

# ENGINEERED WOOD CONSTRUCTION GUIDE



# Be Constructive WOOD



Wood is the right choice for a host of construction applications. It is the earth's natural, energy efficient and renewable building material.

**Engineered wood is a better use of wood.** It uses less wood to make more wood products. That's why using APA trademarked I-joists, glued laminated timbers, laminated veneer lumber, plywood and oriented strand board is constructive ... for the environment, for innovative design, and for strong, durable buildings.

### A few facts about wood.

■ **We're not running out of trees.** One-third of the United States land base – 731 million acres – is covered by forests. About two-thirds of that 731 million acres is suitable for repeated planting and harvesting of timber. But only about half of the land suitable for growing timber is open to logging.



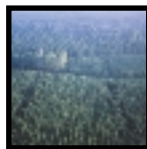
Most of that harvestable acreage also is open to other uses, such as camping, hiking, and hunting. Forests fully cover one-half of Canada's land mass. Of this forestland, nearly half is considered productive, or capable of producing timber on a sustained yield basis. Canada has the highest per capita accumulation of protected natural areas in the world – areas including national and provincial parks.



■ **We're growing more wood every day.** 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.

■ **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



■ **Constructive 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 constructive choice for the environment.



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

**APA Sturd-I-Wall®**

The APA Sturd-I-Wall system consists of APA RATED SIDING (panel or lap) applied direct to studs or over nonstructural fiberboard, gypsum or rigid foam insulation sheathing. Nonstructural sheathing is defined as sheathing not recognized by building codes as meeting both bending and racking strength requirements.

A single layer of panel siding, since it is strong and rack resistant, eliminates the cost of installing separate structural sheathing or diagonal wall bracing. Panel sidings are normally installed vertically, but may also be placed horizontally (long dimension across supports) if horizontal joints are blocked. Maximum stud spacings for both applications are given in Table 16.

When installing panel or lap siding over rigid foam insulation sheathing, drive the nails flush with the siding surface, but avoid over-driving, which can result in dimpling of the siding due to the compressible nature of foam sheathing.

Sidings are occasionally treated with water repellents or wood preservatives to improve finishing characteristics or durability for certain applications. If the siding has been treated, be sure the surface treatment is dry to avoid solvent or chemical reaction with the foam sheathing.

Because of the high resistance of foam sheathing to vapor transmission, a polyethylene vapor retarder or foil-backed gypsum wallboard should be installed on the warm side of the wall to avoid condensation problems in the wall cavity. Ordinary foil- or paper-faced insulation batts are **not** recommended as an alternate.

When rigid foam insulation sheathing is used, building codes also generally require installation of 1/2-inch gypsum wallboard, or other materials of the required thermal barrier rating, on the inside surface of the wall for fire protection.

See Figures 8 through 12 for panel and lap siding installation recommendations for the Sturd-I-Wall system or for siding installed over nailable sheathing.

All panel siding edges in Sturd-I-Wall construction should be backed with framing or blocking. Use nonstaining, noncorrosive nails as described in Tables 16 and 17 to prevent staining the siding.

Where siding is to be applied at an angle, install only over nailable sheathing.

NOTE: Gluing of siding to framing is not recommended.

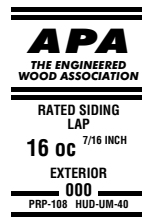
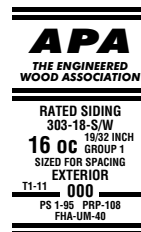
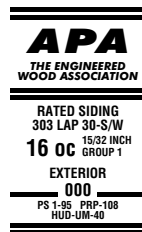


TABLE 16

**APA STURD-I-WALL CONSTRUCTION**

(Recommendations apply to APA Rated Siding direct to studs and over nonstructural sheathing.)

	Siding Description <sup>(a)</sup>	Nominal Thickness (in.) or Span Rating	Max. Stud Spacing (in.)		Nail Size (Use nonstaining box, siding or casing nails) <sup>(b)(c)</sup>	Max. Nail Spacing <sup>(e)</sup> (in.)	
			Strength Axis Vertical	Strength Axis Horizontal		Panel Edges <sup>(i)</sup>	Intermediate Supports
Panel Siding	APA MDO EXT	11/32 & 3/8	16	24	6d for siding 1/2" thick or less; 8d for thicker siding	6 <sup>(d)</sup>	12 <sup>(f)</sup>
		15/32 & thicker	24	24			
	APA RATED SIDING EXT	16 oc (including T1-11)	16	16 <sup>(g)</sup>			
Lap Siding	APA RATED SIDING – LAP EXT	24 oc	24 <sup>(h)</sup>	24 <sup>(h)</sup>	6d for siding 1/2" thick or less; 8d for thicker siding	16 along bottom edge	—
		16 oc	—	16		24 along bottom edge	—
		24 oc	—	24			

(a) For veneered APA RATED SIDING, including APA 303 Siding, recommendations apply to all species groups.

(b) If panel siding is applied over foam insulation sheathing, use next regular nail size. If lap siding is installed over rigid foam insulation sheathing up to 1 inch thick, use 10d (3") nails for 3/8" or 7/16" siding, 12d (3-1/4") nails for 15/32" or 1/2" siding, and 16d (3-1/2") nails for 19/32" or thicker siding. Use nonstaining box nails for siding installed over foam insulation sheathing.

(c) Hot-dipped or hot-tumbled galvanized steel nails are recommended for most siding applications. For best performance, stainless steel nails or aluminum nails should be considered. APA tests also show that electrically or mechanically galvanized steel nails appear satisfactory when plating meets or exceeds thickness requirements of ASTM A641 Class 2 coatings, and is further protected by yellow chromate coating.

**Note:** Galvanized fasteners may react under wet conditions with the natural extractives of some wood species and may cause staining if left unfinished. Such staining can be minimized if the siding is finished in accordance with APA recommendations, or if the roof overhang protects the siding from direct exposure to moisture and weathering.

(d) For braced wall section with 11/32" or 3/8" panel siding applied horizontally over studs 24" o.c., space nails 3" o.c. along panel edges.

(e) Recommendations of siding manufacturer may vary.

(f) Where basic wind speed exceeds 80 mph, nails attaching siding to intermediate studs within 10% of the width of the narrow side from wall corners shall be spaced 6" o.c.

(g) Stud spacing may be 24" o.c. for veneer-faced siding panels.

(h) Maximum stud spacing 16" o.c. for a Code Plus wall.

(i) Fasteners shall be located 3/8 inch from panel edges.

FIGURE 8

**APA STURD-I-WALL (Vertical Panel Installation)**

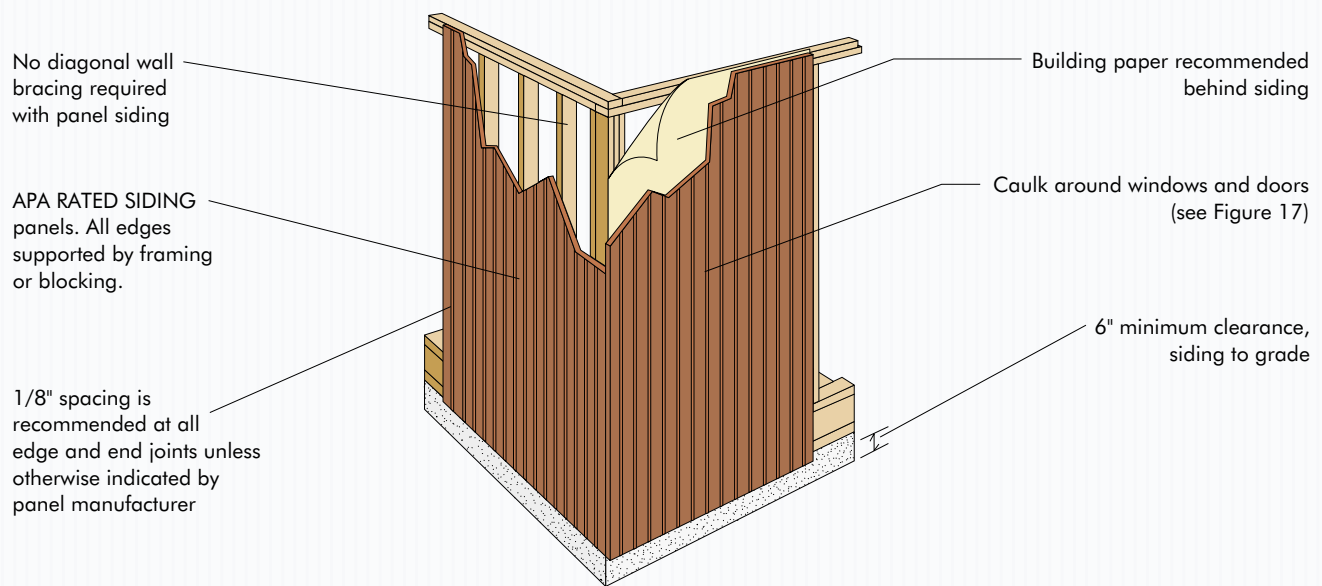


FIGURE 9

**APA STURD-I-WALL (Horizontal Panel Siding Installation)**

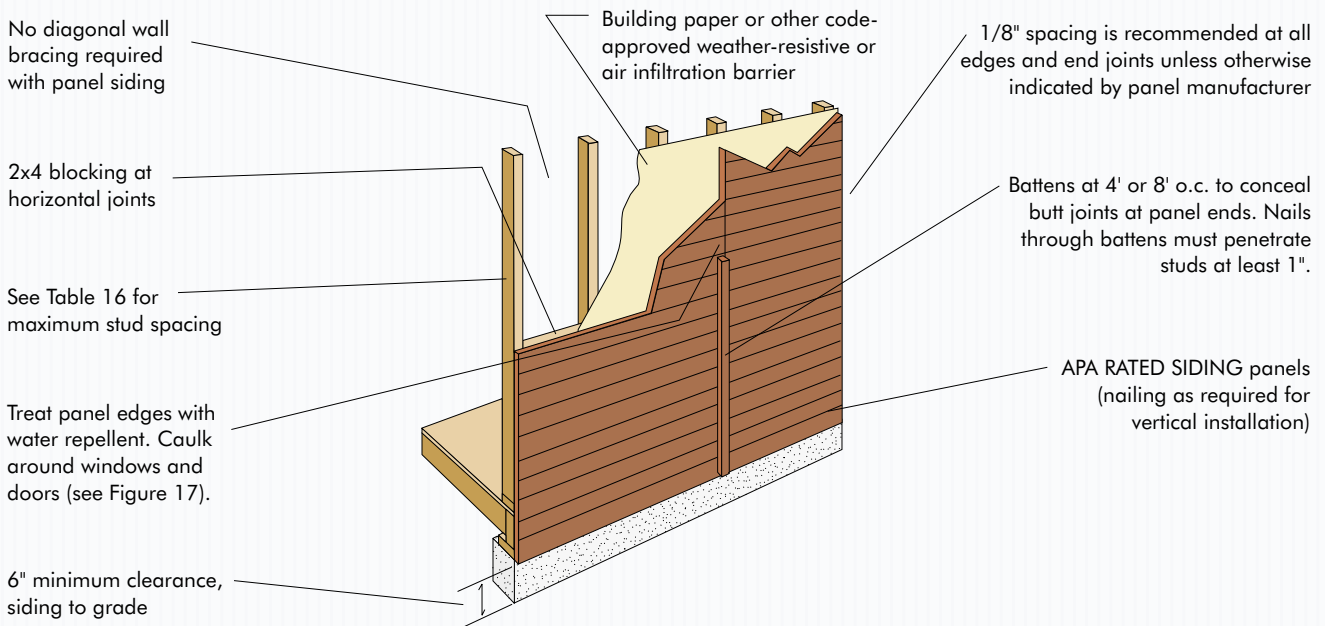
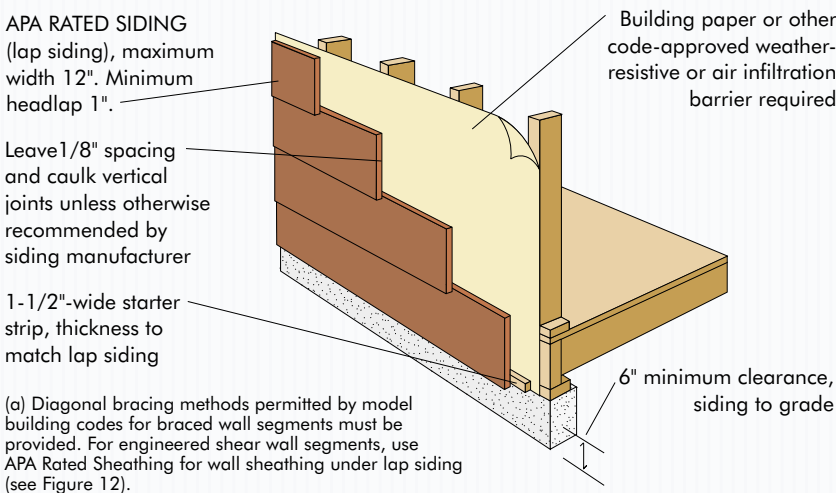


FIGURE 10

**APA STURD-I-WALL (Horizontal Lap Siding Installation)<sup>(a)</sup>**



(a) Diagonal bracing methods permitted by model building codes for braced wall segments must be provided. For engineered shear wall segments, use APA Rated Sheathing for wall sheathing under lap siding (see Figure 12).

**APA Panel and Lap Siding Over Nailable Sheathing**

The recommendations in Table 17 for panel and lap siding apply to siding installed over nailable sheathing. Unless otherwise indicated in the local building code, nailable sheathing includes:

1. Nominal 1-inch boards with studs 16 or 24 inches o.c.
2. APA RATED SHEATHING panels with roof Span Rating of 24 inches or greater installed with strength axis either parallel or perpendicular to studs 16 or 24 inches o.c. (except 3-ply plywood panels must be applied with strength axis across studs when studs are spaced 24 inches o.c.).<sup>(a)</sup>
3. APA RATED SHEATHING panels with roof Span Rating less than 24 inches installed with strength axis either parallel or perpendicular to studs

TABLE 17

**APA RATED SIDING OVER NAILABLE SHEATHING**  
 (For siding over types of nonstructural sheathing, see Sturd-I-Wall recommendations.)

Siding Description <sup>(a)</sup>	Nominal Thickness (in.) or Span Rating	Max. Spacing of Vertical Rows of Nails (in.)		Nail Size (Use nonstaining box, siding or casing nails) <sup>(b)(c)</sup>	Max. Nail Spacing <sup>(c)</sup> (in.)		
		Strength Axis Vertical	Strength Axis Horizontal		Panel Edges <sup>(d)</sup>	Intermediate Supports	
Panel Siding	APA MDO EXT	11/32 & 3/8	16	24	6d for siding 1/2" thick or less; 8d for thicker siding	6	12
		15/32 & thicker	24	24			
	APA RATED SIDING EXT	16 oc (including T1-11) 24 oc	16	24			
Lap Siding	APA MDO EXT	11/32 & thicker	—	—	6d for siding 1/2" thick or less; 8d for thicker siding	8 along bottom edge	—
	APA RATED SIDING – LAP EXT	11/32 & thicker, or 16 oc or 24 oc	—	—			

(a) For veneered APA RATED SIDING, including APA 303 Siding, recommendations apply to all species groups.

(b) Hot-dipped or hot-tumbled galvanized steel nails are recommended for most siding applications. For best performance, stainless steel nails or aluminum nails should be considered. APA tests also show that electrically or mechanically galvanized steel nails appear satisfactory when plating meets or exceeds thickness requirements of ASTM A641 Class 2 coatings, and is further protected by yellow chromate coating.

**Note:** Galvanized fasteners may react under wet conditions with the natural extractives of some wood species and may cause staining if left unfinished. Such staining can be minimized if the siding is finished in accordance with APA recommendations, or if the roof overhang protects the siding from direct exposure to moisture and weathering.

(c) Recommendations of siding manufacturer may vary.

(d) Fasten panels 3/8 inch from panel edges.

**Note:** Shaded nail spacing meets Code Plus wall recommendations.

FIGURE 11

**APA RATED SIDING (PANEL SIDING) OVER NAILABLE SHEATHING**

1/8" spacing is recommended at all edge and end joints unless otherwise indicated by panel manufacturer

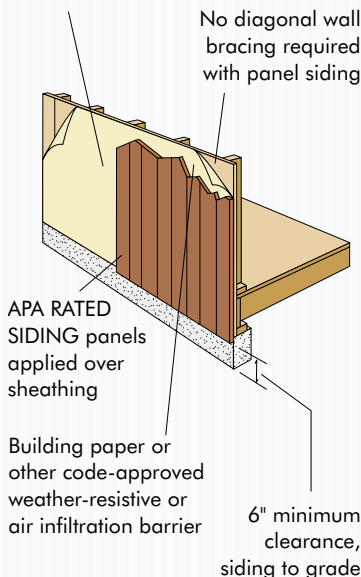
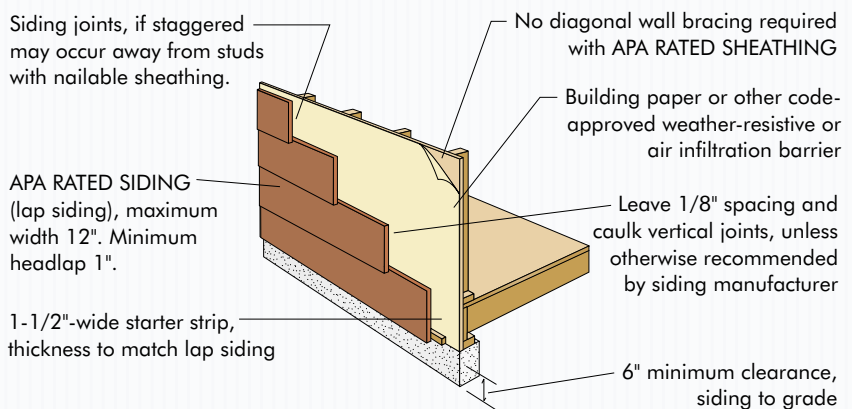


FIGURE 12

**APA RATED SIDING (LAP SIDING) OVER NAILABLE SHEATHING**



16 inches o.c. (except plywood panels 3/8 inch thick or less must be applied with strength axis across studs).<sup>(a)</sup>

Lap siding joints, if staggered, and panel siding joints may occur away from studs with nailable sheathing.

(a) Check local building codes for blocking requirements between studs for braced or engineered shear wall segments, when wall sheathing is installed horizontally across studs.

**NOTE:** In addition to panel edge spacing and the use of straight studs, nailing sequence can also be a factor in maintaining a uniformly flat appearance of the finished wall. Here's a way to install panel siding without built-in compression stress. First, position the panel, maintaining recommended edge spacing, and lightly tack at each corner. Install the first row of nails at the edge next to the preceding panel from top to bottom. Remove remaining tacking nails. Then nail the row at the first intermediate stud. Continue by nailing at the second intermediate stud, and finally, at the edge opposite the preceding panel. Complete the installation by fastening to the top and bottom plates.

**APA Panel Wall Sheathing**

APA RATED SHEATHING easily meets building code wall sheathing requirements for bending and racking strength without let-in corner bracing. Even when fiberboard or other nonstructural sheathing is used, APA RATED SHEATHING corner panels (Figure 14) of the same thickness can eliminate costly let-in bracing. Installation recommendations are given in Figure 13.

Recommended wall sheathing spans with brick veneer or masonry are the same as those for panel sheathing (see Table 18). See Figure 15 for installation recommendations.

Panel recommendations for preframed wall sections are the same as for built-in-place walls.

**NOTE:** Gluing of wall sheathing to framing is not recommended, except when recommended by the adhesive manufacturer for wall sheathing that already has been permanently protected by siding.

TABLE 18

**APA PANEL WALL SHEATHING<sup>(a)</sup>**  
**(APA RATED SHEATHING panels continuous over two or more spans.)**

Panel Span Rating	Maximum Stud Spacing (in.)	Nail Size (b)(c)	Maximum Nail Spacing (in.)	
			Supported Panel Edges(d)	Intermediate Supports
12/0, 16/0, 20/0 or Wall-16 oc	16	6d for panels 1/2" thick or less; 8d for thicker panels	6	12
24/0, 24/16, 32/16 or Wall-24 oc	24			

(a) See requirements for nailable panel sheathing when exterior covering is to be nailed to sheathing.

(b) Common, smooth, annular, spiral-thread, or galvanized box.

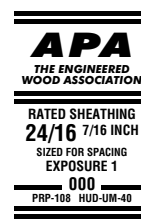
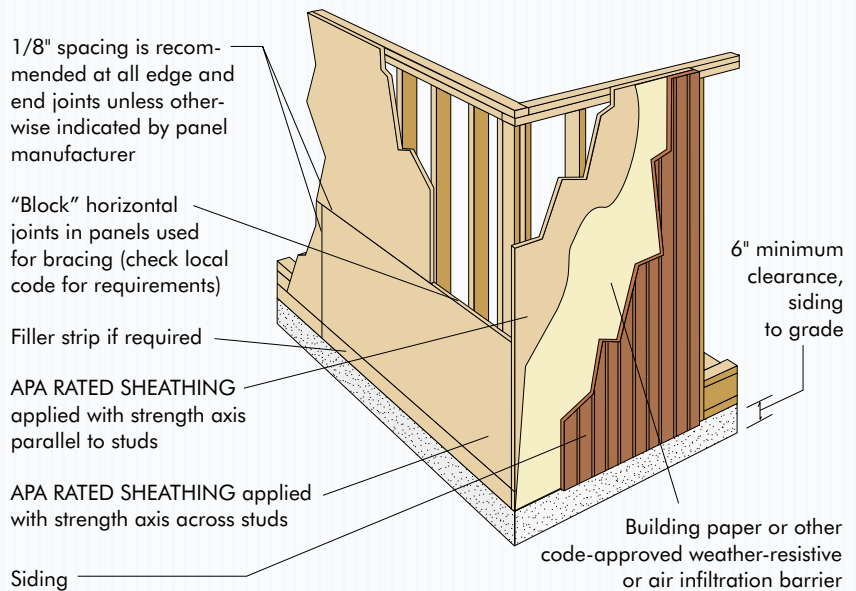
(c) Other code-approved fasteners may be used.

(d) Fasteners shall be located 3/8 inch from panel edges.

**Note:** Shaded construction meets Code Plus recommendations.

FIGURE 13

**APA PANEL WALL SHEATHING**



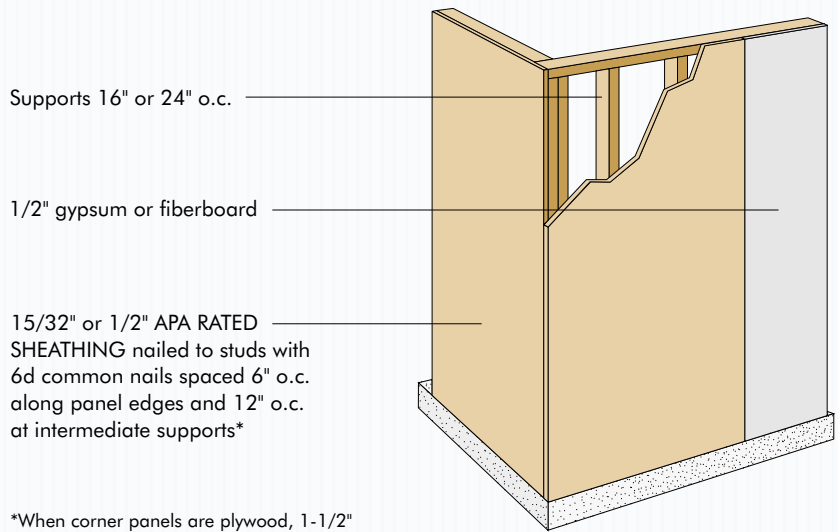
### The Code Plus Wall

The Code Plus wall provides superior wall racking strength, protecting the home from severe winds and earthquakes. Requirements are as follows:

1. For double wall construction, sheath walls with APA RATED SHEATHING.
2. For single wall construction, apply APA RATED SIDING panels which are at least 19/32 inch thick or possess a Span Rating of 24 oc direct to studs spaced 16 inches o.c., or
3. Apply APA RATED SIDING panels which are at least 19/32 inch thick with no grooves or with shallow grooves which are no deeper than the face veneer direct to studs spaced 24 inches o.c.
4. Fasten wall sheathing with 6d nails, or 8d nails for panels greater than 1/2 inch thick, and fasten APA RATED SIDING with 6d or 8d galvanized nails. Space nails 6 inches at supported edges and 12 inches at intermediate supports.
5. Leave a 1/8-inch space at all edge and end joints to allow for panel expansion.

FIGURE 14

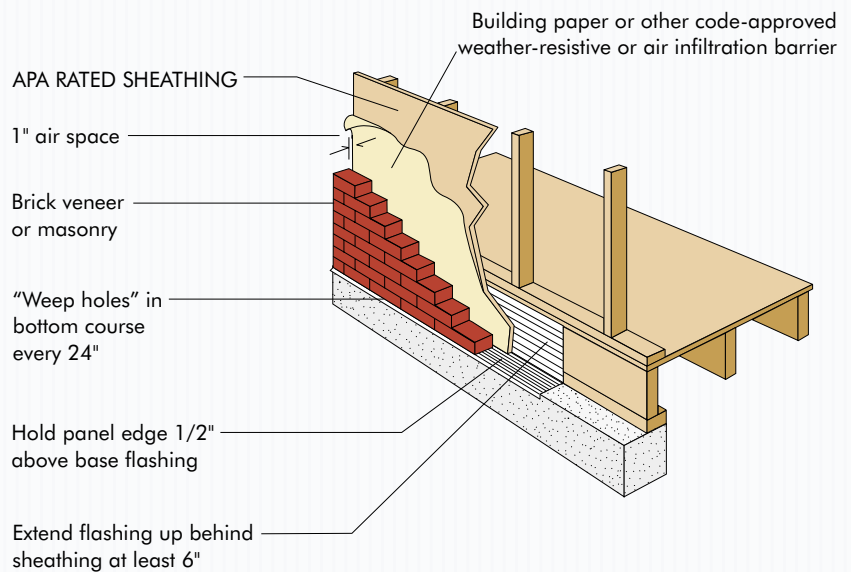
#### APA PANEL CORNER BRACING



\*When corner panels are plywood, 1-1/2" roofing nails spaced 4" o.c. along panel edges and 8" o.c. at intermediate supports may be used.

FIGURE 15

#### BRICK VENEER OVER APA PANEL SHEATHING





**APA Sheathing Under Stucco**

Greater stiffness is recommended for wall sheathing when stucco is to be applied. To increase stiffness, apply the long panel dimension or strength axis across studs. Blocking or a plywood cleat is recommended at horizontal joints. Blocking is required for braced wall sections or shear wall applications. For panel recommendations applied horizontally or vertically, see Table 19.

**Siding Joint Details**

The siding joint details in Figure 17 are based on the use of APA trademarked siding. Nailing of wood structural panel siding along both edges of shiplap siding along both edges of shiplap joints (“double nailing”), as shown, is required for shearwalls or those wall segments that must meet bracing requirements. Double nailing is recommended for all other applications as well to provide maximum wall strength and moisture protection.

Where caulks or joint sealants are indicated, consider the various types available such as urethane, plasticized acrylic latex, butyl and polysulfide. Check with the manufacturer of the caulk or sealant to determine suitability for the intended application and compatibility with coatings and other building materials such as vinyl and aluminum.

In some cases a foam rod or other type filler material may be used behind the sealants as recommended by the manufacturer. For best results in other cases, apply caulking to framing at panel edges before installing the siding panel; or apply a bead of caulk along the panel edge before installing the next panel. A 1/8-inch space is recommended at all edge and end joints unless otherwise indicated by panel manufacturer. If caulk is to be used, also check with caulk manufacturer for recommended

TABLE 19

**RECOMMENDED THICKNESS AND SPAN RATING FOR APA PANEL WALL SHEATHING FOR STUCCO EXTERIOR FINISH**

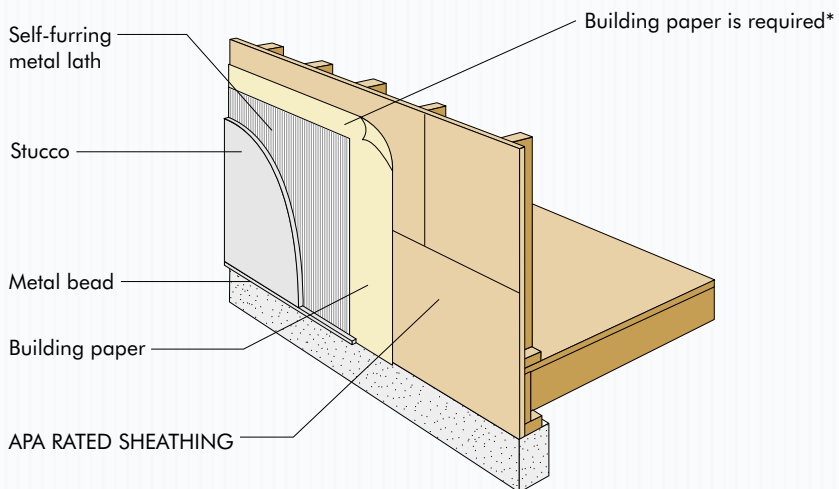
Stud Spacing (in.)	Panel Orientation <sup>(a)</sup>	APA Rated Sheathing <sup>(c)</sup>	
		Minimum Thickness (in.)	Minimum Span Rating
16	Horizontal <sup>(b)</sup>	3/8	24/0
	Vertical	15/32 <sup>(d)</sup> , 1/2 <sup>(d)</sup>	32/16
24	Horizontal <sup>(b)</sup>	7/16	24/16
	Vertical	19/32 <sup>(d)</sup> , 5/8 <sup>(d)</sup>	40/20

(a) Strength axis (typically the long panel dimension) perpendicular to studs for horizontal application; or parallel to studs for vertical application.  
 (b) Blocking recommended between studs along horizontal panel joints.

(c) Recommendations apply to all-veneer plywood, oriented strand board (OSB) or composite (APA COM-PLY) panels except as noted.  
 (d) OSB or 5-ply/5-layer plywood.

FIGURE 16

**STUCCO OVER APA PANEL SHEATHING**



\*Check local building and applicator for specific requirements.

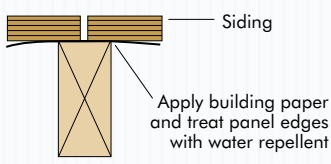
**Note:** Uniform Building Code requires two layers of grade D paper for stucco over wood-based sheathing.

FIGURE 17

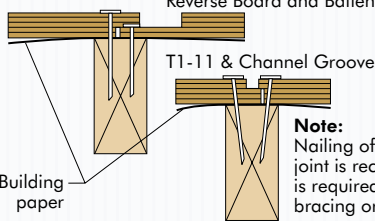
PANEL SIDING JOINT DETAILS

VERTICAL WALL JOINTS

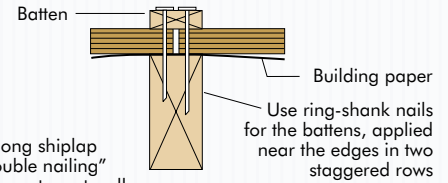
Butt



Shiplap

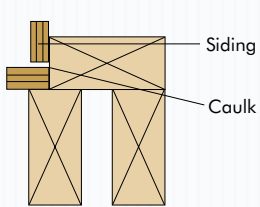


Vertical Batten

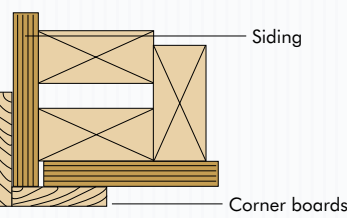


VERTICAL INSIDE & OUTSIDE CORNER JOINTS

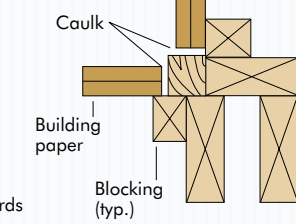
Butt & Caulk



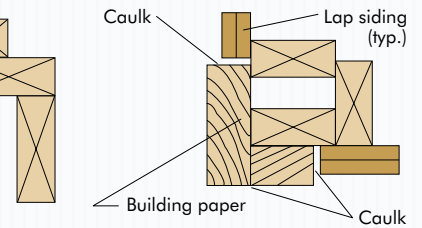
Corner Board Lap Joints



Lap siding (typ.)

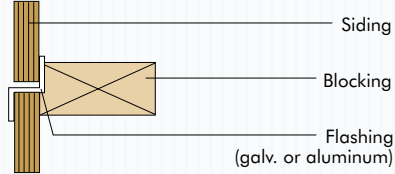


Lap Siding (APA Sturd-I-Wall)

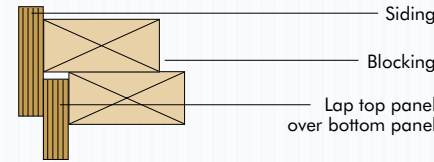


HORIZONTAL WALL JOINTS

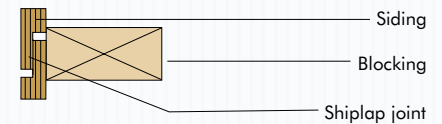
Butt & Flash



Lap



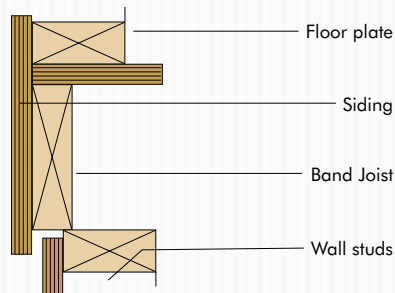
Shiplap



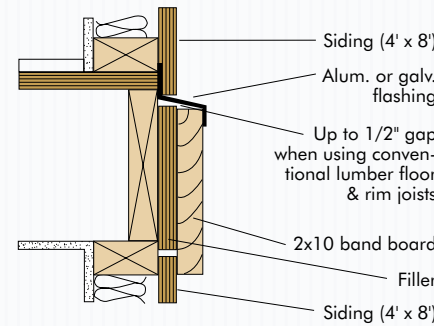
HORIZONTAL BELTLINE JOINTS

(For multistory buildings, when conventional lumber floor joists and rim boards are used, make provisions at horizontal joints for shrinkage of framing, especially when applying siding direct to studs.)

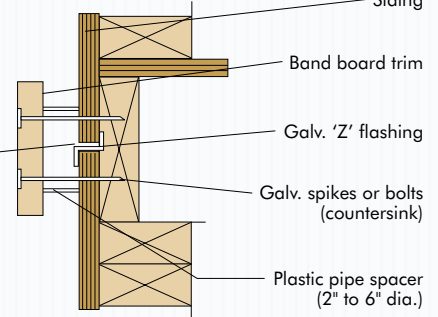
Jog Exterior Stud Line



Band Board Over Panel Filler



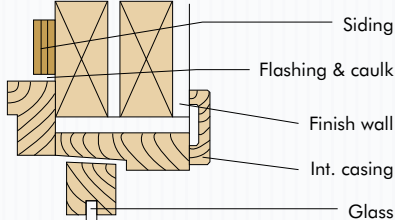
Band Board In Relief



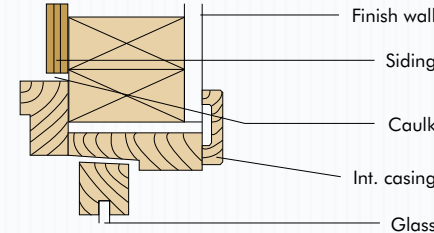
WOOD WINDOW DETAILS

(For metal window details, contact the American Architectural Manufacturers Association.)

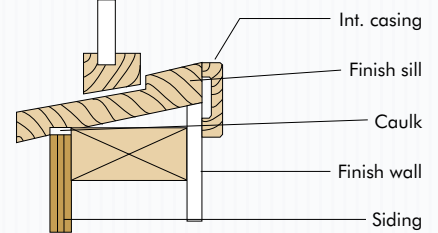
Head



Jamb



Sill



edge spacing. Nails through battens or other wood trim must penetrate at least one inch into studs. Nail panel siding 6 inches o.c. along edges and 12 inches o.c. at intermediate supports. To prevent staining of siding, use hot-dip galvanized, aluminum, or other nonstaining nails as described in Tables 16 and 17.

Siding is often fully exposed to weather and thus has increased susceptibility to elevated moisture conditions. Although siding will periodically experience moisture contents above the threshold value needed to support decay, wood-based siding products have a good history of performance because they dry down below this threshold value before decay can take hold. If trim is installed around siding, be sure that it doesn't trap moisture or reduce the drying ability of the wood. Trim that is applied incorrectly can lead to long-term moisture accumulation that causes decay.

Apply flashing or other means of protection over end grain of siding to minimize water absorption.

**APA Rated Siding Patterns and Grades**

APA RATED SIDING, including 303 plywood siding, is available in a wide variety of surface textures and patterns. For descriptions of siding surface patterns and thicknesses, refer to *APA Product Guide: APA Performance Rated Sidings*, Form E300. Actual dimensions of groove spacing, width and depth may vary with the manufacturer. Where the characteristics of a particular wood species are desired, specify by grade and species preference.

In order to help specifiers select the most appropriate siding appearance for any particular job, APA 303 plywood

TABLE 20

**APA 303 SIDING FACE GRADES<sup>(a)</sup>**

303 Series Plywood Siding Grades	Type of Patch	
	Wood	Synthetic
303-OC 303-OL 303-NR 303-SR	Not permitted	Not permitted
	Not applicable for overlays	
		Not permitted Permitted as natural-defect shape
303-6-W 303-6-S 303-6-S/W	Limit 6 Not permitted	Limit 6 – any combination
303-18-W 303-18-S 303-18-S/W	Limit 18 Not permitted	Limit 18 – any combination
303-30-W 303-30-S 303-30-S/W	Limit 30 Not permitted	Limit 30 – any combination

(a) All panels except 303-NR allow restricted minor repairs such as shims. These and such other face appearance characteristics as knots, knotholes, splits, etc., are limited by both size and number in accordance with panel grades, 303-OC being most restrictive and 303-30 being least. Multiple repairs are permitted only on 303-18 and 303-30 panels. Patch size is restricted on all panel grades.

sidings are also identified by a face grading system. There are four basic siding classifications within the system – Special Series 303, 303-6, 303-18 and 303-30. Each class, as shown in Table 20, is further divided into grades according to categories of repair and appearance characteristics.

**Finishing Plywood for Exterior Exposure**

**Care and Preparation**

Plywood should be stored and handled with care to avoid damaging before finishing. Storage in a cool, dry place out of sunlight and weather is best. If left outdoors, straps on bundles should be loosened or cut and the plywood covered. Allow good air circulation to prevent moisture condensation and possible mold growth.

**Edge Sealing**

Moisture enters the end grain of plywood or other wood-based products faster than through the surface. Consequently, edges and ends of APA RATED SIDING panels or lap siding should be sealed. Although edge sealers are not necessarily moisture-proof or permanently durable, they help to minimize sudden changes in moisture content in the siding, due to weather.

APA RATED SIDING may be edge sealed at the factory. If the siding is not factory-sealed, it can be sealed quickly at the job site while the panels or lap siding pieces are still in a stack. Edges or ends cut during construction should be resealed.

Siding to be finished with a semitransparent or solid-color stain can be edge sealed with a liberal application of a paintable, water-repellent sealer. If the

siding is to be painted, use the same paint primer that will be used on the surface. Horizontal edges, particularly lower drip edges of siding, should be given special care because of their greater wetting exposure.

### Finishing

APA RATED SIDING may be finished with a variety of products such as semitransparent stains, solid-color stains or paint systems. The recommended finishes depend on the type of siding product, and whether it has an overlaid surface.

Oil-based, semitransparent stains may be used on certain veneer-faced siding products as detailed in Table 21. Solid-color stains may be used on most APA RATED SIDING products and usually provide better protection. In general, however, best overall performance on APA RATED SIDING products can be achieved with an all-acrylic latex paint system.

For overlaid siding, any top-quality exterior house paint system formulated for wood performs satisfactorily. Solid-color stains may also be used on overlaid sidings, although some manufacturers recommend only acrylic latex formulations. For specific recommendations on finishing OSB siding products, consult the siding manufacturer.

Table 21 provides a summary of finishing recommendations for APA 303 Siding face grades. For complete information, write for *APA Product Guide: Performance Rated Sidings*, Form E300.

TABLE 21

APA 303 SIDING FINISHING RECOMMENDATIONS

303 Series Plywood Siding Grades	STAINS		PAINTS Minimum 1 primer plus 1 topcoat (acrylic latex)
	Semitransparent (oil)	Solid Color (oil or latex) <sup>(a)</sup>	
303-OC	(b)	(b)	(b)
303-OL	Not Recommended	(d)	(b)
303-NR	(b)	(e)	(e)
303-SR	(c)	(e)	(e)
303-6-W	(b)	(b)	(b)
303-6-S	(c)	(b)	(b)
303-6-S/W	(c)	(b)	(b)
303-18-W	(c)	(b)	(b)
303-18-S	(c)	(b)	(b)
303-18-S/W	(c)	(b)	(b)
303-30-W	(c)	(b)	(b)
303-30-S	(c)	(b)	(b)
303-30-S/W	(c)	(b)	(b)

(a) Except for overlaid panels, use a stain-resistant primer with light-colored latex stains, since the wood extractives may cause a discoloration of the finish.  
 (b) Recommended with provisions given in text.  
 (c) Should not be finished with semitransparent stain unless specifically recommended by the panel manufacturer.

(d) Some panel manufacturers recommend only acrylic latex formulations. Consult the manufacturer's recommendations.  
 (e) Only acrylic latex formulations are recommended when solid-color stains or paint systems are applied over open voids.

### Semitransparent Stains (oil-based only)

Oil-based semitransparent stains emphasize grain patterns, texture and natural characteristics in the wood. They may be used on plywood face grades 303-OC, 303-NR and 303-6-W. It is the only finish recommended for use over brushed plywood. Other 303 face grades should not be finished with semitransparent stains unless specifically recommended by the panel manufacturer.

### Solid-Color Stains (oil or all-acrylic latex)

An opaque or solid-color stain obscures color differences in the wood and between repairs and surrounding wood.

This is often a satisfactory finishing system, therefore, where semitransparent stains are unsuitable. Wood grain is also muted with solid-color stains but wood surface textures usually remain evident. When in question, the finish should be applied to a representative sample in order to demonstrate the finished appearance.

Solid-color stains are particularly recommended for grades 303-6-S and 303-6-S/W, as well as 303-18 and 303-30 with any type of patch.

**Paints (all-acrylic latex)**

Top-quality acrylic latex house paint systems are recommended for all APA Rated Sidings, except brushed plywood. If house paint is used on plywood siding, an all-acrylic latex paint system consisting of at least one stain-blocking prime coat and an all-acrylic latex topcoat is recommended. For extractive staining woods, some house paint systems utilize an oil-alkyd primer. Others use up to two coats of a stain-blocking acrylic latex primer. These latter systems help to reduce face-checking and generally offer superior performance. A paint finish tends to mask the textured plywood surface more than either semitransparent or solid-color stains. On the other hand, a top-quality acrylic latex paint system provides the most durable finish.

Grade 303-OL may be finished with any top-quality exterior paint system – primer and companion topcoat – formulated for wood.

**Field Application of Finish**

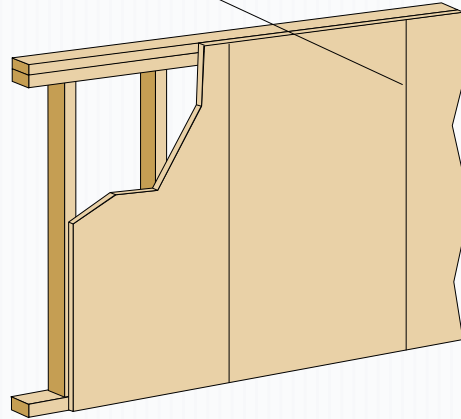
Proper surface preparation is important for good performance of finishes on any surface. Remove dirt and loose wood fibers with a stiff nonmetallic bristle brush. Mildew may be removed with a solution of 1/4 part household bleach to 3/4 part warm water. Be sure to rinse thoroughly after application of bleach.

Finishes should be applied as soon as possible after installation of the siding. Weathering of unprotected wood can cause surface damage in as little as two to four weeks. Apply finishes during favorable weather conditions. As a rule of thumb, finishes should not be applied

FIGURE 18

**PANELING NEW INTERIOR WALLS**

Leave 1/32" spacing at panel edges



**Note:**

If applied horizontally, block all unsupported edges.

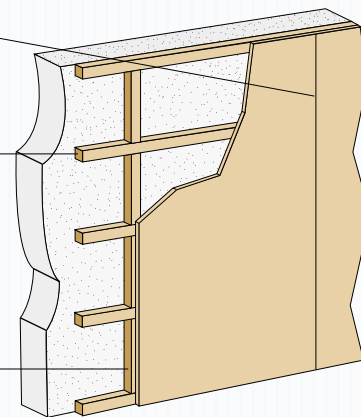
FIGURE 19

**PANELING EXISTING INTERIOR WALLS**

Leave 1/32" spacing at panel edges

Install 1x2 furring strips horizontal and/or vertical with nails into studs, expansion bolts, concrete nails, powder-actuated fasteners, or adhesive as necessary

Block all unsupported edges



when the outside air temperature is expected to drop below 50° F (10° C) within 24 hours for latex finishes, or 40° F (5° C) for oil-based finishes. However, recommendations of individual manufacturers may vary and should always be followed. Wood surfaces should be clean and dry, although extremely dry surfaces should be dampened slightly when applying latex finishes.

Use only top-quality finishes and application equipment. Finishes should be applied according to the spread rates recommended by the manufacturer. Textured surfaces may require up to twice as much finish as smooth surfaces. The first coat should be applied by brush. If spray equipment is used to apply the finish, then the finish should be either back-brushed or back-rolled while it is still wet. Subsequent coats of finish may be applied by any conventional means.

### Interior Paneling

APA RATED SIDING panels lend themselves to a number of decorative surface treatments for attractive interior paneling and accent walls. (See Figures 18 and 19.) Such treatments include saw-textured, brushed, embossed and grooved. Let APA panels acclimatize to room temperature and humidity conditions for several days prior to attachment to the wall. This can be accomplished by placing the panels on edge with space between each panel to allow air to circulate freely over both sides. Preservative treatment of furring or studs is recommended when they are attached to masonry or concrete exterior walls and to any uncured concrete wall. Also, in these instances, install a 4-mil polyethylene vapor retarder between the paneling and the furring or studs and insulate exterior walls. Support and nail spacing recommendations are given in Table 22. Recommendations apply to all species groups.

### Panel Backing

Wood structural panels are excellent backing for wall coverings such as rare hardwoods, vinyl surfaces and decorative fabrics. Panels less than 15/32 inch thick should be applied with strength axis perpendicular to studs and with 2x4 blocking at horizontal edges. Thicker plywood may be applied with strength axis parallel to studs. Plywood panels should have C-Plugged or better faces. Use 6d nails spaced 6 inches on center at panel edges and 12 inches on center at intermediate supports. A 1/16-inch space should be left between panels. Where moisture may be present, use nonstaining nails and either Exposure 1 or Exterior type panels. A 1/4-inch clearance is recommended at the bottom edge of the panels.

TABLE 22

#### INTERIOR PANELING

Panel Thickness (in.)	Maximum Support Spacing (in.)	Nail Size (Use casing or finishing nails)	Maximum Nail Spacing (in.)	
			Panel Edges	Intermediate Supports
1/4	16 <sup>(a)</sup>	4d	6	12
5/16	16 <sup>(b)</sup>	6d	6	12
1 1/32 - 1/2	24	6d	6	12
1 9/32 - 3/4	24	8d	6	12
Texture 1-11	24	8d	6	12

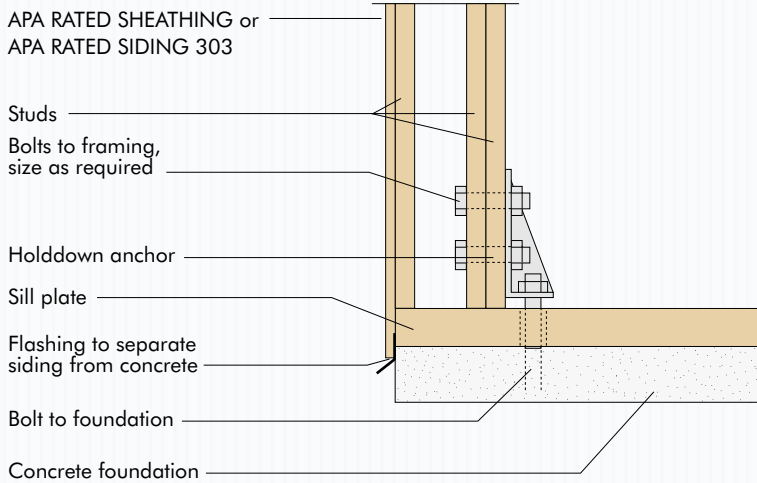
(a) Can be 20 inches if strength axis of paneling is across supports.

(b) Can be 24 inches if strength axis of paneling is across supports.

FIGURE 20

**SHEAR WALL FOUNDATION ANCHOR**

High shear wall overturning moments may be transferred by a fabricated steel bracket such as this. Regular foundation bolts may be all that is required in some cases.



**APA Panel Shear Walls**

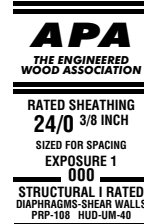
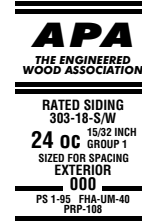
While all of the wall systems presented here will provide sufficient strength under normal conditions in residential and light-frame construction, shear walls may be desirable or required in areas of the country with frequent seismic activity or high wind loads. Shear walls, of course, are also integral to commercial and industrial construction.

Either APA RATED SHEATHING or all-veneer plywood APA RATED SIDING (and other APA RATED SIDING panels that qualify on a proprietary basis) can be used in shear wall design. The data presented here give maximum shears for

walls with APA RATED SHEATHING, with plywood APA RATED SIDING installed directly to studs (APA Sturd-I-Wall), and with panels applied over gypsum sheathing for walls required to be fire rated from the outside.

To design a shear wall, follow these steps.

1. Determine the unit shear transferred by the roof diaphragm to the wall. This generally will be one-fourth the area of the adjacent wall, multiplied by the wind load, divided by the length of the shear wall being designed (subtract length of large openings).



2. Determine the required panel grade and thickness, and nailing schedule from Table 23. Check anchor bolts in sill plate for shear.

3. Check wall framing on each end of shear wall and design foundation anchor if required (see Figure 20).

Design data for roof diaphragms are given on pages 59 and 60. For complete information on shear walls and diaphragms, write for *APA Design/Construction Guide: Diaphragms and Shear Walls*, Form L350.

TABLE 23

**RECOMMENDED SHEAR (POUNDS PER FOOT) FOR APA PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS-FIR, LARCH, OR SOUTHERN PINE<sup>(a)</sup> FOR WIND OR SEISMIC LOADING<sup>(b)</sup>**

Panel Grade	Minimum Nominal Panel Thickness (in.)	Minimum Nail Penetration in Framing (in.)	Panels Applied Direct to Framing				Panels Applied Over 1/2" or 5/8" Gypsum Sheathing					
			Nail Size (common or galvanized box)	Nail Spacing at Panel Edges (in.)				Nail Size (common or galvanized box)	Nail Spacing at Panel Edges (in.)			
				6	4	3	2 <sup>(e)</sup>		6	4	3	2 <sup>(e)</sup>
APA STRUCTURAL I grades	5/16	1-1/4	6d	200	300	390	510	8d	200	300	390	510
	3/8			230 <sup>(d)</sup>	360 <sup>(d)</sup>	460 <sup>(d)</sup>	610 <sup>(d)</sup>					
	7/16	1-3/8	8d	255 <sup>(d)</sup>	395 <sup>(d)</sup>	505 <sup>(d)</sup>	670 <sup>(d)</sup>	10d	280	430	550 <sup>(f)</sup>	730
	15/32			280	430	550	730					
	15/32	1-1/2	10d	340	510	665 <sup>(f)</sup>	870		—	—	—	—
APA RATED SHEATHING; APA RATED SIDING <sup>(g)</sup> and other APA grades except species Group 5	5/16 or 1/4 <sup>(c)</sup>			180	270	350	450		180	270	350	450
	3/8	1-1/4	6d	200	300	390	510	8d	200	300	390	510
	3/8			220 <sup>(d)</sup>	320 <sup>(d)</sup>	410 <sup>(d)</sup>	530 <sup>(d)</sup>					
	7/16	1-3/8	8d	240 <sup>(d)</sup>	350 <sup>(d)</sup>	450 <sup>(d)</sup>	585 <sup>(d)</sup>	10d	260	380	490 <sup>(f)</sup>	640
	15/32			260	380	490	640					
	15/32			310	460	600 <sup>(f)</sup>	770	—	—	—	—	—
APA RATED SIDING <sup>(g)</sup> and other APA grades except species Group 5			<b>Nail Size (galvanized casing)</b>					<b>Nail Size (galvanized casing)</b>				
	5/16 <sup>(c)</sup>	1-1/4	6d	140	210	275	360	8d	140	210	275	360
	3/8	1-3/8	8d	160	240	310	410	10d	160	240	310 <sup>(f)</sup>	410

(a) For framing of other species: (1) Find specific gravity for species of lumber in the AFPA National Design Specification. (2) For common or galvanized box nails, 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) All panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space nails maximum 6 inches o.c. along intermediate framing members for 3/8-inch and 7/16-inch panels installed on studs spaced 24 inches o.c. For other conditions and panel thicknesses, space nails maximum 12 inches o.c. on intermediate supports. Fasteners shall be located 3/8 inch from panel edges.

(c) 3/8-inch or APA RATED SIDING 16 oc is minimum recommended when applied direct to framing as exterior siding.

(d) Shears may be increased to values shown for 15/32-inch sheathing with same nailing provided (1) studs are spaced a maximum of 16 inches o.c., or (2) if panels are applied with strength axis across studs.

(e) Framing at adjoining panel edges shall be 3-inch nominal or wider, and nails shall be staggered where nails are spaced 2 inches o.c. Check local code for variations of these requirements.

(f) Framing at adjoining panel edges shall be 3-inch nominal or wider, and nails shall be staggered where 10d nails having penetration into framing of more than 1-1/2 inches are spaced 3 inches o.c. Check local code for variations of these requirements.

(g) Values apply to all-veneer plywood APA RATED SIDING panels only. Other APA RATED SIDING panels may also qualify on a proprietary basis. APA RATED SIDING 16 oc plywood may be 11/32 inch, 3/8 inch or thicker. Thickness at point of nailing on panel edges governs shear values.

**Typical Layout for Shear Walls**





### **APA Panel Systems Over Concrete Slabs**

A system of APA panels over sleepers embedded in mastic has been successfully installed over concrete slabs. Tongue-and-groove panels eliminate blocking between sleepers at panel edges and allow air circulation beneath the floor. Use only panels marked Exterior or Exposure 1. A vapor barrier is essential directly above or below the slab. Preservative treatment of the sleepers is recommended when the slab is on or below grade, although panels normally will not require treatment.

Tongue-and-groove plywood can be installed over polystyrene or polyurethane foam. The foam, bonded to both the plywood and concrete slab with mastic, provides high insulating value and resistance to termites, rot and fungus.

Exterior plywood at least 15/32 inch thick is recommended. A vapor barrier such as polyethylene is required either directly above or below the concrete slab.

### **Special Floor Surfacing**

Hardboard overlaid plywood (APA PLYRON®) is sometimes used as a finish floor, especially for industrial installation. (Check your local dealer for availability.) High Density Overlay (HDO) panels with a special heavy-duty screen-grid surface provide skid-resistant, long-wearing surfaces under foot traffic. And a number of liquid coatings – some suitable for balconies, porches, patio decks and other exterior applications – are also available.

## **ADDITIONAL INFORMATION**

### **About APA – The Engineered Wood Association and Engineered Wood Systems**

APA – The Engineered Wood Association is a nonprofit trade association whose member mills produce approximately 75 percent of the structural wood panel products manufactured in North America.

The Association's trademark appears only on products manufactured by member mills and is the manufacturer's assurance that the product conforms to the standard shown on the trademark. That standard may be an APA performance standard, the Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood or Voluntary Product Standard PS 2-92, Performance Standards for Wood-Based Structural-Use Panels. Panel quality of all APA trademarked products is subject to verification through APA audit.

APA's services go far beyond quality testing and inspection. Research and promotion programs play important roles in developing and improving plywood and other panel construction systems, and in helping users and specifiers to better understand and apply panel products.

Always insist on panels bearing the **mark of quality** – the APA trademark. Your APA panel purchase is not only your highest possible assurance of product quality, but an investment in the many trade services that APA provides on your behalf.

The APA EWS trademark appears only on engineered wood products manufactured by members of Engineered Wood Systems, a related corporation of APA. The mark signifies that the manufacturer is committed to a rigorous program of quality verification and testing and that products are manufactured in conformance with an APA or national standard such as ANSI Standard A190.1, American National Standard for Structural Glued Laminated Timber.

**For additional information** on wood construction systems, contact APA – The Engineered Wood Association, P.O. Box 11700, Tacoma, Washington 98411-0700, or the nearest APA regional field office listed on the back cover. Visit us on the World Wide Web at [www.apawood.org](http://www.apawood.org). For a list of additional APA and Engineered Wood Systems publications, request the: **APA Publications Index**, Form B300 **EWS Publications Index**, Form S400



## ENGINEERED WOOD CONSTRUCTION GUIDE

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

### APA – THE ENGINEERED WOOD ASSOCIATION HEADQUARTERS

7011 So. 19th St. ■ P.O. Box 11700  
Tacoma, Washington 98411-0700  
(253) 565-6600 ■ Fax: (253) 565-7265

Web Address:



[www.apawood.org](http://www.apawood.org)

### PRODUCT SUPPORT HELP DESK

(253) 620-7400  
E-mail Address: [help@apawood.org](mailto:help@apawood.org)

(Offices: Bournemouth, United Kingdom;  
Hamburg, Germany; Mexico City, Mexico;  
Tokyo, Japan.)

*The product use recommendations in this publication are based on APA – The Engineered Wood Association's continuing programs of laboratory testing, product research, and comprehensive field experience. However, because the Association 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. Because engineered wood product performance requirements vary geographically, consult your local architect, engineer or design professional to assure compliance with code, construction, and performance requirements.*

Form No. E30R/Revised January 2001/0800

