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.

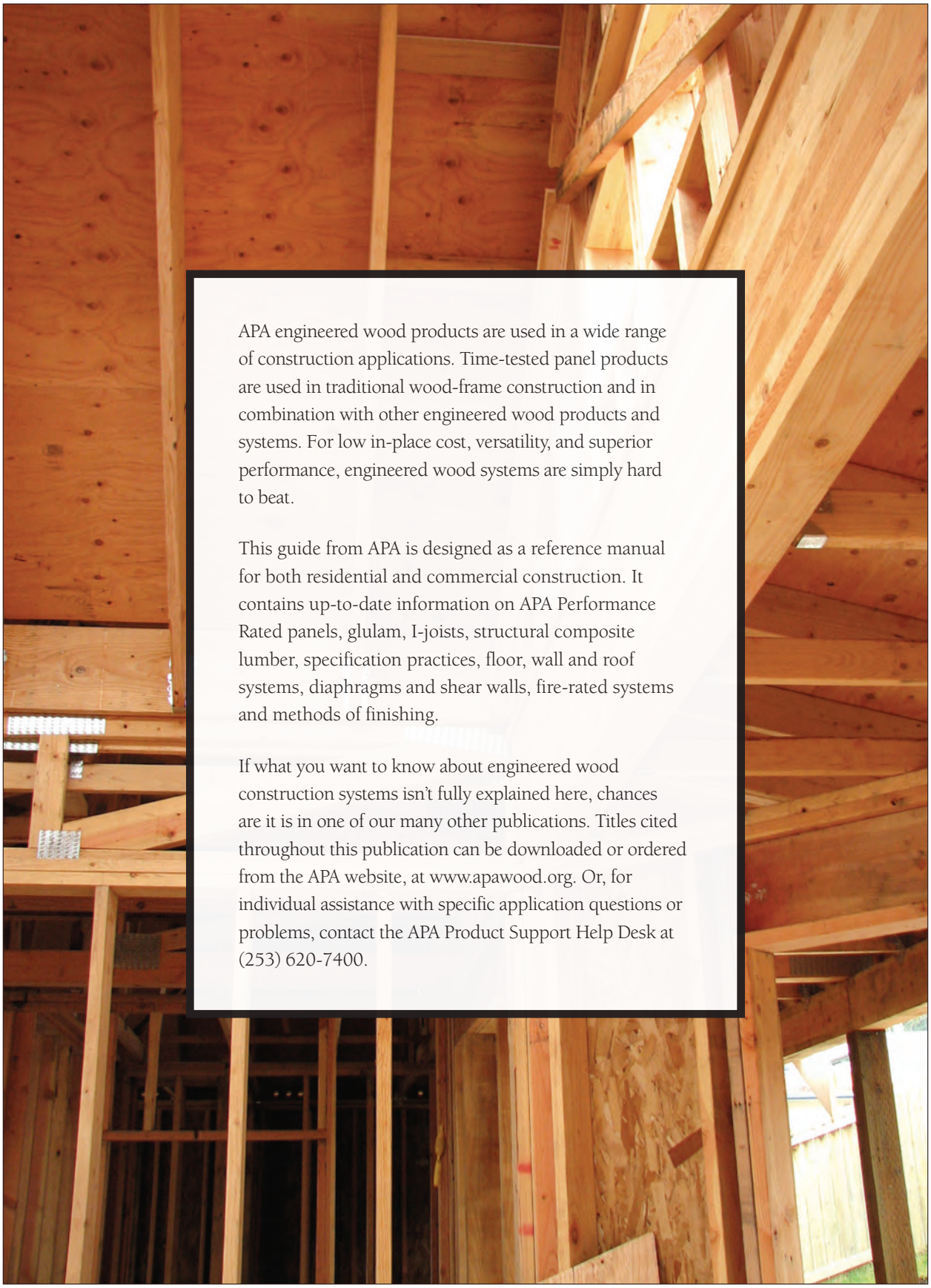
▪ ***Manufacturing wood is energy efficient.*** Wood products made up 47 percent of all industrial raw materials manufactured in the United States, yet consumed only 4 percent of the energy needed to manufacture all industrial raw materials, according to a 1987 study.

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.

I-JOIST SELECTION AND SPECIFICATION

I-joists are "I"-shaped engineered wood structural members designed for use in residential and nonresidential construction. The product is prefabricated using sawn or structural composite lumber flanges and OSB webs, bonded together with exterior type adhesives. To simplify the specification and use of I-joists, APA introduced the APA Performance Rated I-Joist (PRI). The joist is limited to a L/480 live load maximum deflection (where L = span) for glued-nailed residential floor applications, a criteria which provides superior floor performance.

TABLE 8

ALLOWABLE SPANS FOR *APA EWS* PERFORMANCE RATED I-JOISTS – SIMPLE SPAN ONLY

Depth	Joist Designation	Simple Span On Center Spacing 12"	16"	19.2"	24"
9-1/2"	PRI-20	16'-7"	15'-2"	14'-4"	13'-5"
	PRI-30	17'-1"	15'-8"	14'-10"	13'-10"
	PRI-40	18'-0"	16'-5"	15'-6"	14'-6"
	PRI-50	17'-10"	16'-4"	15'-5"	14'-5"
	PRI-60	18'-11"	17'-4"	16'-4"	15'-3"
11-7/8"	PRI-20	19'-10"	18'-2"	17'-2"	16'-0"
	PRI-30	20'-6"	18'-9"	17'-8"	16'-6"
	PRI-40	21'-5"	19'-7"	18'-6"	16'-8"
	PRI-50	21'-4"	19'-6"	18'-5"	17'-2"
	PRI-60	22'-7"	20'-8"	19'-6"	18'-2"
	PRI-70	23'-0"	21'-0"	19'-10"	18'-6"
	PRI-80	24'-11"	22'-8"	21'-4"	19'-10"
	PRI-90	25'-8"	23'-4"	22'-0"	20'-5"
14"	PRI-40	24'-4"	22'-3"	20'-6"	18'-4"
	PRI-50	24'-4"	22'-2"	21'-0"	19'-7"
	PRI-60	25'-9"	23'-6"	22'-2"	20'-8"
	PRI-70	26'-1"	23'-10"	22'-6"	20'-11"
	PRI-80	28'-3"	25'-9"	24'-3"	22'-7"
	PRI-90	29'-1"	26'-5"	24'-11"	23'-2"
16"	PRI-40	26'-11"	24'-3"	22'-1"	19'-9"
	PRI-50	27'-0"	24'-8"	23'-4"	20'-2"
	PRI-60	28'-6"	26'-0"	24'-7"	22'-10"
	PRI-70	29'-0"	26'-5"	24'-11"	23'-1"
	PRI-80	31'-4"	28'-6"	26'-10"	25'-0"
	PRI-90	32'-2"	29'-3"	27'-7"	25'-7"

Notes:

1. Allowable **clear** span applicable to simple-span residential floor construction with a design dead load of 10 psf and live load of 40 psf. The live load deflection is limited to span/480.
2. Spans are based on a composite floor with glued-nailed sheathing meeting the requirements for APA Rated Sheathing or APA Rated STURD-I-FLOOR conforming to PRP-108, PS 1, or PS 2 with a minimum Performance Category of 19/32 (40/20 or 20 oc) for a joist spacing of 19.2 inches or less, or 23/32 (48/24 or 24 oc) for a joist spacing of 24 inches. Adhesive shall meet ASTM D3498 or APA Specification AFG-01. Spans shall be reduced 1 foot when the floor sheathing is nailed only.
3. Minimum bearing length shall be 1-3/4 inches for the end bearings.
4. Bearing stiffeners are **not** required when I-joists are used with the spans and spacings given in this table, except as required for hangers.
5. This span chart is based on uniform loads. For applications with other than uniformly distributed loads, an engineering analysis may be required based on the use of the design properties in Table 7 of *APA Performance Rated I-Joists,* Form Z725.

APA Performance Rated I-Joists are identified by their net depth followed by a designation, such as PRI-30, which relates to the joist strength and stiffness. APA PRIs are available in four depths: 9-1/2, 11-7/8, 14, and 16 inches.

Most manufacturers supply I-joists to distributors and dealers in lengths up to 60 feet. These are then cut to frequently used lengths such as 16 to 36 feet. Check local supplier for availability.

APA PRI-400

APA PRIs are manufactured in accordance with *PRI-400, Performance Standard for APA EWS I-Joists,* Form X720. This Performance Standard provides an easy-to-use table of allowable spans for applications in residential floor construction, allowing designers and builders to select and use I-joists from various member manufacturers using just one set of span tables. APA PRIs are recognized through ICC-ES ESR-1405.

Residential Floor Spans

Some APA PRIs include in their trademarks allowable spans for uniformly loaded residential floor construction at various I-joist spacings. The specific I-joist needed is easily determined by selecting the span and then choosing the I-joist that meets the span, spacing, and loading criteria. See Tables 8 and 9.

For more information on selecting APA I-joists, and for design tables, refer to *APA Performance Rated I-Joists,* Form Z725.

TABLE 9

ALLOWABLE SPANS FOR *APA EWS* PERFORMANCE RATED I-JOISTS – MULTIPLE SPAN ONLY

Depth	Joist Designation	Multiple Span On Center Spacing 12"	16"	19.2"	24"
9-1/2"	PRI-20	18'-1"	16'-6"	15'-7"	13'-5"
	PRI-30	18'-7"	17'-0"	16'-1"	15'-0"
	PRI-40	19'-7"	17'-11"	16'-4"	14'-7"
	PRI-50	19'-5"	17'-9"	16'-9"	15'-7"
	PRI-60	20'-8"	18'-10"	17'-9"	16'-6"
11-7/8"	PRI-20	21'-8"	19'-7"	16'-9"	13'-5"
	PRI-30	22'-4"	20'-5"	18'-10"	15'-0"
	PRI-40	23'-5"	20'-5"	18'-7"	16'-7"
	PRI-50	23'-3"	21'-2"	20'-0"	16'-1"
	PRI-60	24'-8"	22'-6"	21'-2"	19'-7"
	PRI-70	25'-1"	22'-10"	21'-7"	18'-6"
	PRI-80	27'-1"	24'-8"	23'-3"	21'-7"
	PRI-90	27'-11"	25'-5"	23'-11"	22'-2"
14"	PRI-40	25'-11"	22'-5"	20'-5"	18'-3"
	PRI-50	26'-6"	24'-2"	20'-2"	16'-1"
	PRI-60	28'-0"	25'-7"	24'-1"	19'-9"
	PRI-70	28'-5"	25'-11"	23'-2"	18'-6"
	PRI-80	30'-10"	28'-0"	26'-5"	23'-11"
	PRI-90	31'-8"	28'-10"	27'-1"	25'-2"
16"	PRI-40	27'-11"	24'-2"	22'-0"	19'-8"
	PRI-50	29'-6"	24'-3"	20'-2"	16'-1"
	PRI-60	31'-1"	28'-4"	24'-9"	19'-9"
	PRI-70	31'-7"	27'-10"	23'-2"	18'-6"
	PRI-80	34'-2"	31'-1"	29'-3"	23'-11"
	PRI-90	35'-1"	31'-10"	30'-0"	26'-7"

Notes:

1. Allowable **clear** span applicable to multiple-span residential floor construction with a design dead load of 10 psf and live load of 40 psf. The end spans shall be 40 percent or more of the adjacent span. The live load deflection is limited to span/480.
2. Spans are based on a composite floor with glued-nailed sheathing meeting the requirements for APA Rated Sheathing or APA Rated STURD-I-FLOOR conforming to PRP-108, PS 1, or PS 2 with a minimum Performance Category of 19/32 (40/20 or 20 oc) for a joist spacing of 19.2 inches or less, or 23/32 (48/24 or 24 oc) for a joist spacing of 24 inches. Adhesive shall meet ASTM D3498 or APA Specification AFG-01. Spans shall be reduced 1 foot when the floor sheathing is nailed only.
3. Minimum bearing length shall be 1-3/4 inches for the end bearings, and 3-1/2 inches for the intermediate bearings.
4. Bearing stiffeners are **not** required when I-joists are used with the spans and spacings given in this table, except as required for hangers.
5. This span chart is based on uniform loads. For applications with other than uniformly distributed loads, an engineering analysis may be required based on the use of the design properties in Table 7 of *APA Performance Rated I-Joists,* Form Z725.

I-Joist Storage and Handling

Store, stack and handle I-joists with the webs vertical, and try to keep joists level. Do not store I-joists in direct contact with the ground. Maintain at least 12 inches between the ground and the I-joists. Protect I-joists from weather, and use stickers to separate the bundles. If I-joists are delivered wrapped, do not open bundles until time of installation.

When handling I-joists with a crane on the job site ("picking"), take a few simple precautions to prevent damage to the joists and injury to the work crew: pick I-joists in bundles as shipped by the supplier; orient the bundles so that the webs of the I-joists are vertical; and pick the bundles using a spreader bar if necessary. Do not twist or apply loads to the I-joists when they are horizontal. Never use or try to repair a damaged I-joist.

I-joists are not stable until completely installed, and will not carry any load until fully braced and sheathed. Do not allow workers to walk on joists until the joists are fully installed and braced. To avoid accidents, brace and nail each I-joist as it is installed, using hangers, blocking panels, Rim Board, and/or cross-bridging at joist ends and over each support. For additional storage and handling recommendations, refer to *APA Builder Tip: Storage, Handling and Safety Recommendations for APA Performance Rated I-Joists,* Form Z735.

APA PERFORMANCE RATED I-JOIST SPECIFICATION GUIDE

The following is a guide for specifying APA Performance Rated I-Joists (PRI) to be used in residential floor applications. These structural products are available in net depths of 9-1/2 inches, 11-7/8 inches, 14 inches, and 16 inches, and can be used for simple- or multiple-span floor construction. Exterior use, or use of wood I-joists in other than protected dry conditions, is not recommended.

A. General

1. APA PRIs shall be furnished and installed as shown by the approved building plans and installation instructions.

2. The designation of APA PRI shall be based on the applicable loading, joist spacing and spans shown in the plans. PRIs may be selected using Tables 8 and 9. For non-uniform loading conditions requiring an engineering analysis, see Table 7 of *APA Performance Rated I-Joists,* Form Z725 for PRI joist design properties.

The specification for I-joists required for a specific floor application shall include joist depth, designation, length, and number of pieces required.

Example: 21 pieces – APA 9-1/2" PRI-30 x 30 feet long

3. All accessory products such as I-joist blocking panels, rim boards, squash blocks, web stiffeners, etc., shall be provided and installed in accordance with the applicable installation details shown in *APA Performance Rated I-Joists,* Form Z725.

4. *APA EWS* trademarked glued-laminated timber (glulam) or approved structural composite lumber (SCL) shall be furnished for load-bearing joist headers. The depth of these components shall be specified to match the I-joist depth when flush framing is required.

5. The contractor shall use approved connection hardware (joist hangers) as specified in the plans. Such hardware shall be compatible with the width and depth of APA PRIs furnished, to provide flush nailing surfaces at adjoining members and to prevent rotation.

B. Manufacture

1. Materials, Manufacture, and Quality Assurance. Product quality shall conform to the manufacturer's approved quality control manual, with compliance assurance services provided by APA in accordance with building code requirements and the applicable code evaluation report.

2. Trademarks. I-joists shall be marked with the APA EWS trademark indicating conformance with the manufacturing, quality assurance, and marking provisions of *APA EWS Standard PRI-400, Performance Standard for APA EWS I-Joists,* Form X720, or the applicable manufacturer's code evaluation report.

3. Job Site Shipment. I-joists shall be protected from direct exposure to weather prior to installation.

ADDITIONAL INFORMATION

About APA – The Engineered Wood Association

APA – The Engineered Wood Association is a nonprofit trade association of and for structural wood panel, glulam timber, wood I-joist, structural composite lumber, and other engineered wood product manufacturers. Based in Tacoma, Washington, APA represents approximately 150 mills throughout North America, ranging from small, independently owned and operated companies to large integrated corporations.

Always insist on engineered wood products bearing the **mark of quality** – the *APA* or *APA EWS* trademark. Your APA engineered wood 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 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.

For panels, that standard may be the Voluntary Product Standard PS 1-09 for Structural Plywood, Voluntary Product Standard PS 2-10, Performance Standards for Wood-Based Structural-Use Panels or APA PRP-108 Performance Standards and Qualification Policy for Structural-Use Panels. Panel quality of all APA trademarked products is subject to verification through APA audit.

The *APA* or *APA EWS* trademark appears only on engineered wood products manufactured by members 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/AITC A190.1, Standard for Structural Glued Laminated Timber; ANSI/APA PRP 210, Standard for Performance-Rated Engineered Wood Panel Siding; APA PRI-400, Performance Standard for *APA EWS* I-Joists; ANSI/APA PRR 410, Standard for Performance-Rated Engineered Wood Rim Boards; or with a manufacturer's building code evaluation report or APA Product Report (www.apawood.org/ProductReports).

APA's services go far beyond quality testing and inspection. Research and promotion programs play important roles in developing and improving construction systems using wood structural panels, glulam, I-joists, and structural composite lumber, and in helping users and specifiers to better understand and apply engineered wood products. For more information, please see the back cover.

Engineered Wood Construction Guide

APA offers a comprehensive set of services and tools for design and construction professionals specifying and using engineered wood products and building systems. If you're looking for detailed product information, training material, or technical assistance, APA can help.

www.apawood.org, APA's website, is your link to in-depth design and building support, including a library of more than 400 publications available for instant pdf download or hard-copy purchase.

help@apawood.org or (253) 620-7400 is your connection to the APA Product Support Help Desk. Staffed by specialists who have the knowledge to address a diverse range of inquiries related to engineered wood, the Help Desk can answer your questions about specification and application of APA products.

Tap into APA's extensive knowledge and resources.

- Training materials and assistance, including Wood University, APA's online portal for engineered wood education, located at www.wooduniversity.org
- Information to protect homes against damaging moisture infiltration through the Build a Better Home and Free From Mold programs, including guides and details for builders at www.buildabetterhome.org and an inspection regimen for homeowners at www.freefrommold.org
- More than 200 downloadable CAD details, found at www.apacad.org
- Field representatives in many major U.S. cities and Canada who can answer questions about APA trademarked products

For a list of APA and *APA EWS* publications, download the *APA Publications Index,* Form B300, at www.apawood.org/publications.

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