

# ICC-ES Evaluation Report

**ESR-1144**

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**DIVISION: 06—WOOD AND PLASTICS**  
**Section: 06170—Prefabricated Structural Wood**

**REPORT HOLDER:**

**BOISE BUILDING SOLUTIONS MANUFACTURING LLC**  
 70 RUE INDUSTRIELLE  
 ST. JACQUES, NEW BRUNSWICK E7B 1T1  
 CANADA  
 (866) 245-8888  
[www.bc.com](http://www.bc.com)

**EVALUATION SUBJECT:**
**AJS SERIES PREFABRICATED WOOD I-JOISTS**
**1.0 EVALUATION SCOPE**
**Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)

**Property evaluated:**

Structural

**2.0 USES**

The AJS series prefabricated wood I-joists are used as floor joists and blocking panels to support floor design loads.

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

The AJS Series prefabricated wood I-joists have solid-sawn lumber or composite lumber flanges and oriented strand board (OSB) webs. The top and bottom flanges are parallel, creating constant-depth joists. The web-to-web joints of the I-joists are square butt joints and conform to the specifications in the approved quality control manuals. The web-to-flange connection is a proprietary grooved connection, also conforming to the approved quality control manuals. The I-joists are available in various lengths and depths. See Table 1 for a description of the I-joists.

**3.2 Material Specifications:**

**3.2.1 Flanges:** The flanges of the I-joists are sawn lumber or composite lumber conforming to the specifications in the approved quality control manuals. The composite lumber flanges are 1<sup>1</sup>/<sub>2</sub>-inch-by-2<sup>1</sup>/<sub>2</sub>-inch (38 by 64 mm) spruce-pine-fir (SPF) and are used interchangeably with any of the sawn lumber flanges of the same dimensions. The sawn lumber flange material, grade, width and depth are noted in Table 1.

**3.2.2 Web:** Web material for the I-joists is 3<sup>1</sup>/<sub>8</sub>-inch-thick (10 mm) OSB conforming to Exposure 1 requirements of DOC PS-2, with further requirements set forth in the approved quality control manuals and manufacturing standards.

**3.2.3 Adhesive:** Adhesives used in the fabrication of the I-joists comply with ASTM D 2559 and Section 5.3.3 of ASTM D 5055-08a, and are specified in the quality control manuals and the manufacturing standards.

**4.0 DESIGN AND INSTALLATION**

Design of the prefabricated wood I-joists described in this report must be in accordance with the applicable code. Additionally, the design and installation of the prefabricated wood I-joists must comply with Sections 4.1 through 4.12, and the manufacturer's installation instructions.

**4.1 Allowable Structural Capacity:**

Reference design moments, reactions, vertical shear capacity, and I-joist stiffness (*EI*) are specified in Table 2. Reference design end reactions are based on a minimum bearing length of 1<sup>1</sup>/<sub>2</sub> inches (38 mm) for simple spans on joists having depths of 9<sup>1</sup>/<sub>4</sub> to 16 inches (235 mm to 406 mm), and 1<sup>3</sup>/<sub>4</sub> inches (44.5 mm) on joists having depths of 18 inches (457 mm) or greater. Reference design intermediate reactions are based on a minimum bearing length of 3<sup>1</sup>/<sub>2</sub> inches (89 mm) at intermediate support points for continuous spans. Floor assemblies, consisting of a minimum 2<sup>3</sup>/<sub>32</sub>-inch-thick (18 mm) Sturd-I-Floor rated sheathing nailed to the I-joists in accordance with the applicable code requirements and adhered to the top flanges of the I-joists using AFG-01 construction adhesive, have the allowable spans shown in Table 3.

**4.2 Fasteners:**

Reference withdrawal design values and lateral load values, for nails installed into the flanges, must be determined in accordance with the applicable code, using a maximum specific gravity of 0.42. Fastener spacing must comply with the minimum spacing requirements prescribed by the applicable code for nails installed in sawn lumber.

**4.3 Web Stiffeners:**

Web stiffener requirements for the I-joists at reaction and concentrated load locations are noted in Figure 1.

**4.4 Lateral Support:**

The compression flange requires continuous lateral support, and the joist ends require restraint to prevent rollover. Methods specified in the applicable code for lateral support of sawn lumber are acceptable. Bridging is not required for floor joist applications.

#### 4.5 Holes in I-joist Web:

Holes in the web of the I-joist are permitted. For I-joists with a simple span and supporting uniform loads only, holes in the webs must be in accordance with Tables 4 and 5 (for round holes) or Tables 6 and 7 (for square and rectangular holes). The reduced shear capacity due to the presence of holes in the web,  $V_{hole}$ , must be calculated as follows:

For round holes:

$$V_{hole} = V_r \left[ B_c - M_c \left( \frac{hole\ diameter}{joist\ depth - 2 \times flange\ depth} \right) \right]$$

For square and rectangular holes:

$$V_{hole} = V_r \left[ B_R - 0.28 \left( \frac{hole\ depth}{joist\ depth - 2 \times flange\ depth} \right) - 0.29 \left( \frac{hole\ width}{18} \right) \right]$$

where:

$V_r$  is the shear value, for the joist, provided in Table 2.

$B_c$  = 0.88 for joist depths less than or equal to 16 inches

0.91 for joist depths greater than 16 inches.

$M_c$  = 0.69 for joist depths less than or equal to 16 inches

0.84 for joist depths greater than 16 inches

$B_R$  = 0.60 for joist depths less than or equal to 16 inches

0.57 for joist depths greater than 16 inches

Where multiple holes occur in the web, the minimum edge-to-edge spacing between holes must be two times the size of the largest dimension of either hole.

#### 4.6 Duration of Load:

Adjustments for duration of load must be in accordance with Section 2.3.2 of the American Forest & Paper Association National Design Specification for Wood Construction (NDS).

#### 4.7 In-service Moisture Conditions:

I-joists must be installed in dry, covered conditions where the in-service moisture content of the wood does not exceed 16 percent.

#### 4.8 Repetitive-member Use:

The repetitive-member use factor applicable to the resistive moment capacities listed in Table 2 is limited to 1.0.

#### 4.9 Member Spans:

I-joist spans must be determined in accordance with Section 3.2.1 of the NDS and the applicable code. Shear calculations include all loads within the span from face to face of supports.

#### 4.10 Deflection:

Total I-joist deflection must be calculated using the formula for deflection due to bending and the following formula for deflection due to shear:

$$\Delta_{shear} = \frac{8M}{K}$$

where:

$\Delta_{shear}$  = Deflection caused by shear stress [inches (mm)].

$M$  = Design moment [inch-lbs (mm-N)].

$K$  = Shear modulus constant [in-lbs/in (mm-N/mm)].

Deflection of a uniformly loaded, simple-span I-joist must be determined using the following formula:

$$\Delta_{Total} = \Delta_{bending} + \Delta_{shear} = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$$

Deflection of a simple-span I-joist with a concentrated load at mid-span must be determined using the following formula:

$$\Delta_{Total} = \Delta_{bending} + \Delta_{shear} = \frac{PL^3}{48EI} + \frac{2PL}{K}$$

where:

$\Delta_{Total}$  = Total I-joist deflection [inches (mm)].

$w$  = Applied uniform loads [lbf/inch (N/mm)].

$P$  = Applied concentrated load [lbf (N)].

$L$  = I-joist span [inches (mm)].

$EI$  = I-joist stiffness from Table 2 [in<sup>2</sup>-lbf (mm<sup>2</sup>-N)].

$M$  = Design moment [inch-lbs (mm-N)].

$K$  = Shear modulus constant from Table 2 [in-lbf/in (mm-N/mm)].

#### 4.11 Blocking Panels:

Bearing walls perpendicular to, and supported by, I-joists at the end or intermediate supports, or both, require full depth blocking. I-joists used as blocking panels must be installed between I-joists and have a maximum applicable vertical load capacity shown in Table 2.

#### 4.12 Cantilevered Joists:

I-joists may be installed with cantilevers, provided the cantilevered portion does not exceed a maximum length equal to one-third of the adjacent span. Additionally, the cantilevered I-joist must be limited to supporting only uniform loads, unless additional design details are provided by a design professional.

### 5.0 CONDITIONS OF USE

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

**5.1** For applications based on Table 2, reference design properties for AJS I-joists, design calculations and details for specific applications must be furnished to the code official. Calculations and drawings must be prepared, signed, and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.2** Flanges of the I-joist may not be cut or notched, unless an engineered design prepared by a registered design professional is submitted to the code official for approval.

**5.3** The I-joists are produced by Boise Building Solutions Manufacturing LLC at their plant located in St. Jacques, New Brunswick, Canada; or by Les Chantiers de Chibougamau, at their plant in Chibougamau, Quebec, Canada; or by International Beams, Inc., at their plant in Pohénégamook, Quebec, Canada. The I-joists with composite lumber flanges are produced by Boise Cascade Alljoist, Ltd.

at the plant located in St. Jacques, New Brunswick, Canada. Quality control inspections are conducted by PFS Corporation (AA-652).

**6.0 EVIDENCE SUBMITTED**

Data in accordance with the ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14), dated October 2007, editorially revised December 2008.

**7.0 IDENTIFICATION**

AJS I-joists are identified by a stamp indicating the joist model; company name (Boise Building Solutions Manufacturing LLC); manufacturing location; evaluation report number (ESR-1144); and the name and logo of the inspection agency (PFS Corporation).

**TABLE 1—DESCRIPTION FOR AJS I-JOISTS**

| JOIST SERIES | FLANGE                        |                                     | WEB MATERIAL                           | RANGE OF JOIST DEPTHS (inches)                                  |
|--------------|-------------------------------|-------------------------------------|--|---|
|              | Material <sup>1</sup>         | Dimensions (depth x width) (inches) |  |   |
| AJS-5        | APG SPF                       | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 11 <sup>7</sup> / <sub>8</sub> |
| AJS-10       | APG Black Spruce              | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-20       | MSR 2100F <sub>b</sub> – 1.8E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-140      | APG SPF                       | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-150      | MSR 1650F <sub>b</sub> – 1.5E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-160      | MSR 1800F <sub>b</sub> – 1.6E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-170      | MSR 1950F <sub>b</sub> – 1.7E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-180      | MSR 2100F <sub>b</sub> – 1.8E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-190      | MSR 2250F <sub>b</sub> – 1.9E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>4</sub> to 16                             |
| AJS-200      | MSR 2400F <sub>b</sub> – 2.0E | 1.5 x 2.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
| AJS-25       | MSR 2100F <sub>b</sub> – 1.8E | 1.5 x 3.5                           | <sup>3</sup> / <sub>8</sub> -inch OSB  | 9 <sup>1</sup> / <sub>2</sub> to 16                             |
|              |                               |                                     | <sup>7</sup> / <sub>16</sub> -inch OSB | 18 to 24  |
| AJS-30       | MSR 2400F <sub>b</sub> – 2.0E | 1.5 x 3.5                           | <sup>7</sup> / <sub>16</sub> -inch OSB | 18 to 24  |

For **SI**: 1 inch = 25.4 mm.

- <sup>1</sup>APG = AJS Proprietary Grade
- SPF = Spruce-pine-fir
- MSR = Machine Stress Rated lumber

TABLE 2—REFERENCE DESIGN PROPERTIES FOR AJS I-JOISTS<sup>1</sup>

| JOIST SERIES | DEPTH (in.)                    | MOMENT $M_r$ (ft-lb) | SHEAR $V_r$ (lb) | $EI^2 \times 10^6$ (lb-in <sup>2</sup> ) | $K^2$ (in-lb/in) | END REACTION, $R_r$ (lb) <sup>9</sup>                     |                    |  |                  | INTERMEDIATE REACTION, $R_r$ (lb) <sup>9</sup>            |                  |  |                    | BLOCKING PANEL <sup>6</sup> (lb/ft) | WEIGHT (lb/ft) |
|--------------|--------------------------------|----------------------|------------------|--|------------------|---|--------------------|--|------------------|---|------------------|--|--------------------|-------------------------------------|----------------|
|              |                                |                      |                  |  |                  | With 1 <sup>1</sup> / <sub>2</sub> " Bearing <sup>3</sup> |                    | With 3 <sup>1</sup> / <sub>2</sub> " Bearing |                  | With 3 <sup>1</sup> / <sub>2</sub> " Bearing <sup>3</sup> |                  | With 5 <sup>1</sup> / <sub>4</sub> " Bearing |                    |                                     |                |
|              |                                |                      |                  |  |                  | No <sup>4</sup>   | Yes <sup>5</sup>   | No <sup>4</sup>                              | Yes <sup>5</sup> | No <sup>4</sup>   | Yes <sup>5</sup> | No <sup>4</sup>                              | Yes <sup>5</sup>   |                                     |                |
| AJS-5        | 9 <sup>1</sup> / <sub>2</sub>  | 2,175                | 1,160            | 182                                      | 5.2              | 950   | 1,200              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.2            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 2,820                | 1,490            | 310                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.5            |
| AJS-10       | 9 <sup>1</sup> / <sub>2</sub>  | 2,960                | 1,160            | 232                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.5            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 3,835                | 1,490            | 394                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.8            |
|              | 14                             | 4,620                | 1,790            | 578                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 3.0            |
|              | 16                             | 5,355                | 2,065            | 786                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.3            |
| AJS-20       | 9 <sup>1</sup> / <sub>2</sub>  | 3,395                | 1,160            | 232                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.5            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 4,400                | 1,490            | 394                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.8            |
|              | 14                             | 5,295                | 1,790            | 578                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 3.0            |
|              | 16                             | 6,140                | 2,065            | 786                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.3            |
| AJS-140      | 9 <sup>1</sup> / <sub>2</sub>  | 2,450                | 1,160            | 182                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.2            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 3,175                | 1,490            | 310                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.5            |
|              | 14                             | 3,825                | 1,790            | 457                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 2.8            |
|              | 16                             | 4,435                | 2,065            | 623                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.1            |
| AJS-150      | 9 <sup>1</sup> / <sub>2</sub>  | 2,820                | 1,160            | 194                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.2            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 3,650                | 1,490            | 331                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.5            |
|              | 14                             | 4,390                | 1,790            | 487                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 2.7            |
|              | 16                             | 5,090                | 2,065            | 664                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.0            |
| AJS-160      | 9 <sup>1</sup> / <sub>2</sub>  | 3,057                | 1,160            | 207                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.4            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 3,959                | 1,490            | 352                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.7            |
|              | 14                             | 4,767                | 1,790            | 517                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 2.9            |
|              | 16                             | 5,527                | 2,065            | 705                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.2            |
| AJS-170      | 9 <sup>1</sup> / <sub>2</sub>  | 3,300                | 1,160            | 219                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.5            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 4,270                | 1,490            | 372                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.8            |
|              | 14                             | 5,140                | 1,790            | 547                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 3.0            |
|              | 16                             | 5,960                | 2,065            | 746                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.3            |
| AJS-180      | 9 <sup>1</sup> / <sub>2</sub>  | 3,640                | 1,160            | 232                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.5            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 4,710                | 1,490            | 394                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.8            |
|              | 14                             | 5,675                | 1,790            | 578                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 3.0            |
|              | 16                             | 6,580                | 2,065            | 786                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.3            |
| AJS-190      | 9 <sup>1</sup> / <sub>4</sub>  | 3,770                | 1,125            | 229                                      | 5.1              | 950   | 1,185              | 1,170  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.5            |
|              | 9 <sup>1</sup> / <sub>2</sub>  | 3,895                | 1,160            | 244                                      | 5.2              | 950   | 1,200              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.5            |
|              | 11 <sup>1</sup> / <sub>4</sub> | 4,740                | 1,400            | 365                                      | 6.2              | 955   | 1,280              | 1,205  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.8            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 5,045                | 1,490            | 414                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.8            |
|              | 14                             | 6,070                | 1,790            | 608                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 3.0            |
|              | 16                             | 7,040                | 2,065            | 827                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.3            |
| AJS-200      | 9 <sup>1</sup> / <sub>2</sub>  | 4,155                | 1,160            | 257                                      | 5.2              | 950   | 1,240              | 1,175  | 1,480            | 2,350   | 2,450            | 2,350  | 2,450              | 1,875                               | 2.6            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 5,385                | 1,490            | 435                                      | 6.6              | 955   | 1,335              | 1,215  | 1,595            | 2,390   | 2,800            | 2,390  | 2,800              | 1,680                               | 2.9            |
|              | 14                             | 6,485                | 1,790            | 638                                      | 7.8              | 960   | 1,420              | 1,250  | 1,700            | 2,430   | 3,130            | 2,430  | 3,130              | 1,500                               | 3.1            |
|              | 16                             | 7,515                | 2,065            | 868                                      | 9.0              | 970   | 1,500              | 1,285  | 1,800            | 2,465   | 3,435            | 2,465  | 3,435              | 1,340                               | 3.4            |
| AJS-25       | 9 <sup>1</sup> / <sub>2</sub>  | 5,370                | 1,160            | 307                                      | 5.3              | 950   | 1,240              | 1,175  | 1,480            | 2,600   | 2,850            | 2,600  | 2,850              | 1,875                               | 3.1            |
|              | 11 <sup>1</sup> / <sub>8</sub> | 6,960                | 1,490            | 519                                      | 6.7              | 955   | 1,335              | 1,215  | 1,595            | 2,690   | 3,190            | 2,690  | 3,190              | 1,680                               | 3.4            |
|              | 14                             | 8,380                | 1,790            | 756                                      | 7.9              | 960   | 1,420              | 1,250  | 1,700            | 2,770   | 3,500            | 2,770  | 3,500              | 1,500                               | 3.7            |
|              | 16                             | 9,720                | 2,065            | 1,028                                    | 9.1              | 970   | 1,505              | 1,285  | 1,800            | 2,850   | 3,800            | 2,850  | 3,800              | 1,340                               | 3.9            |
|              | 18                             | 10,975               | 3,010            | 1,427                                    | 12.3             | N/A   | 2,240 <sup>7</sup> | N/A  | 2,620            | N/A   | 4,720            | N/A  | 4,720              | 3,200 <sup>8</sup>                  | 4.6            |
|              | 20                             | 12,270               | 3,240            | 1,813                                    | 13.7             | N/A   | 2,490 <sup>7</sup> | N/A  | 2,980            | N/A   | 5,110            | N/A  | 5,110              | 3,200 <sup>8</sup>                  | 4.9            |
| AJS-30       | 22                             | 13,455               | 3,470            | 2,249                                    | 15.0             | N/A   | 2,490 <sup>7</sup> | N/A  | 3,150            | N/A   | 5,230            | N/A  | 5,505              | 2,700 <sup>8</sup>                  | 5.1            |
|              | 24                             | 14,625               | 3,690            | 2,737                                    | 16.5             | N/A   | 2,490 <sup>7</sup> | N/A  | 3,320            | N/A   | 5,345            | N/A  | 5,900              | 2,700 <sup>8</sup>                  | 5.4            |
|              | 18                             | 13,905               | 3,010            | 1,575                                    | 12.3             | N/A   | 2,240 <sup>7</sup> | N/A  | 2,620            | N/A   | 4,720            | N/A  | 4,720              | 3,200 <sup>8</sup>                  | 4.6            |
|              | 20                             | 15,540               | 3,240            | 1,998                                    | 13.7             | N/A   | 2,490 <sup>7</sup> | N/A  | 2,980            | N/A   | 5,110            | N/A  | 5,110              | 3,200 <sup>8</sup>                  | 4.9            |
| 22           | 17,040                         | 3,470                | 2,477            | 15.0                                     | N/A              | 2,490 <sup>7</sup>  | N/A                | 3,150  | N/A              | 5,230   | N/A              | 5,505  | 2,700 <sup>8</sup> | 5.1                                 |                |
| 24           | 18,525                         | 3,690                | 3,012            | 16.5                                     | N/A              | 2,490 <sup>7</sup>  | N/A                | 3,320  | N/A              | 5,345   | N/A              | 5,900  | 2,700 <sup>8</sup> | 5.4                                 |                |

For SI: 1 inch = 25.4 mm; 1 ft-lb = 1.36 N-m; 1 in<sup>2</sup>-lb = 179 mm<sup>2</sup>-N, 1 in-lb/in = 4.4 N-mm/mm; 1 lb = 4.45 N; 1 lb/ft = 14.6 N/m.

<sup>1</sup> For I-joist description, see Table 1.

<sup>2</sup> Deflections are calculated using standard engineering formulae for bending deflection and 8M/K for shear deflection. Refer to Section 4.10 in this report.

<sup>3</sup> Minimum bearing length required.

<sup>4</sup> No = Web stiffener is not required.

<sup>5</sup> Yes = Web stiffener required. See Figure 1.

<sup>6</sup> Allowable vertical load capacity for I-joists used as blocking panels.

<sup>7</sup> For I-joists with depths greater than or equal to 18 inches, the minimum end bearing length must be 3<sup>1</sup>/<sub>4</sub> inches.

<sup>8</sup> Web stiffeners required at each end of blocking panel. See Figure 1. Distance between stiffeners must be ≤ 24 inches.

<sup>9</sup> The tabulated reference design reaction values,  $R_r$ , are for normal duration of load and are permitted to be adjusted for other load durations in accordance with the NDS, provided the adjusted design reaction,  $R_r'$ , does not exceed the adjusted flange bearing capacity,  $P_{c,1}'$ , calculated as follows:

$$P_{c,1}' = F_{c,1}' \ell_b (w_f - 0.15)$$

where:  $F_{c,1}'$  = 425 psi for end reactions, 470 psi for 3<sup>1</sup>/<sub>2</sub>-inch intermediate reactions, and 455 psi for 5<sup>1</sup>/<sub>4</sub>-inch intermediate reactions.

$\ell_b$  = Bearing length in inches.

$w_f$  = The nominal width of the flange in inches.

TABLE 3—AJS ALLOWABLE FLOOR SPANS<sup>1,2,3,4,5,6,7</sup>

| SERIES  | DEPTH (inches)                 | ON-CENTER SPACING |           |             |            |
|---------|--------------------------------|-------------------|-----------|-------------|------------|
|         |                                | 12 inches         | 16 inches | 19.2 inches | 24 inches  |
| AJS-5   | 9 <sup>1</sup> / <sub>2</sub>  | 18' - 6"          | 16' - 0"  | 14' - 7"    | 13' - 0"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 21' - 1"          | 18' - 3"  | 16' - 7"    | 14' - 10"  |
| AJS-10  | 9 <sup>1</sup> / <sub>2</sub>  | 21' - 2"          | 18' - 8"  | 17' - 0"    | 15' - 3"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 24' - 7"          | 21' - 3"  | 19' - 5"    | 17' - 4"   |
|         | 14                             | 27' - 0"          | 23' - 5"  | 21' - 4"    | 18' - 11"  |
|         | 16                             | 29' - 1"          | 25' - 2"  | 23' - 0"    | *20' - 4"  |
| AJS-20  | 9 <sup>1</sup> / <sub>2</sub>  | 21' - 2"          | 19' - 4"  | 18' - 3"    | 16' - 4"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 25' - 2"          | 22' - 10" | 20' - 10"   | 18' - 7"   |
|         | 14                             | 28' - 6"          | 25' - 0"  | 22' - 10"   | *20' - 3"  |
|         | 16                             | 31' - 2"          | 27' - 0"  | *24' - 5"   | *21' - 10" |
| AJS-140 | 9 <sup>1</sup> / <sub>2</sub>  | 19' - 9"          | 17' - 0"  | 15' - 6"    | 13' - 10"  |
|         | 11 <sup>1</sup> / <sub>8</sub> | 22' - 4"          | 19' - 4"  | 17' - 8"    | 15' - 9"   |
|         | 14                             | 24' - 7"          | 21' - 3"  | 19' - 5"    | 17' - 4"   |
|         | 16                             | 26' - 6"          | 22' - 11" | 20' - 11"   | 18' - 8"   |
| AJS-150 | 9 <sup>1</sup> / <sub>2</sub>  | 20' - 1"          | 18' - 3"  | 16' - 7"    | 14' - 10"  |
|         | 11 <sup>1</sup> / <sub>8</sub> | 23' - 11"         | 20' - 9"  | 18' - 11"   | 16' - 11"  |
|         | 14                             | 26' - 4"          | 22' - 9"  | 20' - 9"    | 18' - 7"   |
|         | 16                             | 28' - 5"          | 24' - 7"  | 22' - 5"    | *19' - 10" |
| AJS-160 | 9 <sup>1</sup> / <sub>2</sub>  | 20' - 5"          | 18' - 9"  | 17' - 4"    | 15' - 6"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 24' - 4"          | 21' - 8"  | 19' - 9"    | 17' - 8"   |
|         | 14                             | 27' - 5"          | 23' - 9"  | 21' - 8"    | *19' - 2"  |
|         | 16                             | 29' - 7"          | 25' - 7"  | 23' - 4"    | *20' - 8"  |
| AJS-170 | 9 <sup>1</sup> / <sub>2</sub>  | 20' - 9"          | 19' - 0"  | 18' - 0"    | 16' - 1"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 24' - 9"          | 22' - 6"  | 20' - 6"    | 18' - 4"   |
|         | 14                             | 28' - 1"          | 24' - 8"  | 22' - 6"    | *19' - 11" |
|         | 16                             | 30' - 9"          | 26' - 7"  | 24' - 1"    | *21' - 6"  |
| AJS-180 | 9 <sup>1</sup> / <sub>2</sub>  | 21' - 2"          | 19' - 4"  | 18' - 3"    | 16' - 11"  |
|         | 11 <sup>1</sup> / <sub>8</sub> | 25' - 2"          | 23' - 0"  | 21' - 4"    | *19' - 1"  |
|         | 14                             | 28' - 6"          | 25' - 8"  | 23' - 8"    | *21' - 0"  |
|         | 16                             | 31' - 7"          | 27' - 11" | *25' - 4"   | *22' - 7"  |
| AJS-190 | 9 <sup>1</sup> / <sub>4</sub>  | 21'-0"            | 19'-3"    | 18'-2"      | 16'-11"    |
|         | 9 <sup>1</sup> / <sub>2</sub>  | 21' - 5"          | 19' - 7"  | 18' - 6"    | 17' - 3"   |
|         | 11 <sup>1</sup> / <sub>4</sub> | 24'-6"            | 22'-4"    | 21'-2"      | *19' - 2"  |
|         | 11 <sup>1</sup> / <sub>8</sub> | 25' - 6"          | 23' - 4"  | 22' - 0"    | *19' - 9"  |
|         | 14                             | 28' - 11"         | 26' - 5"  | *24' - 4"   | *21' - 8"  |
|         | 16                             | 32' - 0"          | 28' - 11" | *26' - 2"   | *23' - 5"  |
| AJS-200 | 9 <sup>1</sup> / <sub>2</sub>  | 21' - 9"          | 19' - 11" | 18' - 10"   | 17' - 6"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 25' - 11"         | 23' - 8"  | 22' - 4"    | *20' - 5"  |
|         | 14                             | 9' - 4"           | 26' - 10" | *25' - 4"   | *22' - 5"  |
|         | 16                             | 32' - 6"          | *29' - 8" | *27' - 1"   | *24' - 2"  |
| AJS25   | 9 <sup>1</sup> / <sub>2</sub>  | 22' - 11"         | 21' - 0"  | 19' - 10"   | 18' - 6"   |
|         | 11 <sup>1</sup> / <sub>8</sub> | 27' - 3"          | 24' - 11" | 23' - 6"    | *21' - 11" |
|         | 14                             | 30' - 11"         | 28' - 3"  | *26' - 8"   | *24' - 10" |
|         | 16                             | 34' - 2"          | *31' - 3" | *29' - 6"   | *25' - 4"  |
|         | 18                             | 38'-2"            | 34'-10"   | 32'-11"     | 29'-6"     |
|         | 20                             | 41'-4"            | 37'-8"    | 34'-10"     | 31'-2"     |
|         | 22                             | 44'-4"            | 40'-0"    | 36'-6"      | 32'-8"     |
|         | 24                             | 47'-4"            | 41'-9"    | 38'-1"      | 34'-0"     |
| AJS30   | 18                             | 39'-4"            | 35'-10"   | 33'-10"     | 31'-6"     |
|         | 20                             | 42'-6"            | 38'-10"   | 36'-7"      | 34'-1"     |
|         | 22                             | 45'-8"            | 41'-8"    | 39'-4"      | 36'-8"     |
|         | 24                             | 48'-9"            | 44'-8"    | 42'-0"      | 38'-4"     |

For SI: 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

<sup>1</sup>For assemblies consisting of minimum <sup>23</sup>/<sub>32</sub>-inch-thick Sturd-I-Floor rated sheathing nailed to the I-joists in accordance with the applicable code and adhered to the top flanges of the I-joists using AFG-01 construction adhesive.

<sup>2</sup>Spans are based on a uniform residential floor loading of 40 psf live load and 10 psf dead load.

<sup>3</sup>Spans are for simply supported joists.

<sup>4</sup>Minimum end bearing length is 1<sup>1</sup>/<sub>2</sub> inches for joist depths 16 inches or less, and 1<sup>3</sup>/<sub>4</sub> inches for joist depths 18 inches or greater, except for spans\* (marked with an asterisk) which must have a minimum 3<sup>1</sup>/<sub>2</sub>-inch bearing length.

<sup>5</sup>Maximum spans are measured in accordance with Section 4.9, and are based on uniformly loaded joists.

<sup>6</sup>Live load deflection must be limited to L/360; total load deflection must be limited to L/240.

<sup>7</sup>Allowable spans take into consideration the composite effect from the glued and nailed subfloor for deflection purposes.

**TABLE 4—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF ROUND HOLE FOR JOIST DEPTHS OF 9 1/2 TO 16 INCHES** <sup>1,2,3,4,5,6</sup>

| SPAN (ft) | MINIMUM DISTANCE (ft-in)        |          |         |          |         |         |          |         |         |          |          |  |
|-----------|---------------------------------|----------|---------|----------|---------|---------|----------|---------|---------|----------|----------|--|
|           | Based on Joist Depth (in)       |          |         |          |         |         |          |         |         |          |          |  |
|           | 9 1/2                           |          |         | 11 7/8   |         |         | 14       |         |         | 16       |          |  |
|           | And Based on Hole Diameter (in) |          |         |          |         |         |          |         |         |          |          |  |
|           | 3                               | 6        | 3       | 6        | 3       | 6       | 9        | 3       | 6       | 9        | 12       |  |
| 8         | 1' - 0"                         | 2' - 0"  | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0"  |  |
| 10        | 1' - 0"                         | 3' - 0"  | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0"  |  |
| 12        | 1' - 0"                         | 4' - 0"  | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 2' - 0"  |  |
| 14        | 1' - 6"                         | 5' - 6"  | 1' - 0" | 1' - 6"  | 1' - 0" | 1' - 0" | 2' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 3' - 0"  |  |
| 16        | 2' - 6"                         | 6' - 6"  | 1' - 0" | 3' - 0"  | 1' - 0" | 1' - 0" | 3' - 6"  | 1' - 0" | 1' - 0" | 1' - 0"  | 4' - 0"  |  |
| 18        | 3' - 6"                         | 8' - 0"  | 1' - 0" | 4' - 0"  | 1' - 0" | 1' - 0" | 4' - 6"  | 1' - 0" | 1' - 0" | 1' - 6"  | 5' - 0"  |  |
| 20        | 4' - 6"                         | 9' - 0"  | 1' - 6" | 5' - 6"  | 1' - 0" | 2' - 0" | 5' - 6"  | 1' - 0" | 1' - 0" | 3' - 0"  | 6' - 6"  |  |
| 22        | 6' - 0"                         | 10' - 6" | 2' - 6" | 6' - 0"  | 1' - 0" | 3' - 0" | 7' - 0"  | 1' - 0" | 1' - 0" | 4' - 0"  | 7' - 6"  |  |
| 24        | 7' - 0"                         | 11' - 6" | 3' - 6" | 7' - 6"  | 1' - 0" | 4' - 6" | 8' - 0"  | 1' - 0" | 1' - 6" | 5' - 0"  | 9' - 0"  |  |
| 26        | —                               | —        | 5' - 0" | 8' - 6"  | 2' - 0" | 5' - 6" | 9' - 0"  | 1' - 0" | 3' - 0" | 6' - 0"  | 10' - 0" |  |
| 28        | —                               | —        | 6' - 0" | 10' - 0" | 3' - 0" | 6' - 6" | 10' - 6" | 1' - 0" | 4' - 0" | 7' - 6"  | 11' - 6" |  |
| 30        | —                               | —        | —       | —        | 4' - 0" | 7' - 6" | 11' - 6" | 1' - 6" | 5' - 0" | 8' - 6"  | 12' - 6" |  |
| 32        | —                               | —        | —       | —        | 5' - 6" | 9' - 0" | 13' - 0" | 3' - 0" | 6' - 0" | 9' - 6"  | 14' - 0" |  |
| 34        | —                               | —        | —       | —        | —       | —       | —        | 4' - 0" | 7' - 0" | 11' - 0" | 15' - 0" |  |

For SI: 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

<sup>1</sup>Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.

<sup>2</sup>For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.

<sup>3</sup>Where more than one hole is desired, the length of web between holes must be equal to twice the diameter of the largest hole.

<sup>4</sup>Flanges may not be cut or notched.

<sup>5</sup>A 1 1/2-inch-diameter hole may be cut anywhere in the web.

<sup>6</sup>See Figure 2 in this report for details.

**TABLE 5—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF ROUND HOLE FOR JOIST DEPTHS OF 18 TO 24 INCHES** <sup>1,2,3,4,5,6</sup>

| SPAN (ft) | MINIMUM DISTANCE (ft-in)        |         |          |         |         |          |         |         |          |         |         |          |
|-----------|---------------------------------|---------|----------|---------|---------|----------|---------|---------|----------|---------|---------|----------|
|           | Based on Joist Depth (in)       |         |          |         |         |          |         |         |          |         |         |          |
|           | 18                              |         |          | 20      |         |          | 22      |         |          | 24      |         |          |
|           | And Based on Hole Diameter (in) |         |          |         |         |          |         |         |          |         |         |          |
|           | 4.5                             | 9       | 13.5     | 5       | 10      | 15       | 5.5     | 11      | 16.5     | 6       | 12      | 18       |
| 10        | 1' - 0"                         | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  |
| 12        | 1' - 0"                         | 1' - 0" | 2' - 0"  | 1' - 0" | 1' - 0" | 1' - 6"  | 1' - 0" | 1' - 0" | 1' - 0"  | 1' - 0" | 1' - 0" | 1' - 0"  |
| 14        | 1' - 0"                         | 1' - 0" | 3' - 6"  | 1' - 0" | 1' - 0" | 2' - 6"  | 1' - 0" | 1' - 0" | 1' - 6"  | 1' - 0" | 1' - 0" | 1' - 0"  |
| 16        | 1' - 0"                         | 1' - 0" | 4' - 6"  | 1' - 0" | 1' - 0" | 3' - 6"  | 1' - 0" | 1' - 0" | 2' - 6"  | 1' - 0" | 1' - 0" | 2' - 0"  |
| 18        | 1' - 0"                         | 1' - 0" | 5' - 6"  | 1' - 0" | 1' - 0" | 4' - 6"  | 1' - 0" | 1' - 0" | 4' - 0"  | 1' - 0" | 1' - 0" | 3' - 0"  |
| 20        | 1' - 0"                         | 1' - 0" | 7' - 0"  | 1' - 0" | 1' - 0" | 6' - 0"  | 1' - 0" | 1' - 0" | 5' - 0"  | 1' - 0" | 1' - 0" | 4' - 0"  |
| 22        | 1' - 0"                         | 1' - 0" | 8' - 0"  | 1' - 0" | 1' - 0" | 7' - 0"  | 1' - 0" | 1' - 0" | 6' - 0"  | 1' - 0" | 1' - 0" | 5' - 6"  |
| 24        | 1' - 0"                         | 1' - 0" | 9' - 6"  | 1' - 0" | 1' - 0" | 8' - 6"  | 1' - 0" | 1' - 0" | 7' - 6"  | 1' - 0" | 1' - 0" | 6' - 6"  |
| 26        | 1' - 0"                         | 2' - 0" | 10' - 6" | 1' - 0" | 1' - 0" | 9' - 6"  | 1' - 0" | 1' - 0" | 8' - 6"  | 1' - 0" | 1' - 0" | 7' - 6"  |
| 28        | 1' - 0"                         | 3' - 6" | 12' - 0" | 1' - 0" | 2' - 0" | 10' - 6" | 1' - 0" | 1' - 0" | 9' - 6"  | 1' - 0" | 1' - 0" | 9' - 0"  |
| 30        | 1' - 0"                         | 4' - 6" | 13' - 0" | 1' - 0" | 3' - 0" | 12' - 0" | 1' - 0" | 2' - 0" | 11' - 0" | 1' - 0" | 1' - 0" | 10' - 0" |
| 32        | 1' - 0"                         | 5' - 6" | 14' - 6" | 1' - 0" | 4' - 0" | 13' - 0" | 1' - 0" | 3' - 0" | 12' - 0" | 1' - 0" | 2' - 0" | 11' - 6" |
| 34        | 1' - 0"                         | 6' - 6" | 15' - 6" | 1' - 0" | 5' - 6" | 14' - 6" | 1' - 0" | 4' - 0" | 13' - 6" | 1' - 0" | 3' - 0" | 12' - 6" |
| 36        | 1' - 0"                         | 7' - 6" | 17' - 0" | 1' - 0" | 6' - 6" | 15' - 6" | 1' - 0" | 5' - 0" | 14' - 6" | 1' - 0" | 4' - 0" | 13' - 6" |
| 38        | 1' - 6"                         | 9' - 0" | 18' - 0" | 1' - 0" | 7' - 6" | 17' - 0" | 1' - 0" | 6' - 0" | 16' - 0" | 1' - 0" | 5' - 0" | 15' - 0" |
| 40        | —                               | —       | —        | 1' - 0" | 8' - 6" | 18' - 0" | 1' - 0" | 7' - 6" | 17' - 0" | 1' - 0" | 6' - 0" | 16' - 0" |

For SI: 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

<sup>1</sup>Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.

<sup>2</sup>For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.

<sup>3</sup>Where more than one hole is desired, the length of web between holes must be equal to twice the diameter of the largest hole.

<sup>4</sup>Flanges may not be cut or notched.

<sup>5</sup>A 1 1/2-inch-diameter-hole may be cut anywhere in the web.

<sup>6</sup>See Figure 2 in this report for details.

**TABLE 6—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF RECTANGULAR HOLE FOR JOIST DEPTHS OF 9 1/2 TO 16 INCHES<sup>1,2,3,4,5,6</sup>**

| SPAN (ft) | MINIMUM DISTANCE (ft-in)          |          |         |         |          |          |         |         |          |         |         |         |         |
|-----------|-----------------------------------|----------|---------|---------|----------|----------|---------|---------|----------|---------|---------|---------|---------|
|           | Based on Joist Depth (in)         |          |         |         |          |          |         |         |          |         |         |         |         |
|           | 9 1/2                             |          |         | 11 7/8  |          |          |         | 14      |          |         | 16      |         |         |
|           | And Based on Hole Dimensions (in) |          |         |         |          |          |         |         |          |         |         |         |         |
|           | 5 x 8                             | 5 x 10   | 5 x 12  | 5 x 14  | 7 x 10   | 7 x 12   | 7 x 14  | 7 x 16  | 10 x 12  | 10 x 14 | 10 x 16 | 12 x 14 | 12 x 16 |
| 8         | 1' - 6"                           | 2' - 0"  | 2' - 6" | 3' - 0" | 1' - 6"  | 2' - 0"  | 2' - 6" | 3' - 0" | 2' - 0"  | 2' - 6" | 3' - 0" | 2' - 6" | 3' - 0" |
| 10        | 3' - 0"                           | 3' - 0"  | 3' - 6" | 4' - 0" | 2' - 6"  | 3' - 0"  | 3' - 6" | 4' - 0" | 3' - 0"  | 3' - 6" | 4' - 6" | 3' - 6" | 4' - 6" |
| 12        | 4' - 0"                           | 4' - 6"  | 5' - 0" | 5' - 6" | 3' - 6"  | 4' - 0"  | 5' - 0" | 5' - 6" | 4' - 6"  | 5' - 0" | 5' - 6" | 4' - 6" | 5' - 6" |
| 14        | 5' - 0"                           | 5' - 6"  | 6' - 0" | 6' - 6" | 5' - 0"  | 5' - 6"  | 6' - 0" | 6' - 6" | 5' - 6"  | 6' - 0" | —       | 6' - 0" | —       |
| 16        | 6' - 6"                           | 7' - 0"  | 7' - 6" | —       | 6' - 0"  | 6' - 6"  | 7' - 6" | —       | 6' - 6"  | 7' - 6" | —       | 7' - 0" | —       |
| 18        | 7' - 6"                           | 8' - 0"  | 8' - 6" | —       | 7' - 6"  | 8' - 0"  | 8' - 6" | —       | 8' - 0"  | —       | —       | 8' - 6" | —       |
| 20        | 9' - 0"                           | 9' - 6"  | —       | —       | 8' - 6"  | 9' - 0"  | —       | —       | 9' - 0"  | —       | —       | 9' - 6" | —       |
| 22        | 10' - 0"                          | 10' - 6" | —       | —       | 10' - 0" | 10' - 6" | —       | —       | 10' - 6" | —       | —       | —       | —       |
| 24        | 11' - 6"                          | —        | —       | —       | 11' - 0" | 11' - 6" | —       | —       | —        | —       | —       | —       | —       |
| 26        | —                                 | —        | —       | —       | 12' - 6" | —        | —       | —       | —        | —       | —       | —       | —       |
| 28        | —                                 | —        | —       | —       | 13' - 6" | —        | —       | —       | —        | —       | —       | —       | —       |
| 30        | —                                 | —        | —       | —       | —        | —        | —       | —       | —        | —       | —       | —       | —       |
| 32        | —                                 | —        | —       | —       | —        | —        | —       | —       | —        | —       | —       | —       | —       |
| 34        | —                                 | —        | —       | —       | —        | —        | —       | —       | —        | —       | —       | —       | —       |

For SI: 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

<sup>1</sup>Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.

<sup>2</sup>For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.

<sup>3</sup>Where more than one hole is desired, the length of web between holes must be equal to twice the greatest dimension of the largest hole.

<sup>4</sup>Flanges may not be cut or notched.

<sup>5</sup>A 1 1/2-inch-diameter hole may be cut anywhere in the web.

<sup>6</sup>See Figure 2 in this report for details.

**TABLE 7—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF SQUARE HOLE FOR JOIST DEPTHS OF 18 TO 24 INCHES<sup>1,2,3,4,5,6</sup>**

| SPAN (ft) | MINIMUM DISTANCE (ft-in)          |          |         |          |          |         |          |          |          |          |          |         |
|-----------|-----------------------------------|----------|---------|----------|----------|---------|----------|----------|----------|----------|----------|---------|
|           | Based on Joist Depth (in)         |          |         |          |          |         |          |          |          |          |          |         |
|           | 18                                |          |         | 20       |          |         | 22       |          |          | 24       |          |         |
|           | And Based on Hole Dimensions (in) |          |         |          |          |         |          |          |          |          |          |         |
|           | 10 x 10                           | 12 x 12  | 14 x 14 | 12 x 12  | 14 x 14  | 16 x 16 | 12 x 12  | 14 x 14  | 16 x 16  | 14 x 14  | 16 x 16  | 18 x 18 |
| 8         | 1' - 0"                           | 1' - 0"  | 2' - 0" | 1' - 0"  | 1' - 0"  | 3' - 0" | 1' - 0"  | 1' - 0"  | 2' - 0"  | 1' - 0"  | 1' - 0"  | 3' - 6" |
| 10        | 1' - 0"                           | 1' - 0"  | 3' - 6" | 1' - 0"  | 2' - 0"  | 4' - 6" | 1' - 0"  | 1' - 0"  | 3' - 0"  | 1' - 0"  | 2' - 0"  | 4' - 6" |
| 12        | 1' - 0"                           | 2' - 0"  | 4' - 6" | 1' - 0"  | 3' - 0"  | 5' - 6" | 1' - 0"  | 2' - 0"  | 4' - 6"  | 1' - 0"  | 3' - 0"  | 4' - 6" |
| 14        | 1' - 0"                           | 3' - 6"  | 6' - 0" | 2' - 0"  | 4' - 6"  | —       | 1' - 0"  | 3' - 0"  | 5' - 6"  | 2' - 0"  | 4' - 6"  | —       |
| 16        | 2' - 6"                           | 4' - 6"  | 7' - 0" | 3' - 0"  | 5' - 6"  | —       | 2' - 0"  | 4' - 6"  | 7' - 0"  | 3' - 0"  | 5' - 6"  | —       |
| 18        | 3' - 6"                           | 5' - 6"  | 8' - 6" | 4' - 6"  | 7' - 0"  | —       | 3' - 0"  | 5' - 6"  | 8' - 0"  | 4' - 6"  | 7' - 0"  | —       |
| 20        | 4' - 6"                           | 7' - 0"  | 9' - 6" | 5' - 6"  | 8' - 0"  | —       | 4' - 0"  | 6' - 6"  | 9' - 6"  | 5' - 6"  | 8' - 0"  | —       |
| 22        | 5' - 6"                           | 8' - 0"  | —       | 6' - 6"  | 9' - 0"  | —       | 5' - 6"  | 8' - 0"  | 10' - 6" | 6' - 6"  | 9' - 6"  | —       |
| 24        | 7' - 0"                           | 9' - 6"  | —       | 8' - 6"  | 10' - 6" | —       | 6' - 6"  | 9' - 0"  | —        | 8' - 0"  | 10' - 6" | —       |
| 26        | 8' - 0"                           | 10' - 6" | —       | 9' - 0"  | 12' - 0" | —       | 7' - 6"  | 10' - 6" | —        | 9' - 0"  | 12' - 0" | —       |
| 28        | 9' - 0"                           | 12' - 0" | —       | 10' - 6" | 13' - 0" | —       | 9' - 0"  | 11' - 6" | —        | 10' - 6" | 13' - 0" | —       |
| 30        | 10' - 6"                          | 13' - 0" | —       | 11' - 6" | 14' - 6" | —       | 10' - 0" | 13' - 0" | —        | 11' - 6" | 14' - 6" | —       |
| 32        | 11' - 6"                          | 14' - 6" | —       | 13' - 0" | 15' - 6" | —       | 11' - 6" | 14' - 0" | —        | 12' - 6" | 15' - 6" | —       |
| 34        | 13' - 0"                          | 15' - 6" | —       | 14' - 0" | —        | —       | 12' - 6" | 15' - 6" | —        | 14' - 0" | —        | —       |

For SI: 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

<sup>1</sup>Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.

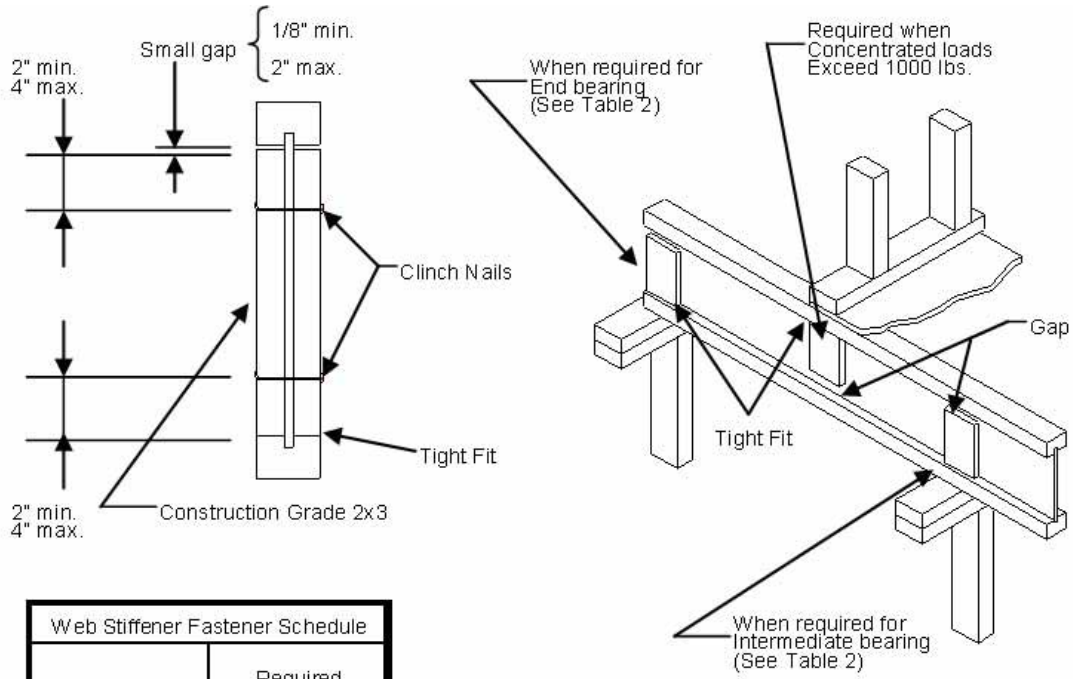
<sup>2</sup>For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.

<sup>3</sup>Where more than one hole is desired, the length of web between holes must be equal to twice the greatest dimension of the largest hole.

<sup>4</sup>Flanges may not be cut or notched.

<sup>5</sup>A 1 1/2-inch-diameter hole may be cut anywhere in the web.

<sup>6</sup>See Figure 2 in this report for details.

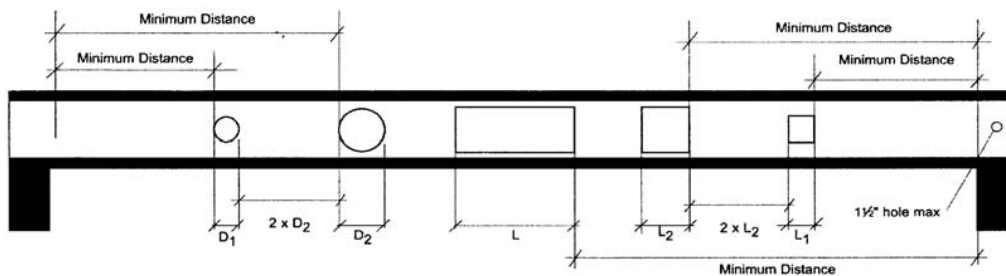


| Web Stiffener Fastener Schedule |                    |
|---------------------------------|--------------------|
| Joist Depth                     | Required Fasteners |
| 9-1/4"                          | 3-10d              |
| 9-1/2"                          | 3-10d              |
| 11-1/4"                         | 3-10d              |
| 11-7/8"                         | 3-10d              |
| 14"                             | 5-10d              |
| 16"                             | 5-10d              |
| 18"                             | 5-10d              |
| 20"                             | 5-10d              |
| 22"                             | 5-10d              |
| 24"                             | 5-10d              |

<sup>1</sup>Nails shall be equally spaced vertically.

<sup>2</sup>Stiffeners are required on all joists supported by U-type hangers when the sides of the hanger do not extend up far enough to support the top flanges laterally.

**FIGURE 1—WEB STIFFENER INSTALLATION REQUIREMENTS**



**FIGURE 2—HOLE IN WEB REQUIREMENTS**