

**ICC-ES Evaluation Report****ESR-1405**

Reissued December 1, 2010

*This report is subject to re-examination in one year.*[www.icc-es.org](http://www.icc-es.org) | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

**DIVISION: 06 00 00—WOOD, PLASTICS AND  
COMPOSITES**  
**Section: 06 17 33—Wood I-joists**

**REPORT HOLDER:**

**APA—THE ENGINEERED WOOD ASSOCIATION**  
7011 SOUTH 19<sup>TH</sup> STREET  
TACOMA, WASHINGTON 98466  
(253) 565-6600  
[www.apawood.org](http://www.apawood.org)  
[help@apawood.org](mailto:help@apawood.org)

**EVALUATION SUBJECT:****PERFORMANCE RATED I-JOISTS****ADDITIONAL LISTEES:**

**ANTHONY EACOM CO.**  
1195 PEOPLES ROAD  
SAULT STE. MARIE, ONTARIO P6C 3W7  
CANADA

**GEORGIA-PACIFIC WOOD PRODUCTS, LLC**  
133 PEACHTREE STREET, NORTHEAST  
ATLANTA, GEORGIA 30303

**INTERNATIONAL BEAMS, INC.**  
418 RUE ST. DIZIER  
MONTREAL, QUEBEC H2Y 3P8  
CANADA

**NORDIC ENGINEERED WOOD**  
1100 DE LA GAUCHETIERE STREET WEST, SUITE 504  
MONTREAL, QUEBEC H3B 2S2  
CANADA

**PACIFIC WOODTECH CORPORATION**  
POST OFFICE BOX 465  
BURLINGTON, WASHINGTON 98233

**ROSEBURG FOREST PRODUCTS**  
POST OFFICE BOX 1088  
ROSEBURG, OREGON 97470

**STANDARD STRUCTURES INCORPORATED**  
5900 PRUITT AVE  
WINDSOR, CALIFORNIA 95492

**STARK TRUSS COMPANY, INC.**  
6855 CHESTNUT RIDGE ROAD NW  
BEACH CITY, OHIO 44608

**1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)

**Properties evaluated:**

- Structural
- Fire resistance

**2.0 USES**

The prefabricated wood I-joists described in this report are used as floor joists and roof rafters to support code-required loads. The wood I-joists comply with Section 2303.1.2 of the IBC; and Section R502.1.4 of the IRC, for allowable stress design.

**3.0 DESCRIPTION****3.1 General:**

The prefabricated wood I-joists described in this report comply with the “PRI-400 Performance Standard for APA EWS I-joists,” dated January 2004, for the performance rating of prefabricated, performance-rated I-joists (PRI) used in floors of residential construction. The standard is promulgated by APA—The Engineered Wood Association. The standard complies with the requirements of the codes specifically referenced in Section 1.0 of this report, and with ASTM D 5055 and the ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14). PRI-400 also complies with the code sections referenced in Section 2.0 of this report.

**3.2 Materials:**

**3.2.1 Flanges:** The flanges are sawn lumber or structural composite lumber (SCL), with both flanges having a minimum net width and thickness of 1½ inches (38 mm), except the minimum flange thickness can be 1<sup>5</sup>/<sub>16</sub> inches (33.3 mm) for structural composite lumber. The structural composite lumber used as flanges are recognized in an ICC-ES evaluation report issued to the manufacturer of the structural composite lumber, or are recognized in the ICC-ES evaluation report issued to the I-joist manufacturer. The structural composite lumber has a minimum equivalent specific gravity of 0.42, as it relates to fastener capacity. Sawn lumber flanges have a minimum specific gravity of 0.42. The top flange is the same size, type, grade and species as the bottom flange.

**3.2.2 Webs:** The webs have a minimum thickness of 3/8 inch (9.5 mm) and are Exposure 1, exterior-grade, plywood or oriented strand board panels, and comply with DOC PS-1 or DOC PS-2.

**3.2.3 Adhesive:** The webs are adhered to the flanges with exterior-type adhesive complying with ASTM D 2559 and Section 5.4.3 of ASTM D 5055-10.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

Designed installations of the I-joists must be based on the allowable design properties in Table 1. Holes in webs of joists must comply with Figure 1 and Table 2. Where required by Table 1 and the notes to Figure 2, web stiffeners at joist supports must comply with Figure 2.

### 4.2 Installation:

**4.2.1 General:** I-joists produced by manufacturers listed in this report, or those complying with the requirements of PRI-400 and recognized in a separate ICC-ES evaluation report issued to the I-joist manufacturer, must be installed in accordance with this report. The separate evaluation report issued to the I-joist manufacturer must indicate the I-joists have been evaluated for compliance with this report, and that they are to be installed in accordance with this evaluation report and the separate report.

The I-joist properties in this evaluation report are based on I-joists installed such that the in-service moisture content of the joists does not exceed 16 percent.

The compression flange of the joists must have continuous lateral support. In single-span, simply supported conditions, the compression flange is the top flange of the joist, and lateral support is normally provided by the floor sheathing attached to the top flange. Lateral support for the I-joist bottom flange must be provided at interior supports of multiple-span joists, and the support adjacent to the unsupported end of cantilevered joists.

The ends of joists must be restrained to prevent rollover. This restraint is normally provided by diaphragm sheathing attached to the top flange and to an end wall or a shear-transfer panel capable of transferring a force of 50 pounds per foot (730 N/m). Blocking with equivalent strength is permitted to be used.

Concentrated loads in excess of 1,500 pounds (6672 N), applied to the top flange of the I-joist, require installation of web stiffeners in accordance with Figure 2, except the gap must be at the bottom flange. Blocking or squash blocks must be installed where concentrated loads occur at I-joist supports.

Spacing for nails installed in sawn lumber flanges of I-joists must be sufficient to prevent splitting of the wood. Allowable loads for nails in solid-sawn-lumber flanges must be in accordance with the allowable loads specified in the applicable code for spruce-pine-fir with a specific gravity of 0.42.

Spacing for nails installed in SCL flanges of joists must be sufficient to prevent splitting of the wood. Allowable loads for nails installed in SCL flanges must be in accordance with those in the applicable code for solid-sawn lumber with a specific gravity of 0.42. Fastener type and fastener penetration into the top flange of the I-joist, for fasteners attaching subfloor sheathing or combination subfloor/underlayment to the I-joist, must comply with the requirements of the applicable code. For engineered design, the designer must specify the proper I-joist designation and flange configuration to match the calculation assumptions.

**4.2.2 One-hour Fire-resistive Floor-ceiling Assemblies:** I-joists produced by manufacturers listed in this report, or complying with the requirements of PRI-400 and recognized in a separate ICC-ES evaluation report issued

to the I-joist manufacturer, may be used as wood structural framing members in one-hour fire-resistive floor-ceiling assemblies when the assemblies are constructed in accordance with Sections 4.2.2.1 through 4.2.2.4 of this report.

**4.2.2.1 Assembly 1:** The assembly must be as described in Figure 3.

**4.2.2.2 Assembly 2:** The I-joists are permitted to be used in lieu of the wood joists or trusses in the one-hour floor-ceiling assemblies described in ICC-ES evaluation report [ESR-1338](#), and described in item 21-1.1 of Table 720.1 (3) of the IBC. Minimum flange dimensions for the joists are 1.5 inches (38 mm) for width and  $1\frac{7}{16}$  inches (33 mm) for thickness. The thickness of wood structural panels for the floor must not be less than  $\frac{1}{2}$  inch (12.7 mm), nor less than required by the applicable code.

**4.2.2.3 Assembly 3:** The assembly must consist of a single-layer floor of minimum  $\frac{3}{4}$ -inch (19.1 mm) tongue-and-groove plywood, or minimum  $\frac{23}{32}$ -inch (18.3 mm) tongue-and-groove APA wood structural panels (exposure 1 or exterior-grade), conforming to DOC PS-1 or PS-2, or an ICC-ES evaluation report, with I-joists spaced up to 24 inches (610 mm) on center; and a ceiling of two layers of  $\frac{1}{2}$ -inch-thick (12.7 mm), Type C gypsum board [two layers of  $\frac{5}{8}$ -inch-thick (15.9 mm), Type X gypsum board must be used for installations using I-joists flanges smaller than  $1\frac{1}{2}$  by  $1\frac{3}{4}$  inches (38 by 44.5 mm)] applied to the bottom chord. Minimum flange dimensions of the I-joists are  $1\frac{5}{16}$  inches by  $1\frac{1}{2}$  inches (33 mm by 38 mm).

The floor sheathing must be installed in accordance with code requirements or with applicable ICC-ES evaluation reports, with all butt joints located on framing members.

The first layer of gypsum board must be attached with  $\frac{5}{8}$ -inch-long (41.3 mm), Type W screws spaced up to 12 inches (305 mm) on center. The second layer of gypsum board must be installed with the joints staggered from the first layer and must be fastened with 2-inch-long (51 mm) [ $2\frac{1}{4}$  inches (57 mm) long for  $\frac{5}{8}$ -inch (15.9 mm) gypsum board], Type W screws spaced up to 12 inches (305 mm) on center in the field and up to 8 inches (203 mm) on center at the butt joints. Type G screws,  $1\frac{1}{2}$  inches (38 mm) long [ $1\frac{3}{4}$  inches (44.5 mm) long for  $\frac{5}{8}$ -inch (15.9 mm) gypsum board], must be spaced up to 8 inches (203 mm) on center and up to 6 inches (152 mm) each side of the butt joint. The second layer must be finished with joint tape and compound.

Resilient channels are permitted to be used as part of the ceiling attachment system, provided they are spaced up to 16 inches (406 mm) on center. The resilient channels are permitted to be spaced up to 24 inches (610 mm) on center, if I-joists are spaced up to 16 inches (406 mm) on center. The channels are fastened perpendicular to joists with 1-inch-long (25.4 mm), case-hardened-steel, 0.15-inch-diameter-shank (0.38 mm), self-drilling, self-tapping, Phillips-head screws. The ceiling must be attached to the resilient channels as described above, except 1-inch (25.4 mm), Type S screws and  $1\frac{5}{8}$ -inch (41.3 mm), Type S screws must be used for the first and second layers, respectively, spaced at up to 12 inches (305 mm) on center.

When used as a roof-ceiling assembly, the decking is permitted to be any wood deck specified in the code, and the I-joist spacing is permitted to exceed 24 inches (610 mm) on center. However, when the I-joist spacing exceeds 24 inches (610 mm), the ceiling attachment system, including the resilient channels, must be applied to stripping spaced up to 24 inches (610 mm) on center. The

attachment to the stripping is similar to the previously described attachment to the joists. The stripping must be either nominal 2-by-4-inch (51 by 102 mm), construction-grade Douglas fir lumber [for spans of up to 5 feet (1524 mm)] attached to the bottom chord with two 10d box nails, or material and attachment of equivalent strength.

**4.2.2.4 Other Fire-resistive Assemblies:** The I-joists described in this report may be used in the assemblies described in IBC Table 720.1(3), Item Numbers 23-1.1 and 24.1.1 through 28.1.1, provided the I-joists used meet the criteria described in the table's "Floor or Roof Construction" column. For the purposes of the minimum flange area requirement of 2.3 square inches (1480 mm<sup>2</sup>) in Item Number 23-1.1, a 1<sup>1</sup>/<sub>2</sub>-by-1<sup>1</sup>/<sub>2</sub>-inch (38 mm by 38 mm) flange having a cross-sectional area of 2.25 square inches (1450 mm<sup>2</sup>) may be considered sufficient.

## 5.0 CONDITIONS OF USE

The Performance Rated I-joists described in this report comply with, or are a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The I-joists must be produced by a manufacturer listed in this report or must be evaluated in a current ICC-ES evaluation report issued to the I-joist manufacturer.
- 5.2 The design and installation must comply with this report and the wood design provisions noted in the applicable edition of the NDS referenced in the applicable code.
- 5.3 Drawings and design calculations demonstrating compliance with this report must be submitted to the building official. The drawings and calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4 No cutting of I-joist flanges is permitted.
- 5.5 The I-joists must be produced at the manufacturing plants noted in Table 3, under a quality control program with inspections by APA—The Engineered Wood Association (AA-649).

## 6.0 EVIDENCE SUBMITTED

- 6.1 PRI-400 Performance Standard for APA—EWS I-joists, dated January 2004.
- 6.2 Data verifying compliance with the ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14), dated October 2007 (editorially revised February 2010).
- 6.3 Reports of fire tests conducted in accordance with ASTM E 119.

## 7.0 IDENTIFICATION

The I-joists must be identified by a stamp indicating the product designation, the evaluation report number (ESR-1405), the manufacturer's name, and the name and logo of the inspection agency (APA—The Engineered Wood Association).

TABLE 1—DESIGN PROPERTIES FOR APA EWS PERFORMANCE-RATED I-JOISTS<sup>(a)</sup>

| Depth   | Joist Designation | EI <sup>(b)</sup><br>10 <sup>6</sup> lbf-in. <sup>2</sup> | M <sup>(c)</sup><br>lbf-ft | V <sup>(d)</sup><br>lbf | IR <sup>(e)</sup><br>lbf | ER <sup>(f)</sup><br>lbf | K <sup>(g)</sup><br>10 <sup>6</sup> lbf |
|---------|-------------------|---|----------------------------|-------------------------|--------------------------|--------------------------|---|
| 9 1/2"  | PRI-20            | 145   | 2,520                      | 1,120                   | 1,700                    | 830                      | 4.94                                    |
|         | PRI-30            | 161   | 3,225                      | 1,120                   | 1,905                    | 945                      | 4.94                                    |
|         | PRI-40            | 193   | 2,735                      | 1,120                   | 2,160                    | 1,080                    | 4.94                                    |
|         | PRI-50            | 186   | 3,800                      | 1,120                   | 2,040                    | 1,015                    | 4.94                                    |
|         | PRI-60            | 231   | 3,780                      | 1,120                   | 2,160                    | 1,080                    | 4.94                                    |
| 11 7/8" | PRI-20            | 253   | 3,265                      | 1,420                   | 1,700                    | 830                      | 6.18                                    |
|         | PRI-30            | 280   | 4,170                      | 1,420                   | 1,905                    | 945                      | 6.18                                    |
|         | PRI-40            | 330   | 3,545                      | 1,420                   | 2,500                    | 1,200                    | 6.18                                    |
|         | PRI-50            | 322   | 4,915                      | 1,420                   | 2,040                    | 1,015                    | 6.18                                    |
|         | PRI-60            | 396   | 4,900                      | 1,420                   | 2,500                    | 1,200                    | 6.18                                    |
|         | PRI-70            | 420   | 6,595                      | 1,420                   | 2,335                    | 1,160                    | 6.18                                    |
|         | PRI-80            | 547   | 6,940                      | 1,420                   | 2,760                    | 1,280                    | 6.18                                    |
|         | PRI-90            | 604   | 8,770                      | 1,925                   | 3,355                    | 1,400                    | 6.18                                    |
| 14"     | PRI-40            | 482   | 4,270                      | 1,710                   | 2,500                    | 1,200                    | 7.28                                    |
|         | PRI-50            | 480   | 5,860                      | 1,710                   | 2,040                    | 1,015                    | 7.28                                    |
|         | PRI-60            | 584   | 5,895                      | 1,710                   | 2,500                    | 1,200                    | 7.28                                    |
|         | PRI-70            | 613   | 7,865                      | 1,710                   | 2,335                    | 1,160                    | 7.28                                    |
|         | PRI-80            | 802   | 8,360                      | 1,710                   | 3,020                    | 1,280                    | 7.28                                    |
|         | PRI-90            | 881   | 10,460                     | 2,125                   | 3,355                    | 1,400                    | 7.28                                    |
| 16"     | PRI-40            | 657   | 4,950                      | 1,970                   | 2,500                    | 1,200                    | 8.32                                    |
|         | PRI-50            | 663   | 6,715                      | 1,970                   | 2,040                    | 1,015                    | 8.32                                    |
|         | PRI-60            | 799   | 6,835                      | 1,970                   | 2,500                    | 1,200                    | 8.32                                    |
|         | PRI-70            | 841   | 9,010                      | 1,970                   | 2,335                    | 1,160                    | 8.32                                    |
|         | PRI-80            | 1,092   | 9,690                      | 1,970                   | 3,020                    | 1,280                    | 8.32                                    |
|         | PRI-90            | 1,192   | 11,985                     | 2,330                   | 3,355                    | 1,400                    | 8.32                                    |

- (a) The tabulated values are design values for normal duration of load. All values, except for EI and K, is permitted to be adjusted for other load durations as permitted by the code.
- (b) Bending stiffness (EI) of the I-joist.
- (c) Moment capacity (M) of I-joists, which must **not** be increased by any repetitive member use factor.
- (d) Shear capacity (V) of the I-joist.
- (e) Intermediate reaction (IR) of the I-joist with a minimum bearing length of 3-1/2 inches without bearing stiffeners.
- (f) End reaction (ER) of the I-joist with a minimum bearing length of 1-3/4 inches without bearing stiffeners. Higher end reactions are permitted. For a bearing length of 4 inches (5 inches for 14" and 16" PRI-50s), the end reaction may be set equal to the tabulated shear value. Interpolation of the end reaction between 1-3/4 and 4-inch (5-inch for 14" and 16" PRI-50s) bearing is permitted. For end reaction values over 1,550 lbf, bearing stiffeners are required with the exception of PRI-90, which requires bearing stiffeners when end reaction values exceed 1,885 lbf.
- (g) Coefficient of shear deflection (K). For calculating uniform load and center-point load deflections of the I-joist in a simple-span application, use Eqs. 1 and 2.

Uniform Load: 
$$\delta = \frac{5\omega\ell^4}{384EI} + \frac{\omega\ell^2}{K} \tag{1}$$

Center-Point Load: 
$$\delta = \frac{P\ell^3}{48EI} + \frac{2P\ell}{K} \tag{2}$$

Where:  $\delta$  = calculated deflection (in.),  $\omega$  = uniform load (lbf/in.),  
 P = concentrated load (lbf),  $\ell$  = design span (in.),  
 EI = bending stiffness of the I-joist (lbf-in.<sup>2</sup>), and  
 K = coefficient of shear deflection (lbf).

## Rules for cutting holes in PRI Joists:

1. The distance between the inside edge of the support and the centerline of any hole must be in compliance with the requirements of Table 2.
2. I-joist top and bottom flanges must NEVER be cut, notched, or otherwise modified.
3. Whenever possible field-cut holes should be centered on the middle of the web.
4. The maximum size hole that can be cut into an I-joist web must equal the clear distance between the flanges of the I-joist minus  $\frac{1}{4}$  inch. A minimum of  $\frac{1}{8}$  inch should always be maintained between the top or bottom of the hole and the adjacent I-joist flange.
5. The sides of square holes or longest sides of rectangular holes must not exceed three fourths of the diameter of the maximum round hole permitted at that location.
6. Where more than one hole is necessary, the distance between adjacent hole edges must exceed twice the diameter of the largest round hole or twice the size of the largest square hole (or twice the length of the longest side of the longest rectangular hole) and each hole must be sized and located in compliance with the requirements of Table 2.
7. A knockout is not considered a hole, may be utilized anywhere it occurs and may be ignored for purposes of calculating minimum distances between holes.
8. One and one-half inch holes are permitted anywhere in a cantilevered section of a PRI Joist. Holes of greater size may be permitted subject to verification.
9. A maximum  $1\frac{1}{2}$ -inch-diameter hole can be placed anywhere in the web provided that it meets the requirements of 6 above.
10. For joists with more than one span, use the longest span to determine hole location in either span.
11. All holes must be cut in a workman-like manner in accordance with the restrictions listed above and as illustrated in Figure 1.
12. Limit 3 maximum size holes per span.
13. A group of round holes at approximately the same location is permitted if they meet the requirements for a single round hole circumscribed around them.

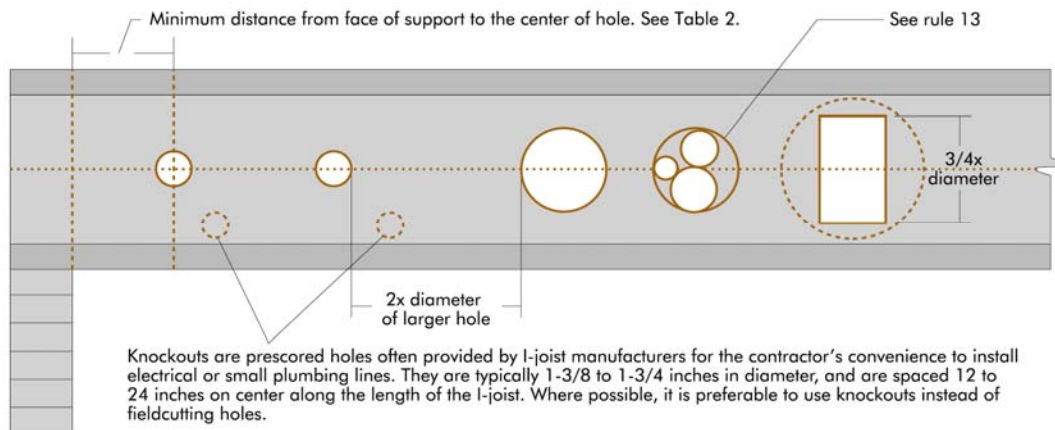


FIGURE 1—TYPICAL HOLES

**TABLE 2—LOCATION OF CIRCULAR HOLES IN PRI JOIST WEBS, SIMPLE OR MULTIPLE SPAN FOR DEAD LOADS UP TO 10 PSF AND LIVE LOADS UP TO 40 PSF<sup>1,2,3,4</sup>**

| Joist Depth                      | Joist  | SAF <sup>5</sup> | MINIMUM DISTANCE FROM INSIDE FACE OF ANY SUPPORT TO CENTER OF HOLE (ft - in.) |        |        |        |        |                               |        |        |                               |        |        |                                |         |         |                                |  |
|----------------------------------|--------|------------------|---|--------|--------|--------|--------|-------------------------------|--------|--------|-------------------------------|--------|--------|--------------------------------|---------|---------|--------------------------------|--|
|                                  |        |                  | Round Hole Diameter (in.)   |        |        |        |        |                               |        |        |                               |        |        |                                |         |         |                                |  |
|                                  |        |                  | 2   | 3      | 4      | 5      | 6      | 6 <sup>1</sup> / <sub>4</sub> | 7      | 8      | 8 <sup>5</sup> / <sub>8</sub> | 9      | 10     | 10 <sup>3</sup> / <sub>4</sub> | 11      | 12      | 12 <sup>3</sup> / <sub>4</sub> |  |
| 9 <sup>1</sup> / <sub>2</sub> "  | PRI-20 | 13'-5"           | 0'-7"   | 0'-11" | 2'-2"  | 3'-6"  | 5'-3"  | 5'-8"                         |        |        |                               |        |        |                                |         |         |                                |  |
|                                  | PRI-30 | 13'-10"          | 0'-9"   | 2'-0"  | 3'-3"  | 4'-7"  | 6'-1"  | 6'-6"                         |        |        |                               |        |        |                                |         |         |                                |  |
|                                  | PRI-40 | 14'-6"           | 0'-7"   | 1'-8"  | 3'-0"  | 4'-4"  | 5'-9"  | 6'-3"                         |        |        |                               |        |        |                                |         |         |                                |  |
|                                  | PRI-50 | 14'-5"           | 1'-1"   | 2'-4"  | 3'-8"  | 5'-0"  | 6'-6"  | 6'-11"                        |        |        |                               |        |        |                                |         |         |                                |  |
|                                  | PRI-60 | 15'-3"           | 1'-8"   | 3'-0"  | 4'-4"  | 5'-8"  | 7'-3"  | 7'-8"                         |        |        |                               |        |        |                                |         |         |                                |  |
| 11 <sup>7</sup> / <sub>8</sub> " | PRI-20 | 13'-5"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 1'-11" | 2'-5"                         | 3'-10" | 5'-11" | 7'-4"                         |        |        |                                |         |         |                                |  |
|                                  | PRI-30 | 15'-0"           | 0'-7"   | 0'-8"  | 0'-8"  | 1'-9"  | 3'-4"  | 3'-9"                         | 5'-0"  | 6'-10" | 8'-0"                         |        |        |                                |         |         |                                |  |
|                                  | PRI-40 | 16'-7"           | 0'-7"   | 0'-8"  | 1'-2"  | 2'-5"  | 3'-9"  | 4'-1"                         | 5'-1"  | 6'-8"  | 7'-11"                        |        |        |                                |         |         |                                |  |
|                                  | PRI-50 | 16'-1"           | 0'-7"   | 0'-8"  | 0'-11" | 2'-6"  | 4'-1"  | 4'-6"                         | 5'-10" | 7'-8"  | 8'-11"                        |        |        |                                |         |         |                                |  |
|                                  | PRI-60 | 18'-2"           | 0'-8"   | 1'-10" | 3'-2"  | 4'-5"  | 5'-10" | 6'-2"                         | 7'-4"  | 8'-11" | 10'-0"                        |        |        |                                |         |         |                                |  |
|                                  | PRI-70 | 18'-6"           | 0'-7"   | 1'-2"  | 2'-5"  | 3'-9"  | 5'-2"  | 5'-8"                         | 7'-0"  | 8'-10" | 10'-2"                        |        |        |                                |         |         |                                |  |
|                                  | PRI-80 | 19'-10"          | 1'-11"  | 3'-2"  | 4'-6"  | 5'-10" | 7'-3"  | 7'-8"                         | 8'-10" | 10'-6" | 11'-7"                        |        |        |                                |         |         |                                |  |
|                                  | PRI-90 | 20'-5"           | 0'-7"   | 0'-8"  | 1'-4"  | 3'-0"  | 4'-9"  | 5'-3"                         | 6'-8"  | 8'-8"  | 10'-0"                        |        |        |                                |         |         |                                |  |
| 14"                              | PRI-40 | 18'-3"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 1'-10" | 2'-2"                         | 3'-2"  | 4'-7"  | 5'-5"                         | 6'-0"  | 7'-7"  | 9'-4"                          |         |         |                                |  |
|                                  | PRI-50 | 16'-1"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 0'-9"  | 1'-1"                         | 2'-6"  | 4'-6"  | 5'-9"                         | 6'-7"  | 8'-10" | 10'-7"                         |         |         |                                |  |
|                                  | PRI-60 | 19'-9"           | 0'-7"   | 0'-8"  | 0'-8"  | 1'-7"  | 3'-2"  | 3'-6"                         | 4'-9"  | 6'-6"  | 7'-8"                         | 8'-4"  | 10'-4" | 11'-11"                        |         |         |                                |  |
|                                  | PRI-70 | 18'-6"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-11" | 2'-6"  | 2'-11"                        | 4'-2"  | 5'-11" | 7'-0"                         | 7'-10" | 10'-1" | 12'-0"                         |         |         |                                |  |
|                                  | PRI-80 | 22'-7"           | 0'-7"   | 1'-9"  | 3'-0"  | 4'-4"  | 5'-8"  | 6'-1"                         | 7'-1"  | 8'-7"  | 9'-7"                         | 10'-3" | 12'-2" | 13'-10"                        |         |         |                                |  |
|                                  | PRI-90 | 23'-2"           | 0'-7"   | 0'-8"  | 0'-9"  | 2'-4"  | 3'-11" | 4'-4"                         | 5'-7"  | 7'-4"  | 8'-6"                         | 9'-3"  | 11'-3" | 12'-10"                        |         |         |                                |  |
| 16"                              | PRI-40 | 19'-8"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 0'-9"  | 0'-10"                        | 1'-5"  | 2'-9"  | 3'-7"                         | 4'-1"  | 5'-6"  | 6'-7"                          | 7'-0"   | 8'-9"   | 10'-9"                         |  |
|                                  | PRI-50 | 16'-1"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 0'-9"  | 0'-10"                        | 0'-10" | 0'-10" | 1'-9"                         | 2'-6"  | 4'-6"  | 6'-0"                          | 6'-8"   | 9'-7"   | 11'-11"                        |  |
|                                  | PRI-60 | 19'-9"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 0'-9"  | 0'-10"                        | 1'-10" | 3'-6"  | 4'-6"                         | 5'-2"  | 7'-3"  | 8'-11"                         | 9'-6"   | 11'-10" | 13'-9"                         |  |
|                                  | PRI-70 | 18'-6"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-9"  | 0'-9"  | 0'-10"                        | 1'-0"  | 2'-11" | 4'-1"                         | 4'-10" | 6'-11" | 8'-7"                          | 9'-1"   | 11'-6"  | 13'-6"                         |  |
|                                  | PRI-80 | 23'-11"          | 0'-7"   | 0'-8"  | 0'-8"  | 1'-7"  | 3'-2"  | 3'-7"                         | 4'-10" | 6'-6"  | 7'-7"                         | 8'-3"  | 10'-2" | 11'-8"                         | 12'-2"  | 14'-3"  | 16'-0"                         |  |
|                                  | PRI-90 | 25'-7"           | 0'-7"   | 0'-8"  | 0'-8"  | 0'-10" | 2'-3"  | 2'-8"                         | 3'-10" | 5'-5"  | 6'-5"                         | 7'-1"  | 8'-10" | 10'-4"                         | 10'-10" | 13'-3"  | 15'-3"                         |  |

For SI: 1 ft = 305 mm; 1 inch = 25.4 mm.

<sup>1</sup>Table may be used for I-joist spacing of 24 inches on center or less.

<sup>2</sup>Hole location distance is measured from inside face of supports to center of hole.

<sup>3</sup>Distances in this chart are based on uniformly loaded joists.

<sup>4</sup>Joists with web hole locations and/or sizes that fall outside of the scope of this table must be analyzed based on the actual hole size, joist spacing, span and loading conditions. The I-joist shear capacity at the location of a circular web hole is calculated using the following equation:  $V_m = \text{Published Shear Value} \times [(\text{Joist Depth} - \text{Hole Diameter}) / \text{Joist Depth}]$ .

<sup>5</sup>SAF = Span Adjustment Factor, used as defined below.

**OPTIONAL:**

Table 2 is based on the I-joists being used at their maximum span. If the I-joists are placed at less than their full allowable span, the minimum distance from the centerline of the hole to the face of any support (D) as given above may be reduced as follows:

$$D_{\text{reduced}} = \frac{L_{\text{actual}}}{\text{SAF}} \times D$$

- Where:  $D_{\text{reduced}}$  = Distance from the inside face of any support to center of hole, reduced for less-than-maximum span applications (ft). The reduced distance must not be less than 6-inches from the face of support to edge of the hole.
- $L_{\text{actual}}$  = The actual measured span distance between the inside faces of supports (ft).
- SAF = Span Adjustment Factor given in Table 2.
- D = The minimum distance from the inside face of any support to center of hole from Table 2 above.

If  $\frac{L_{\text{actual}}}{\text{SAF}}$  is greater than 1, use 1 in the above calculation for  $\frac{L_{\text{actual}}}{\text{SAF}}$ .

Requirements for web stiffeners:

1. Wood Structural Panel web stiffeners must be placed on each side of the I-joist web at:
  - a) Hangers with side nailing
  - b) Hangers with a side, which do not support top flanges of I-joist.
  - c) Locations where concentrated loads in excess of 1,500 pounds are applied to the top flange of the I-joist between supports, or in the case of cantilever, anywhere between the cantilever tip and the support.
  - d) At exterior supports in engineered applications where concentrated loads cause exterior reaction loads to exceed 1,550 pounds.

Web stiffeners must be made of Utility grade SPF (south) or better for lumber and/or Sheathing grade or better for wood structural panels.

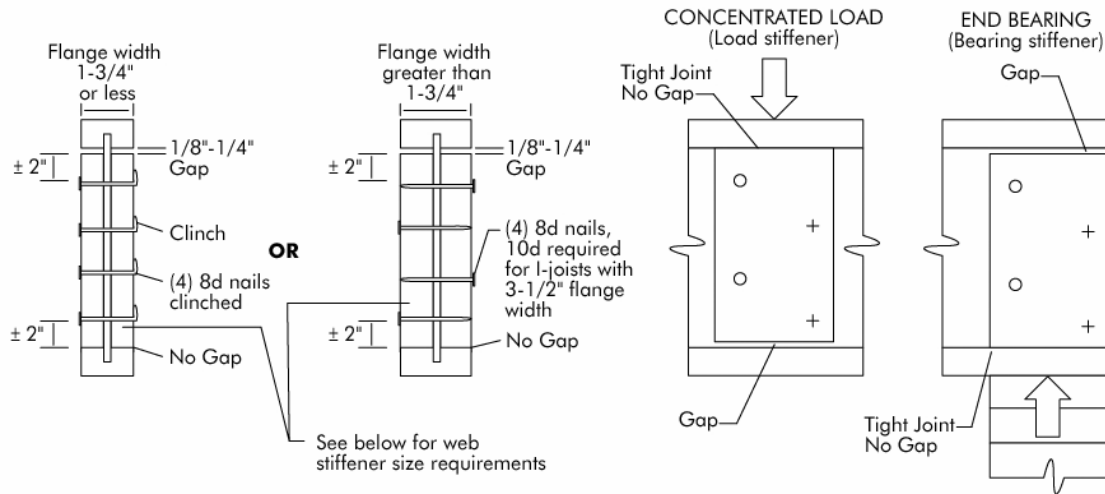


FIGURE 2—PRI I-JOIST WEB STIFFENER CONSTRUCTION DETAILS

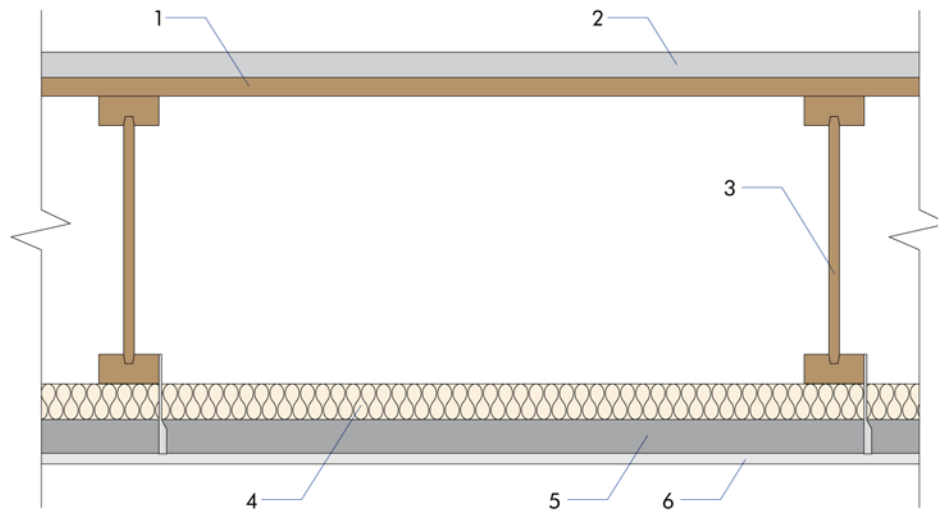
Web stiffener size required

| I-JOIST FLANGE WIDTH | WEB STIFFENER SIZE REQUIRED ON EACH SIDE OF WEB |
|----------------------|---|
| 1 1/2"               | 15/32" x 2 5/16" minimum width                  |
| 1 3/4"               | 19/32" x 2 5/16" minimum width                  |
| 2 5/16"              | 1" x 2 5/16" minimum width                      |
| 2 1/2"               | 1" x 2 5/16" minimum width                      |
| 3 1/2"               | 1 1/2" x 2 5/16" minimum width                  |

For SI: 1 inch = 25.4 mm.

TABLE 3—MANUFACTURERS AND THEIR LOCATIONS

| MANUFACTURER              | LOCATION   |
|---------------------------|--|
| Anthony—Eacom Co          | 1195 People's Road, Sault Ste. Marie, Ontario P6B 6H3, Canada          |
| Georgia-Pacific           | 310 Cypress Road, Ocala, Florida 34472                                 |
| Georgia-Pacific           | 1000 North Park Drive, Roxboro, North Carolina 27573                   |
| Georgia-Pacific           | 19953 Highway 31, Thorsby, Alabama 35171                               |
| International Beams, Inc. | 480, Rue Jocelyn-Bastille, CP 10, Pohenegamook, Quebec G0L 4J0, Canada |
| International Beams, Inc. | 137 Juniper Road, Juniper, New Brunswick E7L 1G8, Canada               |
| Nordic Engineered Wood    | 521, Chemin Merrill, C.P. 216, Chibougamau, Quebec G8P 4J0, Canada     |
| Pacific Woodtech Corp.    | 1850 Park Lane, Burlington, Washington 98233                           |
| Roseburg Forest Products  | 4500 Riddle By-Pass Road, Riddle, Oregon 97469                         |
| Standard Structures Inc.  | 340 Standard Avenue, Windsor, California 95492                         |
| Stark Truss, Inc.         | 6855 Chestnut Ridge Road NW, Beach City, OH 44608                      |



**FIGURE 3—ONE-HOUR FIRE-RESISTANCE-RATED FLOOR-CEILING ASSEMBLY (Ceiling - one layer of  $\frac{1}{2}$  inch or  $\frac{5}{8}$  inch gypsum wallboard, attached to furring channels spaced 24 inches on center)**

1. Single Floor – APA Rated Sturd-I-Floor wood structural panels (Exposure 1 or Exterior) with tongue-and-groove edges and conforming to APA Standard PRP-108, PS 1-95 or PS2-04, with thickness, span rating and fastening in accordance with code requirements or ICC-ES evaluation reports (minimum  $\frac{23}{32}$  inch nominal thickness). Installed with long dimension of panel (strength axis) or face grain of plywood perpendicular to joists with end joints staggered. The panels must be nailed in addition to being glued to framing with construction adhesive conforming to ASTM 3498-93 (APA Specification AFG-01). The construction adhesive must be applied to the top flanges of I-joists and perimeter framing using a nominal  $\frac{1}{4}$ -inch diameter bead of adhesive, with double beads applied where panel end joints butt. A nominal  $\frac{1}{4}$  inch diameter bead of adhesive also is applied in the groove of tongue-and-groove edges of panels before joining panels together.
2. Finish Flooring – Approved lightweight concrete floor topping ( $1\frac{1}{2}$  inches) or proprietary gypsum concrete floor topping optional over single floor, installed in accordance with an ICC-ES Evaluation Report. Minimum thickness of gypsum concrete topping is  $\frac{3}{4}$  inch with I-joists spaced maximum 19.2 inches on center, or 1 inch with I-joists spaced 24 inches on center.
3. Wood Structural Members – Minimum  $9\frac{1}{2}$  inch deep wood I-joists spaced maximum of 24 inches on center, installed in accordance with requirements of this report. Top and bottom flanges, minimum size  $1\frac{1}{2}$  inch x  $2\frac{1}{2}$  inch LVL or  $1\frac{1}{2}$  inch x  $2\frac{1}{2}$  inch lumber; minimum web thickness  $\frac{3}{8}$  inch. Minimum 2 inches bearing on supports. Holes may be cut in web of I-joist as permitted by this report.
4. Insulation – 1-inch thick unfaced mineral wool batt insulation (minimum 6 pounds per cubic foot density) must be placed under the bottom flange of I-joists and supported on furring channels. Edges of the insulation batts must be tightly buffed against the furring channel support clips and adjoining insulation batts, and ends must be located over furring channels.
5. Furring Channels – Inverted hat-type channels,  $\frac{7}{8}$ -inch deep x  $2\frac{5}{8}$ -inches wide, formed of minimum 0.021-inch thick (25 gage) galvanized steel. Channels must be installed perpendicular to I-joists in continuous rows spaced 24 inches on center. Channels must be attached to the bottom flange of each I-joist with one support clip (Simpson Strong-Tie Co. Type CSC) at each crossing. Support clips must be nailed to I-joist flange with one 11 gage (0.1205-inch diameter) x  $1\frac{1}{2}$ -inch nail. At locations of end joints of gypsum wallboard, install double row of channels, centered  $1\frac{1}{2}$  inches from panel ends. Ends of channel must extend a minimum of 6 inches beyond the edge joint of adjoining panels. Channel splices must be centered under the I-joists and overlapped a minimum of 6 inches, and tied together with double strand of No. 18 SWG galvanized steel wire near each end of overlap.
6. Wallboard, Gypsum - Approved  $\frac{1}{2}$ -inch or  $\frac{5}{8}$ -inch proprietary Type X gypsum wallboard, 48 inches wide, installed perpendicular to furring channels (parallel to I-joists) with end joints continuous or staggered. Fasten to furring channels with 1 inch or  $1\frac{1}{8}$  inch Type S drywall screws spaced 12 inches on center. Drywall screws must be driven so that they are flush with the face and do not damage the core of the wallboard, and must be located  $1\frac{1}{2}$  inches from panel ends and a maximum of 6 inches from panel edges. The wallboard must be:
  - National Gypsum Fire-Shield Type C gypsum wallboard,
  - U. S. Gypsum Fire Code C gypsum wallboard, or approved equal.

Finishing System (not shown) – Exposed face layer joints must be covered with tape and joint compound, and screw heads must be covered with joint compound.