, driven through the tongue-and-groove edges 3/8 inch from the joint so as to penetrate the tongue with both legs of the staple. Staples shall be spaced at one-half of the diaphragm boundary nail spacing for Cases 1 and 2, and at one-third the diaphragm boundary nail spacing for Case 3 through 6, as illustrated in Table 38.

Table 38 gives panel and fastening recommendations for roof diaphragms. Panels and framing are assumed already designed for perpendicular loads. To design a diaphragm, follow these steps:

1. Determine lateral loads and resulting shears.

2. Determine nailing schedule (Table 38). 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.

For information about developing higher diaphragm shears than shown in Table 38, see *APA Design/Construction Guide: Diaphragms and Shear Walls, Form L350*.

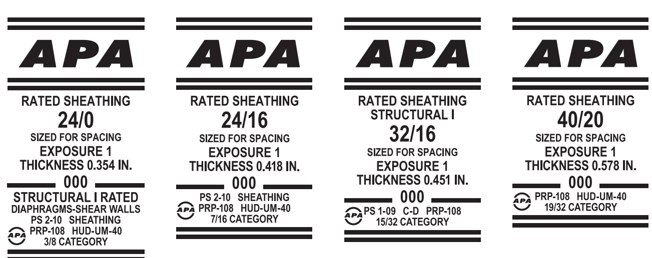


TABLE 38

ALLOWABLE SHEAR (POUNDS PER FOOT) FOR HORIZONTAL APA PANEL DIAPHRAGMS WITH FRAMING OF DOUGLAS-FIR, LARCH OR SOUTHERN PINE[a] FOR WIND[b][c] OR SEISMIC LOADING[c]

					Blocked Diaphragms				Unblocked Diaphragms	
					Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6)[d]				Nails Spaced 6" max. at Supported Edges[d]	
					6	4	2-1/2[e]	2[e]		
					Nail Spacing (in.) at other panel edges (Cases 1, 2, 3 & 4)[d]					
Panel Grade	Common Nail Size[f]	Minimum Nail Penetration in Framing (in.)	Minimum Nominal Panel Thickness (in.)	Minimum Nominal Width of Framing Members at Adjoining Panel Edges and Boundaries[g] (in.)	6	6	4	3	Case 1 (No unblocked edges or continuous joints parallel to load)	All other configurations (Cases 2, 3, 4, 5 & 6)
APA STRUCTURAL I grades	6d[h]	1-1/4	5/16	2	185	250	375	420	165	125
				3	210	280	420	475	185	140
	8d	1-3/8	3/8	2	270	360	530	600	240	180
				3	300	400	600	675	265	200
	10d[i]	1-1/2	15/32	2	320	425	640	730	285	215
				3	360	480	720	820	320	240
APA RATED SHEATHING APA RATED STURD-I-FLOOR and other APA grades except Species Group 5	6d[h]	1-1/4	5/16	2	170	225	335	380	150	110
				3	190	250	380	430	170	125
			3/8	2	185	250	375	420	165	125
				3	210	280	420	475	185	140
	8d	1-3/8	3/8	2	240	320	480	545	215	160
				3	270	360	540	610	240	180
			7/16	2	255	340	505	575	230	170
				3	285	380	570	645	255	190
			15/32	2	270	360	530	600	240	180
				3	300	400	600	675	265	200
	10d[i]	1-1/2	15/32	2	290	385	575	655	255	190
				3	325	430	650	735	290	215
			19/32	2	320	425	640	730	285	215
				3	360	480	720	820	320	240

(a) For framing of other species: (1) Find specific gravity for species of lumber in the AF&PA National Design Specification (NDS). (2) Find shear value from table above for nail size for actual grade. (3) Multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1 – (0.5 – SG)], where SG = specific gravity of the framing. This adjustment shall not be greater than 1.

(b) For wind load applications, the values in the table above shall be permitted to be multiplied by 1.4.

(c) For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

(d) Space nails maximum 12 inches o.c. along intermediate framing members (6 inches o.c. when supports are spaced 48 inches o.c. or greater). Fasteners shall be located 3/8" from panel edges.

(e) Framing at adjoining panel edges shall be 3" nominal or wider, and nails shall be staggered where nails are spaced 2 inches o.c. or 2-1/2 inches o.c.

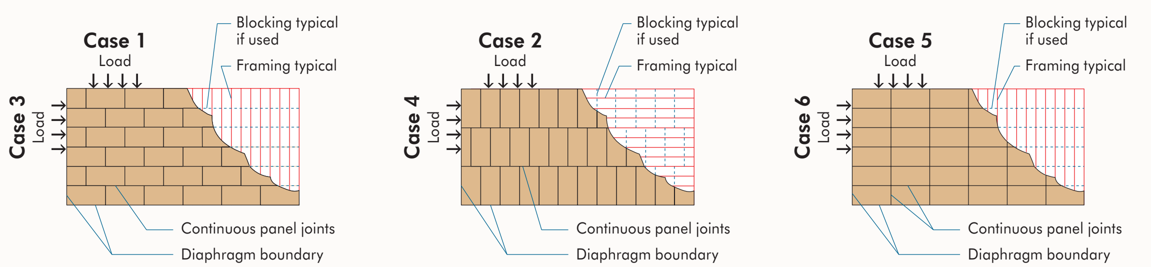
(f) See Table 5, page 14, for nail dimensions.

(g) The minimum normal width of framing members not located at boundaries or adjoining panel edges shall be 2".

(h) 8d is recommended minimum for roofs due to negative pressures of high winds.

(i) Framing at adjoining panel edges shall be 3" nominal or wider, and nails shall be staggered where 10d nails having penetration into framing of more than 1-1/2" are spaced 3 inches o.c.

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.



ADDITIONAL INFORMATION

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