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## NATIONAL EVALUATION REPORT

Report No. **NER-200**

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### TJI® JOIST

#### TRUS JOIST MACMILLAN

A Limited Partnership  
200 EAST MALLARD DRIVE/P.O. BOX 60  
BOISE, IDAHO 83706/83707

### 1.0 SUBJECT

#### TJI® Joist

Note: TJI®, Microllam®, Performance Plus®, TimberStrand® and Trus Joist MacMillan® are registered trademarks of Trus Joist MacMillan (TJM) a limited partnership, Boise, Idaho.

### 2.0 PROPERTY FOR WHICH EVALUATION IS SOUGHT

- 2.1 Structural Wood Framing
- 2.2 Fire Resistance
- 2.3 Sound Transmission

### 3.0 DESCRIPTION

#### 3.1 General

The TJI joist is an I-joist with various combinations of wood flanges and webs as noted in Table 1. The top and bottom flanges are placed to create either a constant depth TJI joist (parallel) or a constantly varying depth TJI joist (single taper).

The web butt joints of the TJI joists are either square or serrated as required by the specific TJM manufacturing standard. The web flange connection is made by inserting the web into a groove in the center of the face of the flange members.

#### 3.2 Fabrication Procedure

The TJI joist is produced in a continuous fabrication process. The flange and web members are fed into a machine which assembles them into the finished products.

### 3.3 Material Specifications

**Flanges:** Microllam LVL and TimberStrand LSL are manufactured according to the TJM manufacturing standards specified in National Evaluation Service Report No. NER-481.

**Webs:** Web material for the TJI joist is either plywood conforming to PS 1-95 along with further requirements set forth by the TJM manufacturing standards or Performance Plus® OSB conforming to PS 2-92, Exposure 1 with further requirements set forth in the TJM manufacturing standards.

Performance Plus OSB web material is produced in mills which subscribe to quality control supervision and inspection by American Plywood Association (NER-QA397). Additional mill inspection is provided by PFS Corporation (NER-QA251) to ensure compliance with the additional unique requirements of the TJM manufacturing standards.

**Adhesive:** Adhesives shall be of the types specified in the TJM manufacturing standards.

### 3.4 Design

The allowable design values are outlined in Table 2. The requirements for web stiffeners and minimum bearing lengths are shown in Figure 1 and Table 2. The joist webs are permitted to have holes as set forth in the allowable hole charts noted in Figures 2 and 3 for plywood webs and Performance Plus OSB webs, respectively.

When joists are used as simple-span members, the design shear is equal to the end reaction.

When joists are used as multiple span members, the design shear is the calculated shear at the interior support reduced by the following:

$$R = W/K \leq 18\%$$

Where:

R = The percent reduction

W = Uniform load, plf

K =  $V_{12}/100$

$V_{12}$  = The allowable shear for a 12 inch (or 11-7/8 inch) deep joist

*This report is limited to the specific product and data and test reports submitted by the applicant in its application requesting this report. No independent tests were performed by the National Evaluation Service, Inc. (NES), and NES specifically does not make any warranty, either expressed or implied, as to any finding or other matter in this report or as to any product covered by this report. This disclaimer includes, but is not limited to, merchantability. This report is also subject to the limitation listed herein.*

By series the constants are -

Joist Series	Joist Depth (in)	V <sub>12</sub>	K
TJI/Pro 150, TJI/Pro 150TS	≤ 11 7/8	1420	14.2
TJI/Pro 250, TJI/Pro 350, TJI Pro 120TS	≤ 16	1420	14.2
TJI/Pro 25P, TJI/L45P, TJI/Pro 35P	≤ 16	990	9.9
TJI/Pro 550, TJI/L60, TJI/L65, TJI/H60, TJI/L90, TJI/H90	≤ 24	1925	19.25
TJI/Pro 350P, TJI/L60P	≤ 24	1420	14.2
TJI/Pro 550P, TJI/L90P, TJI/H60P, TJI/H90P	≤ 24	1575	15.75
TJI/H90X	≤ 24	2555	25.55

For SI: 1 inch = 25.4mm

For all other joist depths, the design shear is the calculated shear at the face of the interior support.

The allowable design shear of multiple span member joists up to 12 inches (305 mm) deep used in residential floor construction is permitted to be increased an additional 10 percent.

For joists qualifying as repetitive members, the bending resistance is permitted to be increased 4 percent for joists with Microllam LVL and TimberStrand LSL flanges.

The top flange of TJI joists shall be laterally supported at least every 24 inches (610 mm) except that 18 inches (457 mm) is required for joists with flanges 2 inches (51 mm) and less in width. The TJI joist ends shall be restrained to prevent rollover. End 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 minimum force of 50 pounds per foot (730 N/m) or the required shear forces due to wind or seismic conditions. Blocking or crossbracing with equivalent strength is permitted.

Bridging is not required in TJI floor and roof joist applications.

**3.5 One-hour, Fire-resistive Roof-Ceiling or Floor-Ceiling Ratings are Assigned to the Following Constructions** (descriptive details for each assembly are noted below and in Figure 4).

**3.5.1 Assembly A:**

1. A double wood floor consisting of a subfloor of nominal 1 inch (25.4 mm) thick tongue-and-groove sheathing or 32/16 span rated sheathing (Exposure 1), and a second layer of nominal 1 inch (25.4 mm) thick tongue-and-groove finish flooring. Alternatively, the finish flooring is permitted to be 40/20 span rated sheathing (Exposure 1) or Type I Grade M-1 particleboard not less than 5/8 inch (15.9 mm) thick.

When used as a roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1),

complying with the applicable code, is permitted to be used for roof sheathing.

All butt joints of the floor or roof sheathing shall be located over framing members.

2. TJI joists shall be installed in accordance with this report with a maximum spacing of 48 inches (1220 mm) on center.
3. The suspended ceiling shall consist of 5/8 inch (15.9 mm) thick, 2 foot by 2 foot (610 mm x 610 mm) or 2 foot by 4 foot (610 mm x 1220 mm) USG FIRECODE AURATONE® lay-in acoustical board supported by an approved exposed fire-rated suspension system attached to the bottom flange or to cold-rolled channels spaced not over 48 inches (1220 mm) on center. When joists are spaced greater than 24 inches (610 mm) on center, framing perpendicular to the joists shall be installed at 24 inches (610 mm) on center to support the ceiling.
4. Installed over the acoustical board ceiling is minimum 1 inch (25.4 mm) thick, minimum 4 pcf (64 kg/m<sup>3</sup>) Thermafiber® Sound Attenuation Fire Blankets or Fibrex®-FBX 1240 Industrial Boards or Fibrex®-IF 1240 Flex Batts.

Light fixtures having a maximum size of 2 feet by 4 feet (610 mm by 1220 mm) are permitted to be installed in the ceiling, provided the aggregate areas of fixtures do not exceed 12 square feet (1.1 m<sup>2</sup>) per 100 square feet (9.3 m<sup>2</sup>) of ceiling area and the fixtures are protected as follows [using for illustration a 2 foot by 4 foot (610 mm by 1220 mm) fixture]: A 2-1/4 inch (57 mm) by 48 inch (1220 mm) by 1-1/4 inch (31.7 mm) thick piece of minimum 4 pcf (64 kg/m<sup>3</sup>) Thermafiber rigid mineral fiber board, Fibrex-FBX 1240 Industrial Board, or Fibrex-IF 1240 Flex Batt light fixture protection is laid along the long sides of the fixture and against adjacent suspension members; two pieces of the same insulation measuring 19-1/2 inches (495 mm) by 48 inches (1220 mm) are laid over the top of the fixture and a 4-1/2 inch (114 mm) by 24 inch (610 mm) piece of the same insulation is laid at each end and tied at the corners of the fixture, to the top pieces with No. 18 SWG steel wire (see Figure 5). In addition, ceiling openings for air difusers up to a maximum size of 12 inches (305 mm) in diameter are permitted, provided openings are protected with code complying fire dampers and the aggregate areas do not exceed 113 square inches (72,900 mm<sup>2</sup>) per 100 square feet (9.3 m<sup>2</sup>) of ceiling area. The distance from the bottom of the TJI joist to the soffit of the ceiling shall be at least 10 inches (254 mm).

**3.5.2 Assembly B**

1. The flooring shall consist of a single layer of 48/24 tongue-and-groove span rated sheathing (Exposure 1).

When used as a roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1), complying with the applicable code, is permitted to be used for roof sheathing.

All butt joints of the floor or roof sheathing shall be located over framing members.

2. TJI joists shall be installed in accordance with this report with a maximum spacing of 24 inches (610 mm) on center for floor-ceiling assemblies. When used in roof-ceiling assemblies, the TJI joists are permitted to be spaced a maximum of 48 inches (1220 mm) on center.
3. Optional 3-1/2 inch (89 mm) thick glass fiber batt insulation is permitted to be installed when resilient channels are used. The insulation shall be placed above the resilient channels between the joist bottom flanges.
4. The ceiling membrane shall consist of two layers of 1/2 inch (12.7 mm) thick Type X gypsum board applied to the joist bottom flange. The first layer of gypsum board shall be attached with 1-5/8 inch (41.3 mm) long Type S screws spaced 12 inches (305 mm) on center. The second layer shall be installed with the joints staggered from the first layer. The second layer shall be fastened to the joists with 2 inch (51 mm) long Type S screws spaced 12 inches (305 mm) on center in the field and 8 inches (203 mm) on center at the butt joints.

Type G screws, 1-1/2 inches (38 mm) long, shall be spaced 8 inches (203 mm) on center and 6 inches (152 mm) from each side of the butt joints of the second layer. The second layer shall 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 16 inches (406 mm) on center [24 inches (610 mm) on center, if joists are 16 inches (406 mm) on center] and fastened perpendicular to the joists with 1 inch (25.4 mm) long Type S screws. The first layer of gypsum board shall be fastened to the resilient channels with 1 inch (25.4 mm) long Type S screws spaced 12 inches (305 mm) on center. The second layer shall be installed with the joints staggered from the first layer and fastened with 1-5/8 inch (41.3 mm) long Type S screws, spaced 12 inches (305 mm) on center in the field and 8 inches (203 mm) on center at the butt joints.

Type G screws, 1-1/2 inches (38 mm) long, shall be spaced 8 inches (203 mm) on center and 6 inches (152 mm) from each side of the butt joints of the second layer. The second layer shall be finished with joint tape and compound.

In roof-ceiling assemblies in which TJI joists are spaced more than 24 inches (610 mm) on center, the ceiling, including the resilient channels, shall be applied to stripping spaced 24 inches (610 mm) on center. The attachment of the ceiling membrane to the stripping members shall be similar to the attachment of the ceiling membrane to the TJI joists. The stripping shall be a minimum of nominal 2 x 4 Construction-grade Douglas fir lumber for spans up to 5 feet (1524 mm) and shall be attached to the bottom flanges with minimum 10d nails. Wood stripping

materials of equivalent strength and attachment are permitted when specifically approved by the building official.

### 3.5.3 Assembly C:

1. The flooring shall consist of a single layer of 48/24 tongue-and-groove span rated sheathing (Exposure 1).

When used as a roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1), complying with the applicable code, is permitted to be used for roof sheathing.

All butt joints of the floor or roof sheathing must be located over framing members.

2. TJI joists shall be installed in accordance with this report with a maximum spacing of 24 inches (610 mm) on center for floor-ceiling assemblies and a maximum spacing of 48 inches (1220 mm) on center for roof-ceiling assemblies. When used in roof-ceiling assemblies in which the joist spacing exceeds 24 inches (610 mm) on center, framing perpendicular to the joists shall be installed at 24 inches (610 mm) on center to support the ceiling.

3. The ceiling membrane shall consist of a single layer of 1/2 inch (12.7 mm) thick Type X gypsum board attached to joists or to stripping spaced at a maximum of 24 inches (610 mm) on center. The gypsum board shall be fastened with 1-5/8 inch (41.3 mm) long Type S screws located 6 inches (152 mm) on center at end joints and 8 inches (203 mm) on center in the field.

4. An approved, exposed, fire rated suspended ceiling system shall be installed beneath the gypsum board ceiling. The minimum distance between the suspended ceiling and the gypsum board ceiling shall be 12 inches (305 mm). The grid system shall be suspended with No. 12 SWG galvanized steel wire fastened to the TJI joists or to stripping with 3 inch (76 mm) long flathead hanger screws. Light fixture protection shall consist of 6 inch (152 mm) wide pieces of ceiling grid panels that are 48 inches (1220 mm) long for the sides and 24 inches (610 mm) long for the ends, with a full grid panel placed on top.

A galvanized steel duct is permitted for each 200 square feet (18.6 m<sup>2</sup>) of ceiling area, provided the duct has a maximum 12 inch (305 mm) diameter steel diffuser opening without a damper and a maximum 6 inch x 12 inch (152 mm x 305 mm) return-air opening. Ceiling panels shall be 5/8 inch (15.9 mm) thick USG FIRECODE AURATONE. Noncombustible batt insulation that is rated R-30 or less is permitted to be installed above the gypsum board in the cavity between the joists.

### 3.5.4 Assembly D:

1. The flooring shall consist of a single layer of 48/24 tongue-and-groove span rated sheathing (Exposure 1).

When used as roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1), complying with the applicable code, is permitted to be used for roof sheathing.

All butt joints of the floor or roof sheathing shall be located over framing members.

2. TJI joists shall be installed in accordance with this report, with a maximum spacing of 24 inches (610 mm) on center.
3. The ceiling membrane shall consist of a single layer of ½ inch (12.7 mm) thick USG FIRECODE® Type C or Westroc® Fireboard C gypsum board screw-attached to steel furring channels placed perpendicular to the TJI joists. The furring channels are spaced 24 inches (610 mm) on center (maximum) and shall be suspended from the joists using No. 24 gauge proprietary attachment clips designated "Simpson Strong-Tie CSC Support Clips". A CSC support clip shall be located at each joist to support the furring channel. At channel splices, adjacent pieces are overlapped a minimum of 6 inches (152 mm) and are tied with double strand No. 18 SWG galvanized steel wire at each end of the overlap.
4. A layer of 1 inch (25.4 mm) thick, minimum 6 pcf (96 kg/m<sup>3</sup>), Thermafiber mineral wool fireproofing, or Fibrex-FBX 1280 Industrial Board or Fibrex-IF 1280 Flex Batt, shall be placed between the bottom flanges of the joists and the top of the furring channels. As an alternative, a layer of 2 inch (51 mm) thick, 8 pcf (128 kg/m<sup>3</sup>), Thermafiber mineral wool fireproofing is also permitted.

### 3.5.5 Assembly E:

1. The flooring shall consist of a double wood floor as described in Section 3.5.1, Assembly A of this report, or a single layer floor of 48/24 tongue-and-groove span rated sheathing (Exposure 1).

When used as a roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1), complying with the applicable code, is permitted to be used for roof sheathing.

All butt joints of the floor or roof sheathing shall be located over framing members.

2. TJI joists shall be installed in accordance with this report with a maximum spacing of 24 inches (610 mm) on center for floor-ceiling assemblies and with a maximum spacing of 48 inches (1220 mm) on center for roof-ceiling assemblies. When the flooring consists of a double wood floor as described in Section 3.5.1 Assembly A of this report, the joists are permitted to be spaced a maximum of 48 inches (1220) on center. When joists are spaced greater than 24 inches (610 mm) on center, framing perpendicular to the joists shall be installed at 24 inches (610 mm) on center to support the ceiling.

3. Any ceiling membrane that provides a 40 minute finish rating is permitted. An example of a ceiling having a 40 minute finish rating is one that consists of two layers of ½ inch (12.7 mm) thick, Type X gypsum board, installed perpendicular to the TJI joists, as described in Assembly B (Section 3.5.2 of this report). Substantiating data, including a report of the fire-endurance testing conducted in accordance with ASTM E 119, shall be furnished to the building official, and shall verify that a particular ceiling system meets the 40 minute finish rating requirement.

The finish rating of the membrane protection shall be determined in accordance with Sections 45 through 50 of ASTM E 119.

### 3.5.6 Assembly F:

1. The flooring shall consist of a single layer of 48/24 tongue-and-groove span rated sheathing (Exposure 1). The flooring shall be attached to the top flange of the joists with AFG-01 construction adhesive and nailed with 8d common nails spaced a maximum of 6 inches (152 mm) on center along the boundary and edges and 12 inches (305 mm) on center in the field.

When used as a roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1), complying with the applicable code, is permitted to be used as roof sheathing.

All butt joints of the floor or roof sheathing shall be located over framing members.

2. TJI joists shall have nominal 2 x 4 or larger flanges and shall be installed in accordance with this report. When used in a floor-ceiling assembly, the joist spacing shall not exceed 24 inches (610 mm) on center. When used in a roof-ceiling assembly, the joist spacing is permitted to exceed 24 inches (610 mm) on center.
3. The ceiling membrane shall consist of one layer of 5/8 inch (15.9 mm) thick, USG FIRECODE Type C or Westroc Fireboard C gypsum board, screw-attached to RC-1 resilient channels spaced 16 inches (406 mm) on center, placed perpendicular to the TJI joists. The resilient channels are attached with 1-5/8 inch (41.3 mm) long Type S screws at each TJI joist. Two resilient channels are provided at each gypsum board butt joint, and extend to the next joist beyond the longitudinal joints. The gypsum board shall be fastened to the resilient channels with 1 inch (25.4 mm) long Type S screws spaced at 12 inches (305 mm) on center in the field and 8 inches (203 mm) on center at the butt joints.

In roof-ceiling assemblies in which TJI joists are spaced more than 24 inches (610 mm) on center, the ceiling, including the resilient channels, shall be attached to stripping spaced 24 inches (610 mm) on center. The attachment of the ceiling membrane to the stripping members is similar to the attachment of the ceiling membrane to the TJI joists. For spans up to 5 feet (1524 mm), the stripping members shall be a minimum of nominal 2 x 4 Construction-grade

Douglas fir lumber. The stripping shall be attached to the bottom flanges with 10d nails. Wood stripping materials of equivalent strength and attachment are permitted when specifically approved by the building official.

4. A layer of 1-1/2 inch (38 mm) thick, 2-1/2 pcf (40 kg/m<sup>3</sup>), Thermafiber Sound Attenuation Fire Blankets or Fibrex SAFB (sound attenuation fire batts) shall be placed between the bottom flanges of the TJI joists and the top of the resilient channels. The insulation material shall be friction fitted into place and supported by the resilient channels.

**3.6 Assembly G - Two-hour, Fire-resistive Roof-Ceiling or Floor-Ceiling Rating is Assigned to the Following Construction** (descriptive details for the assembly are noted below and in Figure 4).

1. The floor sheathing shall consist of a single layer of 48/24 tongue-and-groove span rated sheathing (Exposure 1).

When used as a roof-ceiling assembly, a single layer of square-edge span rated sheathing (Exposure 1), complying with the applicable code, is permitted to be used for roof sheathing.

All butt joints of the floor or roof sheathing must be located over framing members.

2. TJI joists shall be installed in accordance with this report at a maximum spacing of 24 inches (610 mm) on center.
3. Optional glass fiber insulation, unfaced batts that are 24 inches (610 mm) wide by 48 inches (1220 mm) long by 3-1/2 inches (89 mm) thick, are permitted to be placed in the plenum between the TJI joists and supported by stay wires spaced 12 inches (305 mm) on center along the bottom flanges.
4. The ceiling membrane shall consist of three layers of 5/8 inch (15.9 mm) thick Gold Bond Fire Shield G, Type X, gypsum board. The base layer shall be applied perpendicular to the TJI joists, with ends staggered, and attached directly to the bottom flanges with 1-5/8 inch (41.3 mm) long Type S screws spaced 12 inches (305 mm) on center along each joist. Resilient channels, minimum No. 28 gauge [0.016 inch (0.41 mm)], shall be applied over the first layer of gypsum board running perpendicular to the TJI joists and spaced a maximum of 16 inches (406 mm) on center. The channels shall be attached to the TJI joist bottom flanges with 1-5/8 inch (41.3 mm) long Type S screws. The middle layer of gypsum board shall be applied perpendicular to the resilient channels, with end joints staggered, and attached to the resilient channels with 1 inch (25.4 mm) long Type S screws spaced 12 inches (305 mm) on center. The finish layer of gypsum board shall be installed with edges and end joints staggered from the middle layer and shall be fastened to the resilient channels with 1-5/8 inch (41.3 mm) long Type S screws spaced 8 inches (203 mm) on center. Joints

in the finish layer of gypsum board shall be covered with joint compound and paper tape, and exposed screw heads shall be covered with joint compound.

**3.7 Alternate Floor Systems:**

1. An alternate floor or roof deck to Assemblies A, B, C, D, E, F, and G previously described, consists of a minimum 40/20 span rated sheathing (Exposure 1), over joists spaced at a maximum of 24 inches (610 mm) on center with either 1-1/2 inches (38 mm) of lightweight concrete or 1 inch (25.4 mm) of gypsum concrete over the sheathing. When the joists are limited to a maximum spacing of 20 inches (508 mm) on center, a 3/4 inch (19 mm) thick topping of gypsum concrete is permitted to be used. The gypsum concrete shall be evaluated in a current evaluation report issued by the NES, BOCA ES for jurisdictions using the BOCA/National Building Code, ICBO ES for jurisdictions using the Uniform Building Code, or SBCCI PST & ESI for jurisdictions using the Standard Building Code. The report shall include an evaluation for fire resistance that permits the replacement of the floor systems with the span rated sheathing and gypsum concrete system.
2. The ceiling is permitted to be omitted over unusable crawl space below, and flooring is permitted to be omitted where unusable attic space occurs above for all systems in Sections 3.5.1 through 3.5.6, provided the top flange lateral support requirements of Section 3.4 are met.

**3.8 Sound Ratings**

**3.8.1 Assembly B, Option 1, STC = 50**

Assembly B, described in Section 3.5.2 of this report and shown in Figure 4, when constructed with resilient channels spaced at 16 inches (406 mm) on center, has a minimum sound transmission class (STC) rating of 50. This assembly has the following impact insulation class (IIC) ratings when constructed with the additional materials described below:

1. **IIC rating of 60:** The floor covering shall include a 40 ounce per square yard (1.36 kg/m<sup>2</sup>) pad and 56 ounce per square yard (1.90 kg/m<sup>2</sup>) carpet.
2. **IIC rating of 51:** The floor covering shall include Tarkett Acoustiflor sheet vinyl and the ceiling shall consist of two layers of 5/8 inch (15.9 mm) thick Type X gypsum board and 3-1/2 inch (89 mm) thick glass fiber insulation shall be located at the bottom of the floor cavity.
3. **IIC rating of 45:** The floor covering shall include a 43.2 ounce per square yard (1.47 kg/m<sup>2</sup>), minimum 0.123 inch (3.1 mm) thick cushioned vinyl.

**3.8.2 Assembly B, Option 2, STC = 58**

Assembly B, described in Section 3.5.2 of this report and shown in Figure 4, when constructed with resilient channels spaced at 16 inches (406 mm) on center, and with a 3/4 inch (19 mm) thick, topping of gypsum concrete, evaluated in a current evaluation report, has a minimum sound transmission

class (STC) rating of 58. This assembly has the following impact insulation class (IIC) ratings when constructed with the additional materials described below:

1. **IIC rating of 54:** The floor covering shall include a 40 ounce per square yard pad (1.36 kg/m<sup>2</sup>) and 56 ounce per square yard (1.90 kg/m<sup>2</sup>) carpet.
2. **IIC rating of 54:** The floor covering shall include Tarkett Acoustiflor sheet vinyl and the ceiling shall consist of two layers of 5/8 inch (15.9 mm) thick Type X gypsum board and 3-1/2 inch (89 mm) thick glass fiber insulation shall be located at the bottom of the floor cavity.
3. **IIC rating of 50:** The floor covering shall include either Armstrong VIOS or Armstrong Cambray sheet vinyl and the ceiling shall consist of two layers of 5/8 inch (15.9 mm) thick Type X gypsum board and 3-1/2 inch (89 mm) thick glass fiber insulation shall be located at the bottom of the floor cavity.

### 3.8.3 Assembly D, Option 1, STC = 47, IIC = 54

Assembly D, described in Section 3.5.4 of this report and shown in Figure 4, has a minimum sound transmission class (STC) rating of 47. This assembly has an impact insulation class (IIC) rating of 54 when the floor covering includes a 40 ounce per square yard pad (1.36 kg/m<sup>2</sup>) and 56 ounce per square yard (1.90 kg/m<sup>2</sup>) carpet.

### 3.8.4 Assembly D, Option 2, STC = 59, IIC = 54

Assembly D, described in Section 3.5.4 of this report and shown in Figure 4, when constructed with a 3/4 inch (19 mm) thick, topping of gypsum concrete, evaluated in a current evaluation report, has a minimum sound transmission class (STC) rating of 59. This assembly has an impact insulation class (IIC) rating of 54 when the floor covering includes a 40 ounce per square yard (1.36 kg/m<sup>2</sup>) pad and 56 ounce per square yard (1.90 kg/m<sup>2</sup>) carpet.

## 4.0 INSTALLATION

Drawings and/or specifications for the erection and installation of the TJI Joists for each job shall be strictly adhered to and a copy of these documents shall be available at all times on the jobsite during installation.

## 5.0 IDENTIFICATION

TJI Joists shall be identified by a stamp indicating the joist type, NES report number, manufacturer's name, plant number, and the name or logo of the third party quality control agency (PFS Corporation, NER-QA251).

## 6.0 EVIDENCE SUBMITTED

- 6.1 Results of structural load tests, product brochure, descriptive literature, quality control manual and engineering calculations have been submitted under the cover of a manual, dated February, 1982.
- 6.2 Results of a fire test, File No. R5492-2, dated October 6, 1981, conducted by Underwriters Laboratories, Inc. in accordance with ASTM E 119.

- 6.3 Results of sound test performed a Riverbank Acoustical Lab, Geneva, Illinois, and witnessed by Shiner Associates, Inc., Skokie, Illinois, conducted between May 1981 and September 1981, in accordance with ASTM E 492 and ASTM E 90.
- 6.4 Data under the cover of letters, dated March 8, March 23, April 20 and May 20, 1982.
- 6.5 Results of load tests, Job No. 63-1978, dated May 24, 1982, witnessed by Northern Testing Laboratories, Boise, Idaho.
- 6.6 Results of TJI/40 joist bending tests, Job No. 63-398 dated February 24, 1983, witnessed by Northern Testing Laboratories, Boise, Idaho.
- 6.7 Results of load and fire tests and descriptive data under the cover of letters, dated December 2, 1983, February 21, March 2 and July and September 13, 1984.
- 6.8 Descriptive details and calculations under the cover of letters, dated October 24 and October 29, 1984.
- 6.9 Results of bending and shear tests conducted on joists with OSB webs, descriptive details and quality control information of OSB web in a manual, dated February, 1985, prepared by William Couch, P.E. and Joe Piscione, P.E.
- 6.10 Trus Joist Corporation's letter, dated September 18, 1985 with calculations by J.R. Piscione, P.E.
- 6.11 Descriptive details, calculations, results of tests, test reports and quality assurance manual submitted in three volumes under cover of a letter, dated October 30, 1992, signed by Joseph R. Piscione, P.E.
- 6.12 Revised TJI Joist Rational Bearing Analysis, dated October 30, 1998, prepared by Mark Drone and Matt Meyers.
- 6.13 Product Mix Re-Design Report, dated April, 1997. Applicable portions signed by Glen D. Robak, P.E.
- 6.14 TimberStrand LSL Flange I-Joist Report, dated April, 1997. Applicable portions signed by Glen D. Robak, P.E.
- 6.15 TimberStrand TJI/Joist Manufacturing Standard, East Kentucky Plant, dated December 1997.
- 6.16 Microllam LVL Manufacturing Standards for Eugene, Stayton, and Junction City, OR Plants, the Lowndes County, GA Plant, the Natchitoches, LA Plant, and the Buckhannon, WV Plant, dated April, 1994, May, 1996, and January, 1997 respectively.
- 6.17 Review and discussion of two ASTM E 119 full scale floor/ceiling assembly fire tests, dated February, 1996, prepared by David Rice, P.E. Attached were the following tests:
  - Report of fire tests conducted in accordance with ASTM E 119, prepared by Warnock Hersey, Report No. 651-0435, dated September 17, 1992.
  - Report of fire tests conducted in accordance with ASTM E 119, prepared by PFS Corporation, PFS Test Report #89-71, dated February 15, 1990.
- 6.18 Report of fire tests conducted in accordance with ASTM E 119, prepared by PFS Corporation, PFS Test Report #86-09-1, dated July 28, 1986.
- 6.19 Letter prepared by Inchcape Testing Services, dated November 8, 1995, signed by David Rowlandson.
- 6.20 Report of tests conducted in accordance with ASTM E 90 or E 492, prepared by Shiner+Associates, signed by Allen H. Shiner, P.E.:

- Report IN 81-25, dated September 28, 1981.
  - Report IN 81-106, dated July 9, 1981.
  - Report IN 81-23, dated July 9, 1981.
  - Report IN 81-24, dated July 9, 1981.
  - Report IN 81-87, dated May 29, 1981.
  - Report IN 81-17, dated June 3, 1981.
  - Report IN 81-105, dated July 6, 1981.
  - Report IN 81-20, dated July 6, 1981.
- 6.21 Report of tests conducted in accordance with ASTM E 492, prepared by Riverbank Acoustical Laboratories, signed by Peter E. Straus:
- Report RAL - IN 96-28, dated July 15, 1996.
  - Report RAL - IN 96-29, dated July 15, 1996.
  - Report RAL - IN 96-30, dated July 16, 1996.
- 6.22 Qualification data concerning the TJI/H90X joists, witnessed by the PFS Corporation.
- 6.23 Reports of TJM Experiment Nos. 1453, 1440 and 1449 concerning qualification of various TJI/Pro-120 TS joists. Testing witnessed by PFS Corporation.
- 6.24 TJI Joist Manufacturing Standard (Claresholm, East Kentucky, Eugene, Stayton, Evergreen, Lowndes County, and Natchitoches Plants), dated November, 1998.
- 6.25 TJI/L65 Confirmation Testing, CRC Experiment No. X1496, dated December 28, 1998, signed and sealed by Glen D Robak, P.E.. Testing witnessed by PFS Corporation.
- 6.26 Letter prepared by Fibrex, dated December 15, 1998, signed by Jeff Goodwin.
- 6.27 Letter prepared by Thermafiber, dated October 8, 1997, signed by Michael J. Williams.
- 6.28 Qualification testing for the Evergreen Plant.
- 6.29 Derivation of design values for the 9-1/2 inch deep TJI/Pro 550 joist.

## 7.0 CONDITIONS OF USE

The National Evaluation Service Committee finds that TJI® Joists as described in this report are acceptable alternative materials, products or methods of construction to those specified in the 1999 BOCA National Building Code, the 1999 Standard Building Code and the 1997 Uniform Building Code with 1998 Supplement, subject to the following conditions:

- 7.1 TJI Joists shall be produced at the Trus Joist MacMillan Valdosta, Georgia; Eugene, Oregon; Stayton, Oregon; Natchitoches, Louisiana; Chavies, Kentucky; Claresholm, Alberta and Castleberry, Alabama plants with quality control inspections by PFS Corporation (NER-QA251).
- 7.2 Allowable loads shall not exceed the values set forth in Table 2.
- 7.3 Design calculations and details for specific applications shall be furnished to the code official verifying compliance with this report and the applicable code. The individual preparing such documents shall possess the necessary credentials regarding competency and qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken.
- 7.4 Cutting, notching or boring of the TJI joist flanges is not permitted. Holes in webs of the TJI joists shall conform to the requirements given in Figures 2 and 3 of this report.
- 7.5 This report is subject to re-examination on a periodic basis. For information on the current status of this report, contact one of the participating members of the NES.

TABLE 1 - JOIST DESCRIPTION

TJI Joist Series	Flange Grade	Flange Size (inches)	Web Thickness (inches)	Range of Joist Depths (inches)	
<b>1. Performance Plus OSB Web TJI Joists</b>					
TJI®/Pro 150	(1)	2.1	1.5 x 1.5	3/8	9 1/2 - 11 7/8
TJI®/Pro 250	(1)	2.1	1.5 x 1.75	3/8	7 1/2 - 16
TJI®/Pro 350	(1)	2.0	1.5 x 2.3	3/8	9 1/2 - 16
TJI®/Pro 550	(1)	2.0	1.5 x 3.5	7/16	9 1/2 - 16
TJI®/Pro 120TS	(2)	1.55	1.5 x 1.75	3/8	9 1/2 - 14
TJI®/Pro 150TS	(2)	1.55	1.5 x 2.0	3/8	9 1/2 - 11 7/8
<b>2. Plywood Web TJI® Joists</b>					
TJI®/Pro 25P & TJI/L45P	(1)	2.1	1.5 x 1.75	3/8	7 1/2 - 16 (8-24 Taper)
TJI®/Pro 35P	(1)	2.1	1.5 x 2.3	3/8	10 - 20
TJI®/Pro 350P & TJI/L60P	(1)	2.1	1.5 x 2.3	15/32	10 - 30 (8-30 Taper)
TJI®/Pro 550P & TJI/L90P	(1)	2.1	1.5 x 3.5	15/32	10 - 30 (8-30 Taper)
TJI®/H60P	(1)	2.1	1.75 x 2.3	15/32	10 - 30
TJI®/H90P	(1)	2.1	1.75 x 3.5	15/32	10 - 30

For SI: 1 inch = 25.4 mm

(1) = Microllam® LVL

(2) = TimberStrand® LSL

TABLE 2 - PROPERTIES FOR TJI JOISTS

BASIC PROPERTIES						REACTION PROPERTIES									
JOIST DEPTH (In.)	JOIST WT. (plf)	RESISTIVE MOMENT (ft.-lbs.)	VERT. SHEAR (lbs.)	EI x 10 <sup>6</sup> lbs.-in. <sup>2</sup>	K	END REACTION (lbs.)					INTERMEDIATE REACTION (lbs.)				
						1-3/4"		3-1/2"		NAILS REQ'D.	3-1/2"		5-1/4"		NAILS REQ'D.
						Bearing Lgth.		Bearing Lgth.			5-1/4" (7)		7" (7)		
						Web Stiffeners		Web Stiffeners			Bearing Lgth.		Bearing Lgth.		
						NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
<b>TJI/Pro 150</b>															
9-1/2	2.0	2730	1120	160	4.5	945	NA	1120	NA	NA	1895	NA	2440	NA	NA
11-7/8	2.3	3620	1420	276	4.5	945	NA	1420	NA	NA	1895	NA	2440	NA	NA
<b>TJI/Pro 250</b>															
7-1/2	2.0	2335	860	103	4.5	860	NA	860	NA	NA	2030	NA	2225	NA	NA
9-1/2	2.2	3210	1120	185	4.5	1015	NA	1120	NA	NA	2030	NA	2575	NA	NA
11-7/8	2.5	4260	1420	319	4.5	1015	1120	1420	1420	3-8d	2030	2385	2575	2930	3-8d
14	2.8	5210	1710	474	4.5	1015	1120	1560	1710	3-8d	2030	2385	2575	2930	3-8d
16	3.0	6075	1970	653	4.5	1015	1120	1560	1915	3-8d	2030	2385	2575	2930	3-8d
<b>TJI/Pro 350</b>															
9-1/2	2.7	3745	1120	231	4.5	1120	NA	1120	NA	NA	2320	NA	2870	NA	NA
10	2.8	4010	1185	261	4.5	1160	1185	1185	1185	3-8d	2320	2680	2870	3065	3-8d
11-7/8	3.0	5000	1420	395	4.5	1160	1420	1420	1420	3-8d	2320	2680	2870	3225	3-8d
14	3.2	6135	1710	584	4.5	1160	1505	1615	1710	3-8d	2320	2680	2870	3225	3-8d
16	3.5	7205	1970	801	4.5	1160	1505	1615	1970	3-8d	2320	2680	2870	3225	3-8d
<b>TJI/Pro 550</b>															
9 1/2	3.8	5745	1675	348	5.3	1400	NA	1675	NA	NA	3355	NA	3970	NA	NA
10	3.9	6150	1720	394	5.3	1400	1715	1720	1720	2-16d	3355	3670	3970	4285	2-16d
11-7/8	4.2	7675	1925	593	5.3	1400	1875	1885	1925	3-16d	3355	3830	3970	4445	3-16d
14	4.5	9420	2125	874	5.3	1400	1875	1885	2125	3-16d	3355	3830	3970	4445	3-16d
16	4.7	11065	2330	1192	5.3	1400	1875	1885	2330	3-16d	3355	3830	3970	4445	3-16d
<b>TJI/L60</b>															
16	3.7	8015	2330	847	5.3	1315	1505	1885	2330	6-8d	2625	3330	3245	3990	6-8d
18	4.0	8825	2535	1119	5.3	1315	1505	1885	2535	7-8d	2625	3330	3245	4115	7-8d
20	4.3	9905	2740	1437	5.3	NA	1505	NA	2740	8-8d	NA	3330	NA	4235	8-8d
22	4.5	10985	2935	1801	5.3	NA	1505	NA	2935	9-8d	NA	3330	NA	4360	9-8d
24	4.8	11635	3060	2214	5.3	NA	1505	NA	3010	10-8d	NA	3330	NA	4485	10-8d
26	5.1	12680	2900	2678	5.3	NA	1505	NA	2900	11-8d	NA	4610	NA	5325	11-8d
28	5.4	13725	2900	3196	5.3	NA	1505	NA	2900	12-8d	NA	4735	NA	5380	12-8d
30	5.6	14770	2900	3769	5.3	NA	1505	NA	2900	13-8d	NA	4860	NA	5475	13-8d
<b>TJI/L65</b>															
9.5	3.0	4715	1675	268	5.3	1390	NA	1675	NA	NA	2780	NA	3395	NA	NA
10	3.1	5040	1720	303	5.3	1390	1680	1720	1720	3-8d	2780	3150	3395	3765	3-8d
11.875	3.4	6260	1925	459	5.3	1390	1680	1885	1925	3-8d	2780	3150	3395	3765	3-8d
14	3.7	7655	2125	678	5.3	1390	1680	1885	2125	5-8d	2780	3400	3395	4015	5-8d
16	3.9	8935	2330	930	5.3	1390	1680	1885	2330	6-8d	2780	3525	3395	4140	6-8d
18	4.2	9835	2535	1227	5.3	1390	1680	1885	2535	7-8d	2780	3650	3395	4265	7-8d
20	4.5	11040	2740	1572	5.3	NA	1680	NA	2740	8-8d	NA	3720	NA	4385	8-8d
22	4.8	12245	2935	1967	5.3	NA	1680	NA	2935	9-8d	NA	3720	NA	4510	9-8d
24	5.0	12975	3060	2414	5.3	NA	1680	NA	3060	10-8d	NA	3720	NA	4635	10-8d
26	5.3	14140	2900	2915	5.3	NA	1680	NA	2900	11-8d	NA	4760	NA	5380	11-8d
28	5.6	15305	2900	3473	5.3	NA	1680	NA	2900	12-8d	NA	4885	NA	5505	12-8d
30	5.8	16465	2900	4089	5.3	NA	1680	NA	2900	13-8d	NA	5005	NA	5625	13-8d
<b>TJI/L90</b>															
16	4.7	12425	2330	1246	5.3	1400	2030	1885	2330	4-16d	3355	3985	3970	4605	4-16d
18	5.0	13680	2535	1635	5.3	1400	2030	1885	2515	4-16d	3355	3985	3970	4605	4-16d
20	5.3	15360	2740	2085	5.3	NA	2190	NA	2675	5-16d	NA	4145	NA	4760	5-16d
22	5.6	17040	2935	2597	5.3	NA	2345	NA	2830	6-16d	NA	5090	NA	5710	11-16d
24	5.8	18060	3060	3172	5.3	NA	2345	NA	2830	6-16d	NA	5195	NA	6025	13-16d
26	6.1	19680	2900	3814	5.3	NA	2345	NA	2900	7-16d	NA	5900	NA	5900	14-16d
28	6.4	21300	2900	4525	5.3	NA	2345	NA	2900	8-16d	NA	5900	NA	5900	15-16d
30	6.6	22925	2900	5306	5.3	NA	2345	NA	2900	8-16d	NA	5900	NA	5900	17-16d

TABLE 2 - CONTINUED Page 2

BASIC PROPERTIES						REACTION PROPERTIES									
JOIST DEPTH (In.)	JOIST WT. (plf)	RESISTIVE MOMENT (ft.-lbs.)	VERT. SHEAR (lbs.)	EI x 10 <sup>6</sup> (lbs.-in. <sup>2</sup> )	K	END REACTION (lbs.)				INTERMEDIATE REACTION (lbs.)					
						1-3/4"		3-1/2"		NAILS REQ'D.	3-1/2"		5-1/4"		NAILS REQ'D.
						Bearing Lgth.		Bearing Lgth.			5-1/4" (7)		7" (7)		
						Web Stiffeners		Web Stiffeners			Bearing Lgth.		Bearing Lgth.		
NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES				
<b>TJI/H60</b>															
10	3.2	5000	1720	300	5.3	1400	1505	1720	1720	3-8d	3335	3335	4090	4450	3-8d
11-7/8	3.4	6260	1925	456	5.3	1400	1505	1885	1925	3-8d	3335	3335	4090	4460	3-8d
14	3.7	7695	2125	679	5.3	1400	1505	1885	2125	5-8d	3335	3335	4090	4710	5-8d
16	4.0	9055	2330	934	5.3	1400	1505	1885	2330	6-8d	3335	3335	4090	4830	6-8d
18	4.2	10070	2535	1236	5.3	1400	1505	1885	2535	7-8d	3335	3335	4090	4840	7-8d
20	4.5	11340	2740	1587	5.3	NA	1505	NA	2740	8-8d	NA	3335	NA	4840	8-8d
22	4.8	12590	2935	1989	5.3	NA	1505	NA	2935	9-8d	NA	3335	NA	4840	9-8d
24	5.1	13350	3060	2444	5.3	NA	1505	NA	3010	10-8d	NA	3335	NA	4840	10-8d
26	5.3	14555	2900	2955	5.3	NA	1505	NA	2900	11-8d	NA	4840	NA	5800	11-8d
28	5.6	15760	2900	3523	5.3	NA	1505	NA	2900	12-8d	NA	4840	NA	5800	12-8d
30	5.9	16965	2900	4151	5.3	NA	1505	NA	2900	13-8d	NA	4840	NA	5800	13-8d
<b>TJI/H90</b>															
10	4.3	7760	1720	453	5.3	1400	1715	1720	1720	2-16d	3495	3810	4100	4420	2-16d
11-7/8	4.6	9730	1925	687	5.3	1400	1715	1885	1925	2-16d	3495	3810	4100	4420	2-16d
14	4.9	11975	2125	1015	5.3	1400	1875	1885	2125	3-16d	3495	3970	4100	4575	3-16d
16	5.2	14100	2330	1389	5.3	1400	2030	1885	2330	4-16d	3495	4130	4100	4735	4-16d
18	5.4	15685	2535	1827	5.3	1400	2030	1885	2515	4-16d	3495	4130	4100	4735	4-16d
20	5.7	17670	2740	2331	5.3	NA	2190	NA	2675	5-16d	NA	4285	NA	4890	5-16d
22	6.0	19625	2935	2904	5.3	NA	2345	NA	2830	6-16d	NA	5195	NA	5840	11-16d
24	6.3	20810	3060	3549	5.3	NA	2345	NA	2830	6-16d	NA	5195	NA	6155	13-16d
26	6.5	22695	2900	4266	5.3	NA	2345	NA	2900	7-16d	NA	5800	NA	5800	14-16d
28	6.8	24580	2900	5059	5.3	NA	2345	NA	2900	8-16d	NA	5800	NA	5800	15-16d
30	7.1	26465	2900	5930	5.3	NA	2345	NA	2900	8-16d	NA	5800	NA	5800	17-16d
<b>TJI/H90X</b>															
10	4.5	7750	2345	455	6.0	1600	1920	2150	2345	2-16d	3995	4320	4690	5010	2-16d
11-7/8	4.8	9710	2555	690	6.0	1600	1920	2150	2475	2-16d	3995	4320	4690	5010	2-16d
14	5.1	11955	2795	1022	6.0	1600	2080	2150	2635	3-16d	3995	4480	4690	5170	3-16d
16	5.4	14075	3020	1400	6.0	1600	2240	2150	2795	4-16d	3995	4640	4690	5330	4-16d
18	5.7	15655	3245	1845	6.0	1600	2240	2150	2795	4-16d	3995	4640	4690	5330	4-16d
20	6.0	17640	3470	2359	6.0	NA	2345	NA	2955	5-16d	NA	4800	NA	5495	5-16d
22	6.3	19585	3700	2943	6.0	NA	2345	NA	3120	6-16d	NA	5195	NA	6460	11-16d
24	6.7	20770	3925	3602	6.0	NA	2345	NA	3120	6-16d	NA	5195	NA	6780	13-16d
26	7.0	22650	4150	4337	6.0	NA	2345	NA	3280	7-16d	NA	6940	NA	7635	14-16d
28	7.3	24535	4375	5151	6.0	NA	2345	NA	3440	8-16d	NA	7105	NA	7795	15-16d
30	7.6	26415	4375	6047	6.0	NA	2345	NA	3440	8-16d	NA	7425	NA	8120	17-16d
32	7.9	28300	4375	7026	6.0	NA	2345	NA	3600	9-16d	NA	7540	NA	8280	18-16d
34	8.2	30180	4375	8092	6.0	NA	2345	NA	3600	9-16d	NA	7540	NA	8440	19-16d
<b>TJI/Pro 25P, TJI/L45P</b>															
7-1/2	1.9	2330	640	100	2.7	640	NA	640	NA	NA	1655	NA	1655	NA	NA
9-1/2	2.2	3200	805	177	2.7	805	NA	805	NA	NA	1905	NA	2085	NA	NA
11-7/8	2.4	4245	990	300	2.7	950	990	990	990	3-8d	1905	2260	2415	2560	3-8d
14	2.6	5190	1160	440	2.7	950	1120	1160	1160	5-8d	1905	2480	2415	2730	5-8d
16	2.8	6055	1315	598	2.7	950	1120	1315	1315	6-8d	1905	2480	2415	3095	6-8d
18	3.0	6665	1470	783	2.7	950	1120	1465	1470	7-8d	1905	2480	2415	3250	7-8d
20	3.2	7480	1625	996	2.7	950	1120	1465	1625	8-8d	1905	2480	2415	3370	8-8d
22	3.5	8295	1350	1238	2.7	950	1120	1350	1350	9-8d	1905	2480	2415	3175	9-8d
24	3.7	8785	1350	1509	2.7	950	1120	1350	1350	10-8d	1905	2480	2415	3175	10-8d

TABLE 2 - CONTINUED Page 3

BASIC PROPERTIES						REACTION PROPERTIES									
JOIST DEPTH (In.)	JOIST WT. (plf)	RESISTIVE MOMENT (ft.-lbs.)	VERT. SHEAR (lbs.)	EI x 10 <sup>6</sup> lbs.-in. <sup>2</sup>	K	END REACTION (lbs.)					INTERMEDIATE REACTION (lbs.)				
						1-3/4"		3-1/2"		NAILS REQ'D.	3-1/2" 5-1/4" (7)		5-1/4" 7" (7)		NAILS REQ'D.
						Bearing Lgth.		Bearing Lgth.			Bearing Lgth.		Bearing Lgth.		
						Web Stiffeners		Web Stiffeners		Web Stiffeners		Web Stiffeners			
NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES				
<b>TJI/Pro 35P</b>															
10	2.7	4555	845	263	2.7	845	NA	845	NA	NA	2180	NA	2185	NA	NA
11-7/8	2.9	5660	1000	394	2.7	1000	1000	1000	1000	3-8d	2180	2540	2590	2590	3-8d
14	3.1	6920	1180	576	2.7	1090	1180	1180	1180	5-8d	2180	2730	2695	2730	5-8d
16	3.3	8075	1315	781	2.7	1090	1315	1315	1315	6-8d	2180	2895	2895	3095	6-8d
18	3.5	8890	1470	1020	2.7	NA	1470	NA	1470	7-8d	NA	2940	NA	2940	7-8d
20	3.7	9980	1625	1293	2.7	NA	1505	NA	1625	8-8d	NA	3135	NA	3250	8-8d
<b>TJI/Pro 350P, TJI/L60P</b>															
8	2.6	3360	1015	155	3.4	1015	NA	1015	NA	NA	2450	NA	2625	NA	NA
10	2.9	4515	1215	267	3.4	1215	1215	1215	1215	3-8d	2450	2830	3025	3145	3-8d
11-7/8	3.1	5610	1420	402	3.4	1225	1420	1420	1420	3-8d	2450	2830	3025	3405	3-8d
14	3.4	6855	1625	591	3.4	1225	1505	1625	1625	5-8d	2450	3085	3025	3660	5-8d
16	3.6	7995	1830	806	3.4	1225	1505	1800	1830	6-8d	2450	3210	3025	3785	6-8d
18	3.9	8805	2030	1058	3.4	1225	1505	1800	2030	7-8d	2450	3330	3025	3915	7-8d
20	4.2	9880	2235	1349	3.4	NA	1505	NA	2235	8-8d	NA	3330	NA	4040	8-8d
22	4.4	10960	2440	1680	3.4	NA	1505	NA	2440	9-8d	NA	3330	NA	4165	9-8d
24	4.7	11810	2645	2052	3.4	NA	1505	NA	2645	10-8d	NA	3330	NA	4295	10-8d
26	4.9	12650	2775	2468	3.4	NA	1505	NA	2775	11-8d	NA	4430	NA	4905	11-8d
28	5.2	13690	2900	2928	3.4	NA	1505	NA	2900	12-8d	NA	4550	NA	5125	12-8d
30	5.5	14735	2900	3434	3.4	NA	1505	NA	2900	13-8d	NA	4675	NA	5250	13-8d
<b>TJI/H60P</b>															
10	3.1	4985	1380	292	3.4	1380	1380	1380	1380	3-8d	3070	3335	3570	3570	3-8d
11-7/8	3.4	6240	1575	442	3.4	1500	1505	1575	1575	3-8d	3070	3335	3735	4075	3-8d
14	3.6	7675	1770	653	3.4	1500	1505	1770	1770	5-8d	3070	3335	3735	4165	5-8d
16	3.9	9030	1970	893	3.4	1500	1505	1970	1970	6-8d	3070	3335	3735	4495	6-8d
18	4.2	10040	2165	1175	3.4	1500	1505	2020	2165	7-8d	3070	3335	3735	4622	7-8d
20	4.4	11305	2360	1499	3.4	NA	1505	NA	2360	8-8d	NA	3335	NA	4750	8-8d
22	4.7	12550	2555	1868	3.4	NA	1505	NA	2555	9-8d	NA	3335	NA	4840	9-8d
24	4.9	13310	2750	2283	3.4	NA	1505	NA	2750	10-8d	NA	3335	NA	4840	10-8d
26	5.2	14510	2950	2745	3.4	NA	1505	NA	2950	11-8d	NA	4840	NA	5795	11-8d
28	5.5	15710	3030	3255	3.4	NA	1505	NA	3010	12-8d	NA	4840	NA	5920	12-8d
30	5.7	16915	3115	3816	3.4	NA	1505	NA	3010	13-8d	NA	4840	NA	6045	13-8d
<b>TJI/Pro 650P, TJI/L90P</b>															
8	3.6	5190	1180	237	3.4	NA	1180	NA	1180	NA	3055	NA	3055	NA	NA
10	3.9	6990	1380	405	3.4	1380	1380	1380	1380	2-16d	3125	3450	3570	3570	2-16d
11-7/8	4.1	8690	1575	607	3.4	1500	1575	1575	1575	2-16d	3125	3450	3700	4025	2-16d
14	4.4	10630	1770	887	3.4	1500	1770	1770	1770	3-16d	3125	3610	3700	4165	3-16d
16	4.7	12405	1970	1204	3.4	1500	1970	1970	1970	4-16d	3125	3770	3700	4345	4-16d
18	4.9	13660	2165	1574	3.4	1500	2140	2020	2165	4-16d	3125	3770	3700	4345	4-16d
20	5.2	15340	2360	1997	3.4	NA	2305	NA	2360	5-16d	NA	3930	NA	4505	5-16d
22	5.4	17015	2555	2475	3.4	NA	2345	NA	2555	6-16d	NA	4895	NA	5470	11-16d
24	5.7	18030	2750	3011	3.4	NA	2345	NA	2750	6-16d	NA	5195	NA	5795	13-16d
26	6.0	19650	2950	3604	3.4	NA	2345	NA	2950	7-16d	NA	5900	NA	5900	14-16d
28	6.2	21270	3030	4257	3.4	NA	2345	NA	3030	8-16d	NA	6060	NA	6060	15-16d
30	6.5	22890	3115	4971	3.4	NA	2345	NA	3115	8-16d	NA	6230	NA	6230	17-16d

TABLE 2 - CONTINUED Page 4

BASIC PROPERTIES						REACTION PROPERTIES												
JOIST DEPTH (in.)	JOIST WT. (plf)	RESISTIVE MOMENT (ft.-lbs.)	VERT. SHEAR (lbs.)	EI x 10 <sup>6</sup> (lbs.-in. <sup>2</sup> )	K	END REACTION (lbs.)				NAILS REQ'D.	INTERMEDIATE REACTION (lbs.)				NAILS REQ'D.			
						1-3/4"		3-1/2"			5-1/4" (7)	7" (7)	NAILS REQ'D.					
						Bearing Lgth.		Bearing Lgth.						3-1/2" Bearing Lgth.		5-1/4" Bearing Lgth.		
						Web Stiffeners		Web Stiffeners						Web Stiffeners		Web Stiffeners		
NO	YES	NO	YES	NO	YES	NO	YES	NO	YES									
<b>TJ/H90P</b>																		
10	4.3	7750	1380	446	3.4	1380	1380	1380	1380	2-16d	3570	3570	3570	3570	2-16d			
11-7/8	4.5	9710	1575	673	3.4	1500	1575	1575	1575	2-16d	3745	4070	4075	4075	2-16d			
14	4.8	11955	1770	990	3.4	1500	1770	1770	1770	3-16d	3745	4165	4165	4165	3-16d			
16	5.1	14075	1970	1348	3.4	1500	1970	1970	1970	4-16d	3745	4390	4395	4635	4-16d			
18	5.3	15855	2165	1765	3.4	1500	2140	2020	2165	4-16d	3745	4390	4395	5040	4-16d			
20	5.8	17640	2360	2243	3.4	NA	2305	NA	2360	5-16d	NA	4551	NA	5200	5-16d			
22	5.9	19585	2555	2783	3.4	NA	2345	NA	2555	6-16d	NA	5195	NA	6010	11-16d			
24	6.1	20770	2750	3387	3.4	NA	2345	NA	2750	6-16d	NA	5195	NA	6470	13-16d			
26	6.4	22650	2950	4056	3.4	NA	2345	NA	2950	7-16d	NA	5900	NA	6900	14-16d			
28	6.6	24535	3030	4792	3.4	NA	2345	NA	3030	8-16d	NA	6080	NA	8080	15-16d			
30	6.9	26415	3115	5595	3.4	NA	2345	NA	3115	8-16d	NA	6230	NA	8230	17-16d			
<b>TJ/Pro 120TS</b>																		
9-1/2	2.4	2570	1120	141	4.5	1120	NA	1120	NA	NA	2480	NA	2900	NA	NA			
11-7/8	2.7	3430	1420	246	4.5	1120	1120	1420	1420	3-8d	2480	2480	3475	3600	3-8d			
14	2.9	4205	1710	368	4.5	1120	1120	1615	1710	3-8d	2480	2480	3475	3600	3-8d			
<b>TJ/Pro 150TS</b>																		
9-1/2	2.6	2730	1120	160	4.5	1120	NA	1120	NA	NA	2870	NA	2900	NA	NA			
11-7/8	2.9	3620	1420	276	4.5	1200	NA	1420	NA	NA	2870	NA	3515	NA	NA			

For SI: 1 inch = 25.4 mm, 1 plf = 14.59 N/m, 1 ft.-lb. = 1.356 N-m, 1 lbs.-in.<sup>2</sup> = 2.87 kN-mm<sup>2</sup>

**FOOT NOTES FOR TABLE 2**

1. Refer to Figure 1 for web stiffener details.
2. Deflection is calculated as follows:

- Uniform load:  $\Delta = \frac{22.5WL^4}{EI} + \frac{12WL^2}{Kd \times 10^5}$

- Concentrated load at midspan:  $\Delta = \frac{36PL^3}{EI} + \frac{24PL}{Kd \times 10^5}$

Where:

- P = Concentrated load, pounds.
- W = Uniform load in pounds per lineal foot.
- L = Clear span in feet.
- d = Out-to-out depth of joist, inches.
- EI = From table.
- K = From table.

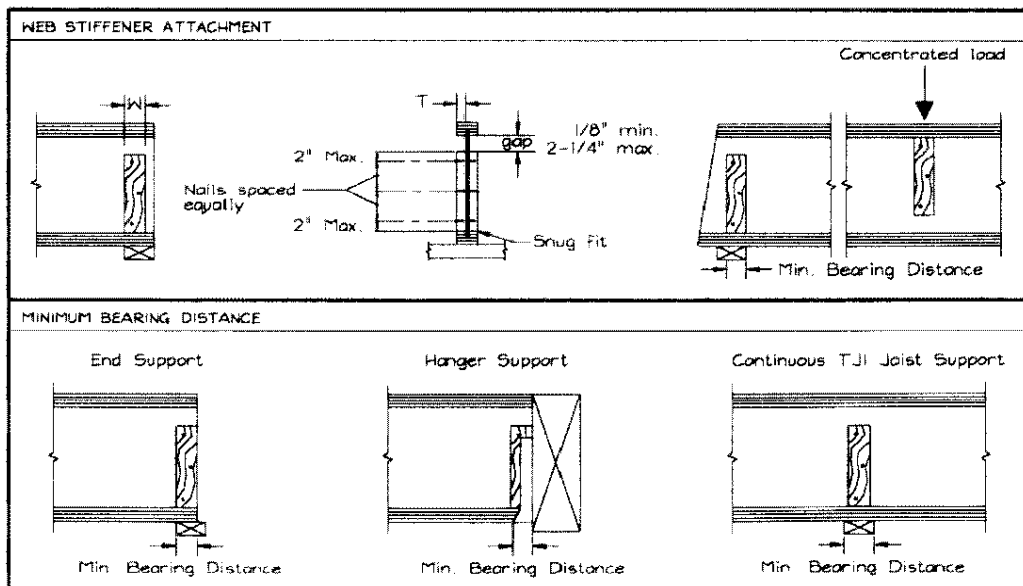
3. The stated allowable design properties are for loads of normal duration. Adjustments to the allowable design values shall be in accordance with the applicable code.
4. Interpolation between bearing lengths and joist depths is permitted for allowable design reactions.
5. The minimum bearing length is permitted to be reduced for joists supported by hangers if supplemental nail attachment is provided to the web stiffener.
6. Allowable bearing lengths have been determined based on Trus Joist MacMillan Products. Allowable bearing on supporting members shall be checked.
7. Shaded areas indicate 5 1/4-inch and 7-inch bearing lengths at intermediate reactions.
8. Joist weights shown are calculated on a rational basis, are based on heavier of eastern or western species products and are suitable for use in dead load calculation. Contact the producing plant for shipping weight information, if needed.

**FIGURE 1  
WEB STIFFENER NOTES AND DETAILS**

1. Web stiffeners shall be installed at bearing points as required in Table 2.
2. Web stiffeners shall be installed at points of concentrated loads greater than 1500 pounds and are to be nailed in accordance with the intermediate reaction schedule in Table 2.
3. Web stiffeners are to be installed on each side of the web as shown, with nails equally spaced vertically.
4. A gap shall be left at the top of web stiffeners as shown at all bearing conditions. In the case of concentrated loads, web stiffeners are required as shown and the gap shall be at the bottom.
5. Web stiffener material shall be sheathing meeting the requirements of PS 1 or PS 2 with the face grain parallel to the long axis.
6. Some hangers require web stiffeners to comply with nailing requirements through side plates.
7. If web stiffeners are not used in hanger support, the side of the hanger shall extend up to laterally support the top flange.

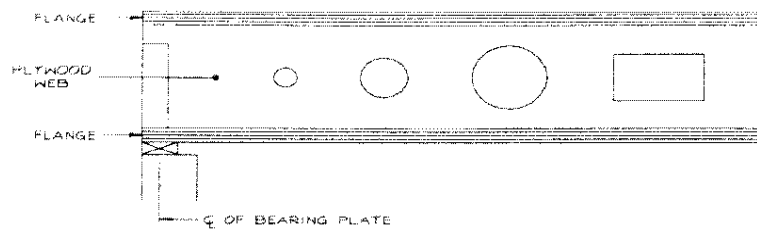
Web stiffener specifications are as follows:

TJI Joist Series	Minimum Dimensions		Grade
	"W" (Inches)	"T" (Inches)	
TJI/Pro 150	2 5/16	1/2	See Note 5
TJI/Pro 250, TJI/Pro 120TS, TJI/Pro 25P, TJI/L45P	2 5/16	5/8	See Note 5
TJI/Pro 150TS	2 5/16	3/4	See Note 5
TJI/Pro 350, TJI/L60, TJI/L65, TJI/H60, TJI/Pro 35P, TJI/Pro 350P, TJI/L60P, TJI/H60P	2 5/16	7/8	See Note 5
TJI/Pro 550, TJI/L90, TJI/H90, TJI/Pro 550P, TJI/L90P, TJI/H90P, TJI/H90X	3 1/2	1 1/2	Construction Grade 2x4



For SI: 1 inch = 25.4 mm, 1 lbf. = 4.448 N

FIGURE 2  
ALLOWABLE HOLE SIZE CHART  
FOR JOISTS WITH PLYWOOD WEBS



SPAN IN FEET	MINIMUM DISTANCE FROM CL OF SUPPORT IN FEET AND INCHES TO CL OF HOLE										
	HOLE DIAMETER										
	3"	4"	5"	6"	7"	8"	9"	10"	12"	14"	16"
14	1-0	1-3	1-6	2-0	2-3	2-6	3-0	3-3	4-0	4-6	5-3
15	1-0	1-3	1-9	2-0	2-6	2-9	3-0	3-6	4-3	5-0	5-6
16	1-0	1-6	1-9	2-3	2-6	3-0	3-3	3-9	4-6	5-3	6-0
17	1-0	1-6	1-9	2-3	2-9	3-0	3-6	4-0	4-9	5-6	6-3
18	1-3	1-6	2-0	2-6	2-9	3-3	3-9	4-3	5-0	5-9	6-9
19	1-3	1-6	2-0	2-6	3-0	3-6	4-0	4-6	5-3	6-3	7-0
20	1-3	1-9	2-3	2-9	3-3	3-9	4-0	4-6	5-6	6-6	7-6
21	1-3	1-9	2-3	2-9	3-3	3-9	4-3	4-9	5-9	6-9	7-9
22	1-3	1-9	2-3	3-0	3-6	4-0	4-6	5-0	6-0	7-3	8-3
23	1-6	2-0	2-6	3-0	3-9	4-3	4-9	5-3	6-3	7-6	8-6
24	1-6	2-0	2-6	3-3	3-9	4-3	5-0	5-6	6-9	7-9	9-0
25	1-6	2-0	2-9	3-3	4-0	4-6	5-0	5-9	7-0	8-0	9-3
26	1-6	2-3	2-9	3-6	4-0	4-9	5-3	6-0	7-3	8-6	9-9
27	1-9	2-3	3-0	3-6	4-3	4-9	5-6	6-3	7-6	8-9	10-0
28	1-9	2-3	3-0	3-9	4-6	5-0	5-9	6-6	7-9	9-0	10-6
29	1-9	2-3	3-0	3-9	4-6	5-3	6-0	6-6	8-0	9-6	10-9
30	1-9	2-3	3-3	4-0	4-9	5-6	6-0	6-9	8-3	9-9	11-3
31	1-9	2-6	3-3	4-0	4-9	5-6	6-3	7-0	8-6	10-0	11-6
32	2-0	2-9	3-6	4-3	5-0	5-9	6-6	7-3	8-9	10-3	12-0
33	2-0	2-9	3-6	4-3	5-3	6-0	6-9	7-6	9-0	10-9	12-3
34	2-0	2-9	3-6	4-6	5-3	6-0	7-0	7-9	9-3	11-0	12-9
35	2-0	3-0	3-9	4-6	5-6	6-3	7-0	8-0	9-9	11-3	13-0
36	2-3	3-0	3-9	4-9	5-6	6-6	7-3	8-3	10-0	11-9	13-6

For SI: 1 inch = 25.4 mm 1 foot = 304.8 mm

TJI JOIST HOLE CHART INSTRUCTIONS

**ROUND HOLES** - For simple spans and uniform loads use the table above (table on page 12 for joists having OSB webs) to determine holes sizes.

**SQUARE HOLES** - Square holes sizes are determined by multiplying the maximum round hole diameter by a factor of 0.8 for plywood and 0.7 for OSB.

**MULTIPLE HOLES** - Where more than one hole is desired the amount of wood between holes shall equal or exceed twice the diameter of the largest hole or twice the side of the largest square hole.

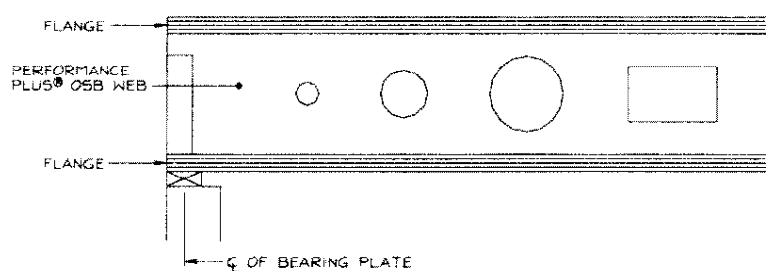
**CANTILEVERS AND CONTINUOUS SPANS** - For uniformly loaded cantilevers and continuous TJI joists, the holes shall be located 1 inch farther from the support for each foot of clear span in addition to the values indicated in the table above.

**SPECIAL** - Exceptions to these rules are possible under some conditions through special inquiry.

**NOTE** - Do not cut the joist within 4 inches of the support centerline, otherwise a 2 inch diameter hole can be cut in the web anywhere. **THE TOP AND BOTTOM FLANGES ARE NEVER TO BE CUT** - The sizes given in the table are hole sizes, not duct sizes.

**FOR TJI JOISTS** with 1.50 inch and 1.75 inch wide x 1.5 inch thick flanges - Where more than three-fourths of the depth of the web is removed, 1 foot shall be added to the distances above.

FIGURE 3  
ALLOWABLE HOLE SIZE CHART FOR  
JOISTS WITH PERFORMANCE PLUS® OSB WEBS



		Hole Factor - Diameter of Hole <sup>1</sup>				
JOIST DEPTH IN INCHES		Hole Factor				
		2	3	4	5	6
10		2 1/4"	3"	3 3/4"	4 1/2"	5 1/4"
12		3"	4"	5"	5 3/4"	6 3/4"
14		3 1/2"	4 3/4"	6"	7 1/4"	8 1/2"
16		4 1/4"	5 3/4"	7"	8 1/2"	10"
18		5"	6 1/2"	8 1/4"	9 3/4"	11 1/2"
20		5 1/2"	7 1/2"	9 1/4"	11 1/4"	13"
22		6 1/4"	8 1/4"	10 1/2"	12 1/2"	14 3/4"
24		7"	9 1/4"	11 1/2"	13 3/4"	16 1/4"
26		7 1/2"	10 1/4"	12 3/4"	15 1/4"	17 3/4"
28		8 1/4"	11"	13 3/4"	16 1/2"	19 1/4"
30		9"	12"	15"	17 3/4"	20 3/4"

For SI: 1 inch = 25.4 mm

<sup>1</sup> If a particular hole diameter is not given in the table, the next largest size diameter indicated should be used.

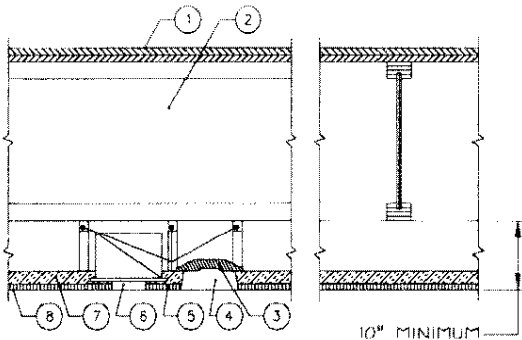
**Instructions:**

1. For a specific joist depth and hole diameter determine the hole factor from Table A.
2. Using the hole factor and the span of the joist the minimum distance from centerline of support to centerline of the hole can be obtained from Table B.
3. The instructions noted at the bottom of Figure 2 are also applicable to Performance® Plus OSB webs

		Minimum Distance from Center Line of Support to Center Line of Hole				
SPAN IN FEET		Hole Factor				
		2	3	4	5	6
14		1'-3"	2'-0"	2'-9"	3'-6"	4'-0"
15		1'-6"	2'-3"	3'-0"	3'-9"	4'-6"
16		1'-6"	2'-3"	3'-0"	4'-0"	4'-9"
17		1'-6"	2'-6"	3'-3"	4'-3"	5'-0"
18		1'-9"	2'-6"	3'-6"	4'-6"	5'-3"
19		1'-9"	2'-9"	3'-9"	4'-9"	5'-6"
20		2'-0"	3'-0"	4'-0"	5'-0"	6'-0"
21		2'-0"	3'-0"	4'-0"	5'-3"	6'-3"
22		2'-0"	3'-3"	4'-3"	5'-6"	6'-6"
23		2'-3"	3'-3"	4'-6"	5'-9"	6'-9"
24		2'-3"	3'-6"	4'-9"	6'-0"	7'-0"
25		2'-6"	3'-9"	5'-0"	6'-3"	7'-6"
26		2'-6"	3'-9"	5'-0"	6'-6"	7'-9"
27		2'-6"	4'-0"	5'-3"	6'-9"	8'-0"
28		2'-9"	4'-0"	5'-6"	7'-0"	8'-3"
29		2'-9"	4'-3"	5'-9"	7'-3"	8'-6"
30		3'-0"	4'-6"	6'-0"	7'-6"	9'-0"
31		3'-0"	4'-6"	6'-0"	7'-9"	9'-3"
32		3'-0"	4'-9"	6'-3"	8'-0"	9'-6"
33		3'-3"	4'-9"	6'-6"	8'-3"	9'-9"
34		3'-3"	5'-0"	6'-9"	8'-6"	10'-0"
35		3'-6"	5'-3"	7'-0"	8'-9"	10'-6"
36		3'-6"	5'-3"	7'-0"	9'-0"	10'-9"

For SI: 1 inch = 25.4 mm 1 foot = 304.8 mm

**FIGURE 4  
FIRE-RESISTIVE ASSEMBLY DETAILS**

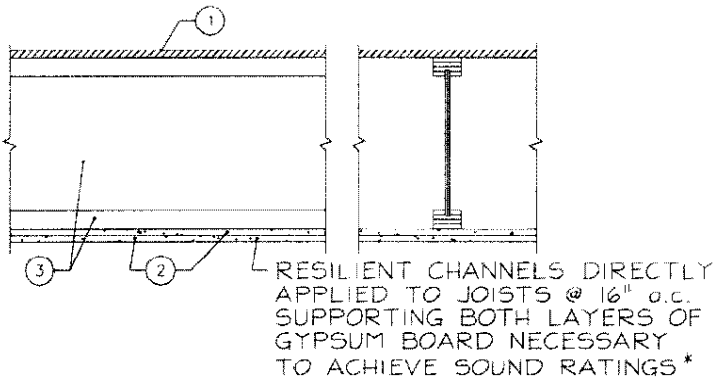


**ASSEMBLY A. (See Section 3.5.1 of this report.)**

1. Double wood floor.
2. TJI Joist.
3. Fixture protection.
4. 24 inch x 48 inch recessed light fixture.
5. Cold-rolled channels.
6. 12 inch air diffuser.
7. Thermafiber or Fibrex-FBX or Fibrex-IF mineral wool blankets.
8. 5/8 inch thick acoustical panels 24 inches x 24 inches or 24 inches x 48 inches supported by an approved exposed fire-rated suspension system.

**ASSEMBLY B. (See Section 3.5.2 of this report.)**

1. 48/24 tongue-and-groove span rated sheathing (Exposure 1).
2. Two layers 1/2 inch thick Type X gypsum board.
3. TJI Joist.
4. Optional 3-1/2 inch thick glass fiber batt insulation (not shown).

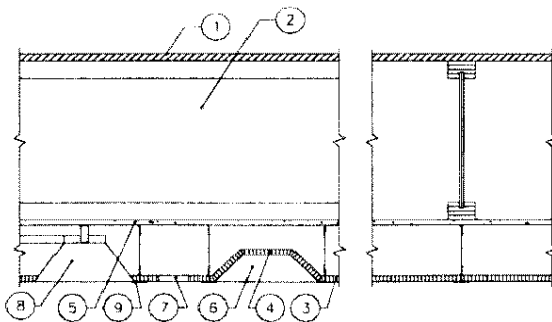


**Sound Test Data\***

W/O Gypsum Concrete	STC = 50	
	Pad & Carpet	IIC = 60
	Tarkett Acoustiflor	IIC = 51 (1)
	Cushioned Vinyl	IIC = 45
W/Gypsum Concrete	STC = 58	
	Pad & Carpet	IIC = 54
	Tarkett Acoustiflor	IIC = 54 (1)
	Armstrong Vios/Armstrong Cambray sheet vinyl	IIC = 50 (1)

(1) Requires two layers of 5/8 inch thick Type X gypsum board with one layer of 3-1/2 inch thick batt insulation.

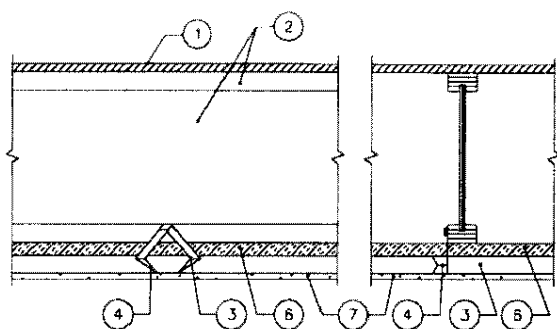
**ASSEMBLY C. (See Section 3.5.3 of this report.)**



1. 48/24 tongue-and-groove span rated sheathing (Exposure 1).
2. TJI Joist.
3. 5/8 inch thick x 24 inch x 24 inch ceiling panels.
4. Fixture protection.
5. 1/2 inch thick Type X gypsum board.
6. 24 inch x 48 inch recessed light fixture.
7. 6 inch x 12 inch opening for return air.
8. 12 inch diameter diffuser opening.
9. Steel suspension grid.

For SI: 1 inch = 25.4 mm

FIGURE 4 (cont)

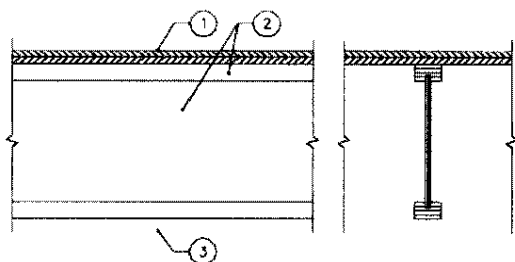


**Sound Test Data:**

W/O Gypsum Concrete	STC = 47	
	Pad & Carpet	IIC = 54
W/Gypsum Concrete	STC = 59	
	Pad & Carpet	IIC = 54

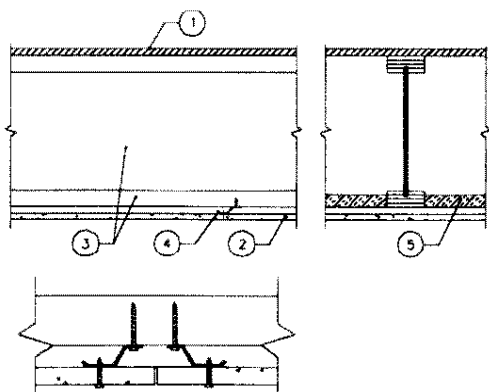
**ASSEMBLY D. (See Section 3.5.4 of this report.)**

1. 48/24 tongue-and-groove span rated sheathing (Exposure 1).
2. TJI Joist.
3. No. 26 gauge galvanized steel furring channel installed perpendicular to joists. Furring channels spaced 1-1/2 inches from and on each side of gypsum board end joints and 24 inches on center away from end joints. Channel secured to joists with support clips (Item 4) at each joist location. At channel splices, adjacent pieces overlapped 6 inches and tied with double strand of No. 18 SWG galvanized steel wire at each end of overlap.
4. Simpson Strong-Tie Co. Type CSC support clips to be used to support furring channels at the intersection with each joist. Support clips nailed to side of joist bottom flange with 1-1/2 inch long No. 11 gauge nail.
5. Stabilizer strap (not shown) - 3/4 inch x 6 inch No. 24 gauge galvanized steel strap used to prevent rotation of the support clips at gypsum board end joints and along walls.
6. 1 inch thick (6 pcf minimum) Thermafiber or Fibrex-FBX or Fibrex-IF mineral wool.
7. 1/2 inch thick USG FIRECODE Type C or Westroc Fireboard C gypsum board.



**ASSEMBLY E. (See Section 3.5.5 of this report.)**

1. Double wood floor or a single layer of 48/24 tongue-and-groove span rated sheathing (Exposure 1).
2. TJI Joist.
3. An approved ceiling system that will provide a 40 minute finish rating. An example of a ceiling with a 40 minute finish rating is described in Section 3.5.2.



Typical detail for butt joints perpendicular to framing members.

**ASSEMBLY F. (See Section 3.5.6 of this report.)**

1. 48/24 tongue-and-groove span rated sheathing (Exposure 1).
2. 5/8 inch thick USG FIRECODE Type C or Westroc Fireboard C gypsum board.
3. TJI Joist (with flange sizes 2 x 4 nominal or larger).
4. USG RC-1 channels at 16 inches on center.
5. Thermafiber or Fibrex-FBX or Fibrex-SAFB mineral wool blankets.

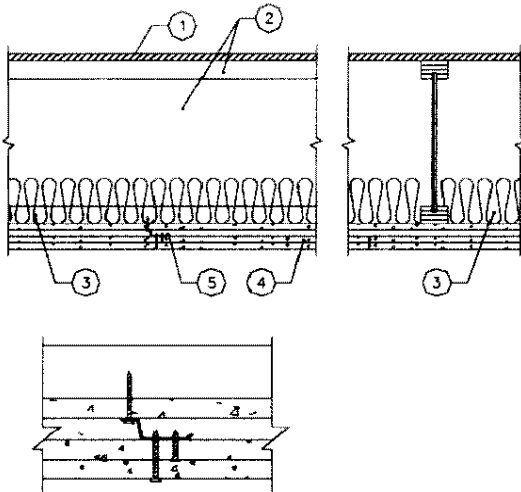
For SI: 1 inch = 25.4 mm

FIGURE 4 (cont)

For SI: 1 inch = 25.4 mm

**Alternate Floor Systems:**

Lightweight concrete may be added to assemblies A through G. See Section 3.7 for details.



Typical resilient channel and gypsum board attachment.

**ASSEMBLY G.** (See Section 3.6 of this report.)

1. 48/24 tongue-and-groove span rated sheathing (Exposure 1).
2. TJI joist.
3. Optional glass fiber insulation, unfaced batts, 3-1/2 inches thick in plenum, supported by stay wires 12 inches on center and centered on joist bottom flanges.
4. Three layers of 5/8 inch thick Gold Bond Fireshield G Type X gypsum board.
5. Resilient channels at 16 inches on center located between first and second layers of gypsum board.

For SI: 1 inch = 25.4 mm

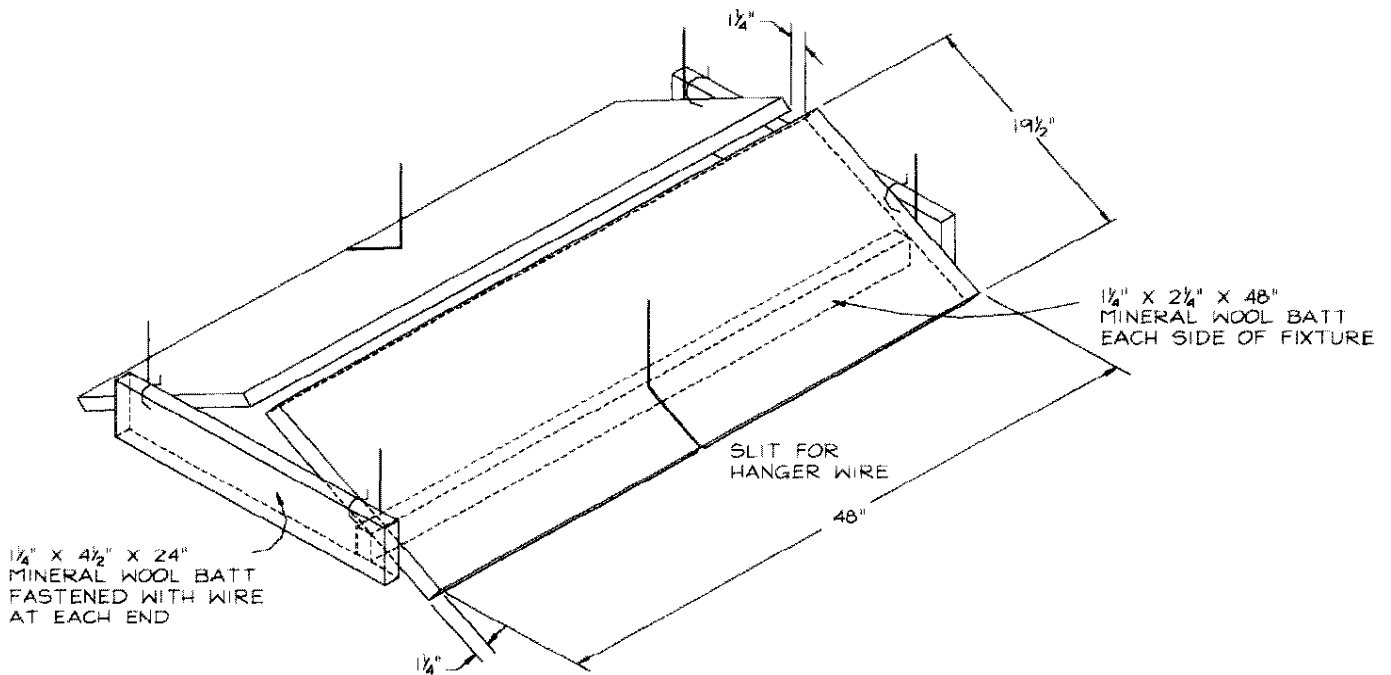


FIGURE 5  
LIGHT FIXTURE PROTECTION

(See 3.5.1 for detailed description of mineral wool batts.)

For SI: 1 inch = 25.4 mm