DESIGN/CONSTRUCTION GUIDE

# Wood Structural Panels Over Metal Framing

APA
THE ENGINEERED WOOD ASSOCIATION

# WOOD
# The Miracle Material

***Engineered wood structural panels are a good choice for the environment.*** They are manufactured for years of trouble-free, dependable use. Wood is a renewable, recyclable, biodegradable resource that is easily manufactured into a variety of viable products.

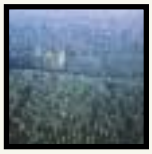
## A few facts about wood.

▪ ***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 right choice for the environment.

APA
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RATED SHEATHING
32/16 15/32 INCH
SIZED FOR SPACING
EXPOSURE 1
000
PS 1-95 C-D PRP-108

***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.*

## PANELS APPLIED TO METAL FRAMING OR DECKING

In roof, floor, and wall applications, wood structural panels are often applied directly to metal framing or decking. Wood structural panels have several features that make them an efficient, strong, and durable building material:

- It's easy to fasten wood panels to metal framing.
- Wood structural panels are easy to cut and install. This reduces time and cost in initial construction, simplifies interior finish and mechanical work, and permits modification of the structure later if desired.
- Wood structural panels work well with most metal framing layouts and are readily available.
- Wood structural panels lend themselves to panelized and prefabricated construction, further reducing on-site labor costs.
- Wood structural panels have high shear values for diaphragm roofs and floors, and for shear walls or bracing.
- Wood structural panels add to the thermal insulation of the assembly, virtually eliminating the vapor condensation problems associated with uninsulated metal and concrete roofs, walls and floor surfaces.
- Compared to concrete decks, wood structural panels save time, weight, and mess. Weight savings alone can save substantially on framing costs.

A variety of APA wood structural panels, including plywood and oriented strand board (OSB) can be applied over metal framing. For the applications described here, APA Rated Sheathing or APA Rated Sturd-I-Floor meet the requirements for structural sheathing and flooring. These APA panels are *performance rated*. APA Performance Rated Panels are manufactured to conform to performance-based standards which provide product performance baselines, such as load-carrying capacity, for designated end uses.

This brochure describes typical assemblies for wood structural panels attached to metal framing in floor, wall, and roof construction.

CONTENTS

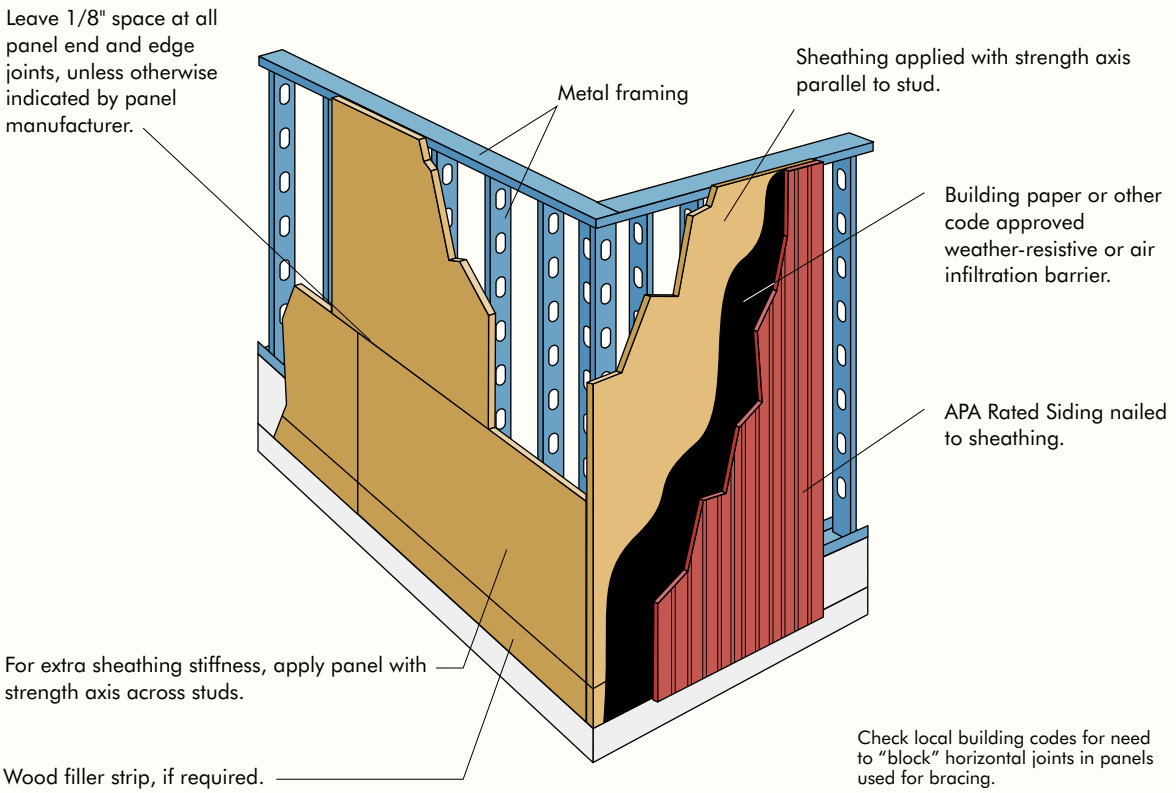
## WOOD STRUCTURAL PANEL WALL SHEATHING

APA Rated Sheathing easily meets building code requirements for bending and racking strength without diagonal straps. Building paper is not required over wall sheathing, except under stucco, and under brick veneer where required by local building code. Rated Sheathing provides an excellent nail base for exterior siding. For information on installing exterior panel siding over nailable sheathing, refer to the *Engineered Wood Construction Guide*, Form E30.

FIGURE 1

**WOOD STRUCTURAL PANEL**

(Note: Use pneumatically driven pins, self-drilling, self-tapping screws, or screw-shank nails spaced 6" o.c. along panel edges over framing and 12" o.c. along intermediate studs.)




APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING
24/0 7/16 INCH
SIZED FOR SPACING
EXPOSURE 1
000
PRP-108 HUD-UM-40

APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING
32/16 15/32 INCH
SIZED FOR SPACING
EXPOSURE 1
000
PS 1-95 C-D
PRP-108

TABLE 1

**WOOD STRUCTURAL PANEL SHEATHING[a][c] – PANEL CONTINUOUS OVER 2 OR MORE SPANS**

| Panel Span Rating | Maximum Stud Spacing (inches) | Maximum Fastener Spacing (inches)[b] | |
|---|---|---|---|
| | | Panel Edges (when over framing) | Intermediate (each stud) |
| 12/0, 16/0, 20/0 or Wall-16 oc | 16 | 6 | 12 |
| 24/0, 24/16, 32/16 or Wall-24 oc | 24 | 6 | 12 |

(a) When wood structural panel is used, diagonal wall bracing is not required.
(b) Use fastener recommended by metal-framing manufacturer.
(c) See requirements for nailable panel sheathing when exterior covering is to be nailed to sheathing.

## FLOOR AND ROOF CONSTRUCTION

In roof construction, wood structural panels are used over metal framing as a nail base for the finish roofing. On floors, the panels are typically used as a finish floor, or as an underlayment for the flooring.

In floor construction, if a separate underlayment will be installed, the panel subfloor may be square-edged. For single-floor construction, use APA Rated Sturd-I-Floor 16, 20, 24, 32, or 48 oc with tongue-and-grooved edges. The panels can be manually or machine fastened directly to the metal framing either with hardened screw-shank nails, pneumatically driven pins, or with self-drilling, self-tapping screws.

Formed metal joists are available in a "C" or box section from 14- to 19-gauge sheet steel. Joist sizes usually vary from 1-3/4 inches x 7-1/4 inches to 2 inches x 11-3/8 inches, and can be spaced up to 48 inches o.c. Wood structural panels may also be used over heavier steel bar joists, as shown at right.

FIGURE 2

**APA RATED SHEATHING OVER JOISTS**

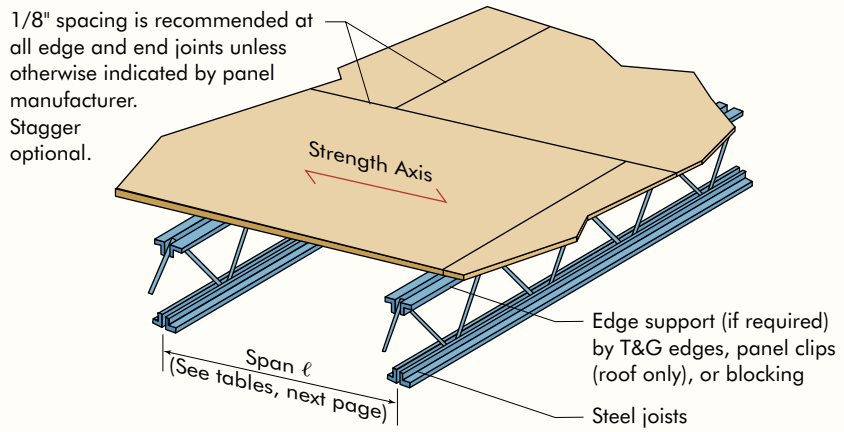
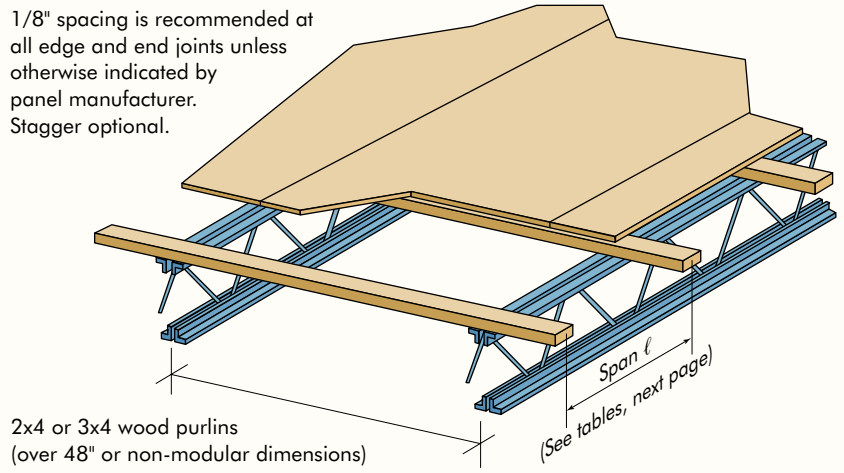



FIGURE 3

**WOOD STRUCTURAL PANELS OVER PURLINS**




APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING
24/16 7/16 INCH
SIZED FOR SPACING
EXPOSURE 1
000
PRP-108 HUD-UM-40

APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING
32/16 15/16 INCH
SIZED FOR SPACING
EXPOSURE 1
000
PS 1-95 C-D PRP-108

APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING
48/24 23/32 INCH
SIZED FOR SPACING
EXTERIOR
000
PS 1-95 C-C PRP-108

TABLE 2

**RECOMMENDED UNIFORM FLOOR LIVE LOADS FOR APA RATED STURD-I-FLOOR AND APA RATED SHEATHING WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS**

| Sturd-I-Floor Span Rating | Sheathing Span Rating | Maximum Span (in.) | Allowable Live Loads (psf)[a] Joist Spacing (in.) 12 | 16 | 20 | 24 | 32 | 40 | 48 |
|---|---|---|---|---|---|---|---|---|---|
| 16 oc | 24/16, 32/16 | 16 | 185 | 100 | | | | | |
| 20 oc | 40/20 | 20 | 270 | 150 | 100 | | | | |
| 24 oc | 48/24 | 24 | 430 | 240 | 160 | 100 | | | |
| 32 oc | 60/32 | 32 | | 430 | 295 | 185 | 100 | | |
| 48 oc | | 48 | | | 460 | 290 | 160 | 100 | 55 |

(a) 10 psf dead load assumed. Live load deflection limit is l/360.

TABLE 3

**APA PANEL SUBFLOORING (APA RATED SHEATHING)[a]**

| Panel Span Rating | Minimum Panel Thickness (in.) | Maximum Span (in.) | Maximum Fastener Spacing (in.)[b] Supported Panel Edges | Intermediate Supports |
|---|---|---|---|---|
| 24/16 | 7/16 | 16 | 6 | 12 |
| 32/16 | 15/32 | 16 | 6 | 12 |
| 40/20 | 19/32 | 20[c] | 6 | 12 |
| 48/24 | 23/32 | 24 | 6 | 12 |
| 60/32 | 7/8 | 32 | 6 | 12 |

(a) For subfloor recommendations under ceramic tile, refer to the APA *Engineered Wood Construction Guide*. For subfloor recommendations under gypsum concrete, contact manufacturer of floor topping.

(b) Use fastener recommended by metal-framing manufacturer.

(c) Span may be 24 inches if a minimum 1-1/2 inches of lightweight concrete is applied over panels.

TABLE 4

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

| Panel Span Rating | Minimum Panel Thickness (in.) | Maximum Span (in.) | | Allowable Live Loads (psf)[d] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | With Edge | Without Edge | Spacing of Supports Center-to-Center (in.) | | | | | | | |
| | | Support[a] | Support | 12 | 16 | 20 | 24 | 32 | 40 | 48 | 60 |
| **APA Rated Sheathing[c]** | | | | | | | | | | | |
| 12/0 | 5/16 | 12 | 12 | 30 | | | | | | | |
| 16/0 | 5/16 | 16 | 16 | 70 | 30 | | | | | | |
| 20/0 | 5/16 | 20 | 20 | 120 | 50 | 30 | | | | | |
| 24/0 | 3/8 | 24 | 20[b] | 190 | 100 | 60 | 30 | | | | |
| 24/16 | 7/16 | 24 | 24 | 190 | 100 | 65 | 40 | | | | |
| 32/16 | 15/32 | 32 | 28 | 325 | 180 | 120 | 70 | 30 | | | |
| 40/20 | 19/32 | 40 | 32 | — | 305 | 205 | 130 | 60 | 30 | | |
| 48/24 | 23/32 | 48 | 36 | — | — | 280 | 175 | 95 | 45 | 35 | |
| 60/32 | 7/8 | 60 | 40 | — | — | — | 305 | 165 | 100 | 70 | 35 |
| **APA Sturd-I-Floor[f]** | | | | | | | | | | | |
| 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 | 25 | |
| 32 oc | 7/8 | 48 | 40 | — | — | 295 | 185 | 100 | 60 | 40 | |
| 48 oc | 1-3/32 | 60 | 48 | — | — | — | 290 | 160 | 100 | 65 | 40 |

(a) Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking, or other. For low slope roofs, see Table 5.

(b) 20 inches for 3/8-inch, and 7/16-inch panels. 24 inches for 15/32-inch and 1/2-inch panels.

(c) Includes APA Rated Sheathing/Ceiling Deck.

(d) 10 psf dead load assumed.

(e) Applies to panels 24 inches or wider applied over two or more spans.

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

## Fastener Schedules

When attaching wood structural panels to metal decking, the main purpose of the fasteners is to keep the panels flat. The fastener schedule should be at least the same as if the panel was applied to framing that is spaced in accordance with the panel's Span Rating. For example, a 32/16 span rated sheathing panel should have fasteners spaced at 6 inches on center along the 4-foot ends, and at no more than 32 inches on center by 12 inches on center across the width of the panel (28 fasteners per panel). If wind uplift is a consideration, additional fasteners may be required.

TABLE 5

**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 Nominal Panel Thickness (in.) | 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.*

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

TABLE 6

**RECOMMENDED MINIMUM FASTENING SCHEDULE FOR APA PANEL ROOF SHEATHING (Increased fastener schedules may be required in high wind or seismic zones.)**

| Panel Thickness[b] (in.) | Fasteners[c] Maximum Spacing (in.) | |
|---|---|---|
| | Panel Edges | Intermediate |
| 5/16-1 | 6 | 12[a] |
| 1-1/8 | 6 | 12[a] |

(a) For spans 48 inches or greater, space fasteners 6 inches at all supports.

(b) For stapling asphalt shingles to 5/16-inch 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.

(c) Use fastener recommended by metal-framing manufacturer.

## FASTENERS

### Self-drilling, Self-tapping Screws

Contractors report self-drilling, self-tapping fasteners cut installation time by about 60 percent compared with conventional screws. These fasteners commonly are used to attach panels up to 1-1/8 inch thick to steel flanges up to 3/16 inch thick. However, since shank threads usually are provided on only a portion of self-drilling, self-tapping type fasteners (and screw-shank nails), it's important to specify the appropriate fastener length for a given panel thickness so that the threaded portion of the shank engages the steel framing. Several lengths and styles are available. Details may be obtained from fastener manufacturers.

### Pneumatically-driven Steel Pins

Details and code approvals may be obtained from pin manufacturers.

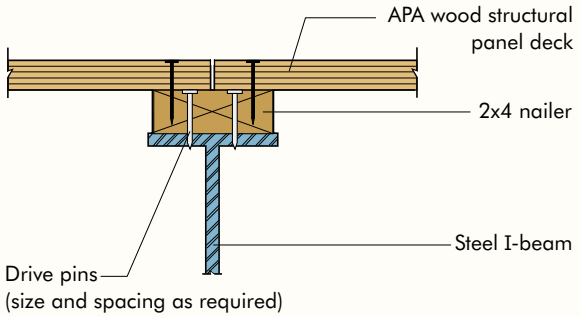
### Screw-shank Nails

Screw-shank nails can be used to fasten wood structural panels to lighter members, such as formed-steel joists. The nail must be long enough to assure proper attachment to the steel framing.

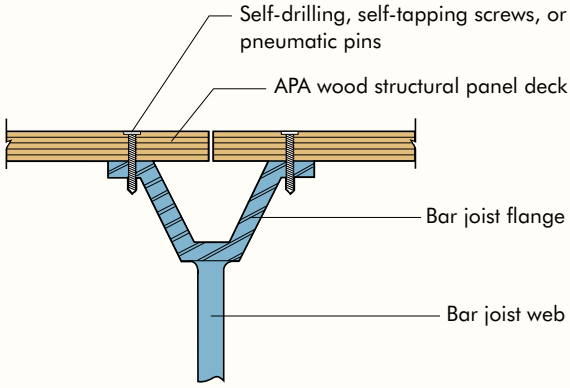
FIGURE 4

**FASTENER RECOMMENDATIONS**

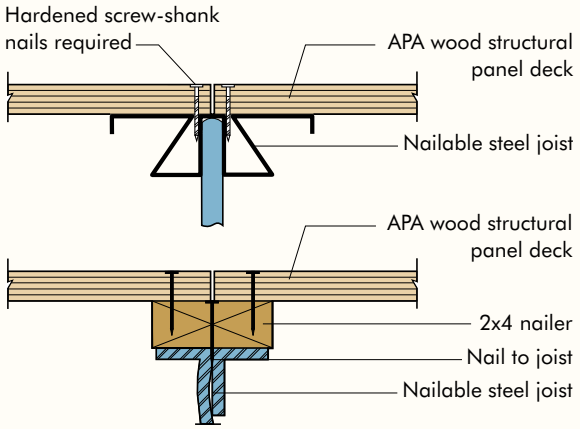
**Nailer Anchored with Power Driven Fasteners**



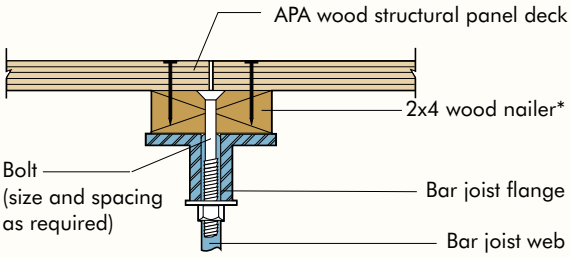

**Panel Attached Directly with Screws**




**Panel Nailed to Nailable Steel Joists**

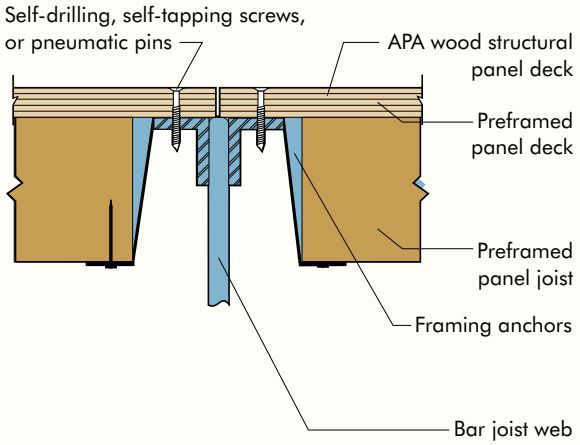



**Nailer Bolted to Steel Joist**

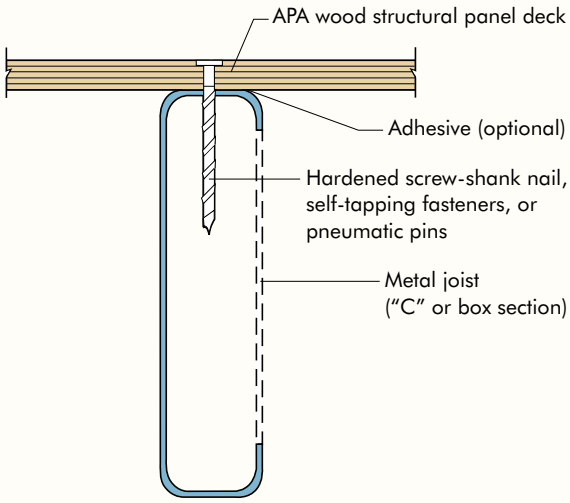



*Nailers installed across joists are suggested where non-modular spacings are used.

**Preframed Panels Attached to Widely Spaced Joists**




**Panel Attached Directly to Formed Steel Joist**



## ABOUT APA

*APA – The Engineered Wood Association* (APA) is a nonprofit trade association whose member mills produce a majority of the structural wood panel products manufactured in North America.

Founded in 1933 as the Douglas Fir Plywood Association and widely recognized today as the foremost authority in the structural wood panel industry, APA performs numerous functions and services on behalf of panel product users, specifiers, dealers, distributors, schools and universities and other key groups.

Among the most important of these functions is quality inspection and testing. APA trademarks appear only on products manufactured by APA member mills and signify that panel quality is subject to verification through APA audit – a procedure designed to assure manufacture in conformance with APA performance standards or *Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood* or *Voluntary Product Standard PS 2-92, Performance Standard for Wood-Based Structural-Use Panels*. APA maintains four quality testing laboratories in key producing regions and a 37,000-square-foot research center at Association headquarters in Tacoma, Washington.

But quality validation is only one of APA's many functions. The Association also:

- Operates the most sophisticated program for basic panel research in the world.
- Maintains a network of field representatives to assist panel product users, specifiers, dealers, distributors and other segments of the trade.
- Conducts informational buyer and specifier seminars and provides dealer and distributor sales training.
- Publishes a large inventory of publications on panel grades, applications, design criteria and scores of other topics. Many of these publications are available on the APA web site.
- Advertises and publicizes panel product systems and applications in national trade and consumer magazines.
- Works to secure acceptance of wood structural panel products and applications by code officials, insuring agencies and lending institutions.
- Develops and maintains performance and industry product standards.
- Conducts in-depth market research and development programs to identify and penetrate new panel markets in the U.S. and abroad.
- Works in conjunction with other wood product industry organizations on solutions to problems of common concern.

Always insist on panels bearing the **mark of quality –** the APA trademark. Your APA panel purchase or specification is your highest assurance of quality. It is also an investment in the many trade services and programs that APA undertakes on your behalf.

### For More Information

For additional information on APA wood construction systems, contact *APA – The Engineered Wood Association*, 7011 So. 19th Street, Tacoma, Washington 98466, or call the APA Product Support Help Desk at (253) 620-7400. Visit us on the World Wide Web at www.apawood.org. For a list of additional APA publications, request the *APA Publications Index*, Form B300.

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 APA engineered wood products, contact us:

**APA – THE ENGINEERED WOOD ASSOCIATION HEADQUARTERS**
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Tacoma, Washington 98466
(253) 565-6600 ▪ Fax: (253) 565-7265

Web Address:
www.apawood.org

**PRODUCT SUPPORT HELP DESK**
(253) 620-7400
E-mail Address: help@apawood.org

*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.*

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