

# ICC-ES Evaluation Report

**ESR-2608\***

Issued April 1, 2008

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**DIVISION: 06—WOOD AND PLASTICS**  
**Section: 06090—Wood and Plastics Fastenings****REPORT HOLDER:****SIMPSON STRONG-TIE COMPANY, INC.**  
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PLEASANTON, CALIFORNIA 94588  
(800) 925-5099  
[www.strongtie.com](http://www.strongtie.com)**EVALUATION SUBJECT:****SIMPSON STRONG-TIE STUD SHOES, PLATE TIES,  
WALL BRACING, AND JOIST BRIDGING FOR WOOD  
CONSTRUCTION****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- Other Codes (see Section 8.0)

**Property evaluated:**

Structural

**2.0 USES**

Simpson Strong-Tie stud shoes, plate ties, wall bracing, and joist bridging are used as wood framing connectors in accordance with applicable sections of the IBC and IRC as follows:

**2.1.1 Stud Shoe Connectors:** Simpson Strong-Tie stud shoes described in this report are used to reinforce structural studs in exterior walls or interior bearing partitions that have been cut, notched or drilled according to Sections 2308.9.10 and 2308.9.11 of the IBC, and Section R602.6 of the IRC. When the size of the cut, notch, or drill hole exceeds the maximums specified in the code, the Simpson Strong-Tie stud shoes may be used provided an engineered design is submitted in accordance with Section 2301.2 of the IBC or Section R301.1.3 of the IRC, as applicable.

**2.1.2 Plate Tie Connectors:** Simpson Strong-Tie plate ties described in this report are used to connect wall top or bottom plates that have been cut to accommodate plumbing, heating or other pipes placed in or partly in the wall or partition in accordance with Section 2308.9.8 of the IBC and Section R602.6.1 of the IRC.

**2.1.3 Wall Bracing Straps:** The Simpson Strong-Tie wall bracing straps described in this report are designed to be used to resist racking during construction. The RCWB and WB/WBC brace straps are designed to brace walls and are designed to be used as an alternate to the code prescribed nominal 1-inch-by-4-inch (25 mm by 102 mm) continuous diagonal wood brace let into studs in wood walls designated as braced wall lines according to Section 2308.9.3 of the IBC and Section R602.10.3 of the IRC.

**2.1.4 Joist Bridging:** Simpson Strong-Tie bridging components described in this report are used to provide lateral support for wood joists (sawn lumber and prefabricated wood I-joists) in accordance with Section 2308.8.5 of the IBC and Section R502.7.1 of the IRC.

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

**3.1.1 SS and HSS Stud Shoes:** The SS and HSS stud shoes are designed to reinforce wood studs that have been notched or bored during construction to accommodate pipes having a maximum outside diameter of 2<sup>3</sup>/<sub>8</sub> inches (60.3 mm). The SS stud shoes provides compression load capacity for notched, cut, or drilled studs; and the HSS stud shoes provide tension (uplift) and compression load capacity for notched, cut, or drilled studs. The SS and HSS stud shoes are fabricated from No. 16 gage galvanized steel. See Table 1 for model numbers; stud shoe width (W) indicating use for single, double, and triple nominally 2-inch-wide studs, single nominally 3-inch-wide studs, and single nominally 4-inch-wide studs; required fasteners; and allowable loads. See Figure 1 for a drawing of overall dimensions of the SS and HSS stud shoes, and drawings of typical stud shoe installation details.

**3.1.2 RPS (Retrofit Plate Strap) Tie:** The RPS tie is designed to reinforce top plates or sill plates of exterior walls or interior bearing walls that have been cut, drilled, or notched to accommodate plumbing, heating or other pipes placed in or partly in the wall or partition. The RPS tie is formed from No. 16 gage galvanized steel. The middle portion of the RPS tie is stamped with lines indicating the maximum span or distance of the tie permitted to span over the cut or notched portion of the plate or sill. An arrow is also stamped onto the tie to facilitate proper installation of straps when they are required at each side of the plate. See Table 2 for models, tie dimensions (width and length), maximum notch width or cut in the plate or sill that specific RPS ties are designed to reinforce, required fasteners, and allowable loads. See Figure 2 for a drawing of the RPS

**\*Revised June 2009**

strap tie and a drawing of RPS ties installed in accordance with the prescriptive requirements of Section 2308.9.8 of the IBC.

### 3.1.3 Wall Bracing:

**3.1.3.1 RCWB Brace:** The RCWB wall bracing straps are fabricated from No. 20 gage galvanized steel into an L-shaped angle with a series of prepunched nail holes used to fasten the brace to the wood wall studs spaced maximum 16 inches (406 mm) on center. After a maximum  $1\frac{1}{8}$ -inch (28.6 mm) deep kerf is saw-cut into the wood studs and the top and bottom wood plates and the  $1\frac{1}{16}$ -inch (27 mm) long leg of the L-shaped RCWB wall brace is inserted into the kerf, the brace is nailed to each intersecting wall stud and top and sill plate in accordance with the specified nailing schedule. See Table 3 for RCWB wall bracing models, strap lengths, wall heights and brace angles measured from the horizontal [8 feet (2438 mm) at 45 degrees and 55 degrees, and 10 feet (3048 mm) at 45 degrees], and fastener schedule. See Figure 3a for a drawing of an installed RCWB wall brace, and Figure 3b for a drawing of the overall brace dimensions.

**3.1.3.2 CWB Compression Wall Bracing:** The CWB wall bracing straps are fabricated from No. 18 gage galvanized steel into an L-shaped angle with a series of prepunched nail holes used to fasten the brace to the wood wall studs spaced maximum 16 inches (406 mm) on center. After a maximum  $\frac{7}{8}$ -inch (22 mm) deep kerf is saw-cut into the wood studs and the top and bottom wood plates and the  $\frac{29}{32}$ -inch (23 mm) long leg of the L-shaped CWB wall brace is inserted into the kerf, the brace is nailed to each intersecting wall stud and top and bottom plates in accordance with the specified nailing schedule. See Table 4 for the CWB brace models recognized in this report, brace lengths, wall height and brace angles measured from the horizontal [8 feet (2438 mm) at 45 degrees and 60 degrees], and required fasteners. See Figure 4 for a drawing of an installed CWB wall brace, and a drawing of the overall brace dimensions.

**3.1.3.3 WB and WBC Wall Bracing:** The WB and WBC wall braces are fabricated from  $1\frac{1}{4}$  inch-wide (31.7 mm) No. 16 gage galvanized steel with a series of prepunched nail holes used to fasten the metal braces to the wood wall studs spaced either 16 or 24 inches (406 or 610 mm) on center. The WB and WBC wall braces resist tension loads only. Consequently, these wall braces must be installed in pairs to resist in-plane racking shear loads applied to the top of the wall. The WBC wall bracing is similar to the WB wall bracing except that it packaged in a coil, and the coil has V-shaped notches indicating where to cut the steel strap for use as wood wall bracing. See Table 5 for the WB and WBC models recognized in this report, brace lengths, wall heights and brace angles measured from the horizontal [8 feet (2438 mm) at 45 degrees and 60 degrees, and 10 feet (3048 mm) at 45 degrees], and the fastener schedule. See Figure 5a for a drawing of the WB brace, Figure 5b for the WBC brace, and Figure 5c for wall braces installed X-pairs or in opposing V-pairs.

**3.1.3.4 TWB (T-Type) Wall Bracing:** The TWB wall braces are fabricated from No. 22 gage galvanized steel into a structural T-shape brace without prepunched nail holes. The TWB wall braces resist tension and compression loads when installed in accordance with this report and when the maximum wall stud spacing is 16 inches (406 mm) on center. After a maximum  $\frac{9}{8}$ -inch (15.9 mm) deep kerf is saw-cut into the wood studs and the top and bottom wood plates and the  $\frac{9}{16}$ -inch (14.3 mm) long

leg of the T-shaped TWB brace is inserted into the kerf, the brace is nailed to each intersecting wall stud and top and bottom plates in accordance with the specified nailing schedule. See Table 6 for the TWB brace models recognized in this report, brace lengths, wall heights and brace angles measured from the horizontal [8 feet (2438) at 45 degrees and 55 degrees, and 10 feet (3048 mm) at 45 degrees], and required fasteners. See Figure 4 for a drawing of an installed CWB wall brace, and a drawing of the overall brace dimensions. Reference Figure 6 for series drawing and Table 6 for general dimensions, required fasteners and allowable loads.

**3.1.4 LTB Light Tension Bridging:** The LTB tension bridging is fabricated from No. 22 gage galvanized steel. The bridging resists tension forces only and must be installed in cross pairs. The LTB bridging devices are designed to provide lateral support of nominally 2x8 or 2x10 sawn joists spaced 16 inches on center. See Table 7 for models, required fasteners, and installation requirements. See Figure 7 for drawings of the LTB20 and LTB40 bridging devices, and a drawing of a typical LTB installation.

**3.1.5 NCA Series and NC2x10-16 Nail-less Metal Bridging:** The NCA bridging series are fabricated from No. 20 gage galvanized steel with the exception of the NCA2X12-16 and NC2X10-16 bridging devices, which are fabricated from No. 18 gage and No. 16 gage galvanized steel, respectively. The bridging devices are V-shaped along their length, and each end has sharp, jagged prongs that penetrate into the wood joists when the bridging is installed with a strong hammer blow. See Table 8 for models, bridging connector lengths, and nominal joist sizes and spacings intended to be laterally braced by specific NCA and NC bridging connectors. See Figure 8a for a drawing of a typical NCA bridging connector, and Figures 8b and 8c for drawing of typical NCA or NC bridging installations.

**3.1.6 TB Tension Bridging:** The TB tension bridging is fabricated from No. 20 gage galvanized steel, and is used to bridge sawn wood joists or prefabricated wood I-joists. Although each end of a TB tension bridge has seven nail holes, actual installation requires only two 10d nails installed at each end, provided the nails are installed perpendicular to the laminations of LVL flanges, when occurs. The bridging resists tension forces only and must be installed in cross pairs. TB tension bridging is available in lengths from 20 to 60 inches (508 mm to 1524 mm). See Table 9A for TB bridging device models used with sawn wood joists at specified spacing. See Table 9B for TB tension models used to bridge prefabricated wood I-joists having depths from  $9\frac{1}{2}$  inches (241 mm) to 32 inches (813 mm) and specified spacings. See Figure 9 for a drawing of a typical TB bridging device and a drawing of I-joists bridged in a cross pair configuration showing the nails installed perpendicular to the laminations of LVL flanges.

## 3.2 Materials:

**3.2.1 Steel:** The connectors described in this report are fabricated from ASTM A 653, SS designation, Grade 33, galvanized steel with a minimum yield strength,  $F_y$ , of 33,000 psi (227 MPa) and a minimum tensile strength,  $F_u$ , of 45,000 psi (310 MPa), except for the RPS (repair plate strap) tie series, which is fabricated from ASTM A 653, SS designation, Grade 40, galvanized steel with a minimum yield strength of 40,000 psi (276 MPa) and a minimum tensile strength of 55,000 psi (379 MPa). Base metal thicknesses for the connectors in this report are as follows:

NOMINAL THICKNESS (Gage)	MINIMUM BASE METAL THICKNESS (inches)
No. 16	0.0555
No. 18	0.0445
No. 20	0.0335
No. 22	0.0275

For SI: 1 inch = 25.4 mm.

The connectors have a minimum G90 zinc coating specification in accordance with ASTM A 653. Some models (designated with a model number ending with Z) are available with a G185 zinc coating specification in accordance with ASTM A 653. Some models (designated with a model number ending with HDG) are available with a hot-dip galvanization, also known as "batch" galvanization, in accordance with ASTM A 123, with a minimum specified coating weight of 2.0 ounces of zinc per square foot of surface area (610 g/m<sup>2</sup>), total for both sides. Model numbers in this report do not include the Z or HDG ending, but the information shown applies. The lumber treater and the holder of this report (Simpson Strong-Tie Company) should be contacted for recommendations on the appropriate coating or material to specify for use of the steel connectors in contact with the specific proprietary preservative treated or fire retardant treated lumber.

**3.2.2 Wood:** Wood members with which the connectors are used must be either sawn lumber or engineered lumber having a minimum specific gravity of 0.50 (minimum equivalent specific gravity of 0.50 for engineered lumber), and having a maximum moisture content of 19 percent (16 percent for engineered lumber) except as noted in Section 4.1. The thickness of the supporting wood member must be equal to or greater than the length of the fasteners specified in the tables in this report, or as required by wood member design, whichever is greater. For installation in engineered wood members, minimum allowable nail spacing and end and edge distances, as specified in the applicable evaluation report for the engineered wood product, must be met.

**3.2.3 Fasteners:** Nails used for hangers described in this report must comply with the material requirements, physical properties, tolerances, workmanship, protective coating and finishes, certification, and packaging and package marking requirements specified in ASTM F 1667. The nails must have the following minimum fastener dimensions and bending yield strengths ( $F_{yb}$ ):

FASTENER <sup>1</sup>	SHANK DIAMETER (inches)	NAIL LENGTH (inches)	$F_{yb}$ (psi)
6d	0.113	2	100,000
8d	0.131	2½	100,000
10dx1½	0.148	1½	90,000
10d	0.148	3	90,000
16d	0.162	3½	90,000
16d Box	0.135	3½	100,000

For SI: 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

<sup>1</sup>Nails are common unless otherwise stated.

Nails and bolts used in contact with preservative treated or fire retardant treated lumber must comply with IBC Section 2304.9.5 or IRC Section R319.3, as applicable. SDS screws used in contact with preservative treated or fire retardant treated lumber must, as a minimum, comply with [ESR-2236](#). For use with treated lumber, the lumber

treater or this report holder (Simpson Strong-Tie Company), or both, should be contacted for recommendations on the coating or material to specify for the fasteners as well as the connection capacities of fasteners used with the specific proprietary preservative treated or fire retardant treated lumber.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

The tabulated allowable loads shown in the product tables of this report are based on Allowable Stress Design (ASD) and include the load duration factor,  $C_D$ , corresponding with the applicable loads in accordance with the National Design Specification for Wood Construction and its supplement (NDS).

Tabulated allowable loads apply to products connected to wood used under dry conditions and where sustained temperatures are 100°F (37.8°C) or less. When products are installed to wood having a moisture content greater than 19 percent (16 percent for engineered wood products), or where wet service is expected, the allowable loads must be adjusted by the applicable wet service factor,  $C_M$ , specified for lateral loads for dowel-type fasteners in the NDS. When connectors are installed in wood that will experience sustained exposure to temperatures exceeding 100°F (37.8°C), the allowable loads in this report must be adjusted by the applicable temperature factor,  $C_t$ , specified in the NDS. Connected wood members must be analyzed for load-carrying capacity at the connection in accordance with the NDS.

### 4.2 Installation:

Installation of the connectors must be in accordance with this evaluation report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

## 5.0 CONDITIONS OF USE

The Simpson Strong-Tie stud shoes, plate ties, wall bracing, and joist bridging for wood construction 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:

- The connectors must be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available at the jobsite at all times during installation.
- When required by the code official, calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- Adjustment factors noted in Section 4.1 and the applicable codes must be considered, where applicable.
- Connected wood members and fasteners must comply, respectively, with Sections 3.2.2 and 3.2.3 of this report.
- Use of connectors with preservative treated or fire retardant treated lumber must be in accordance with Section 3.2.1 of this report. Use of fasteners with preservative treated or fire retardant treated lumber must be in accordance with Section 3.2.3 of this report.

## 6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated October 2006 (corrected March 2007).

## 7.0 IDENTIFICATION

The products described in this report are identified with a die-stamped label indicating the name of the manufacturer (Simpson Strong-Tie), the model number, and the number of an index evaluation report ([ESR-2523](#)) that is used as an identifier for the products recognized in this report.

## 8.0 OTHER CODES

### 8.1 Evaluation Scope:

In addition to the codes referenced in Section 1.0, the products in this report were evaluated for compliance with the requirements of the following codes:

- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IRC)
- 1997 *Uniform Building Code*™ (UBC)

The products described in this report comply with, or are suitable alternatives to what is specified in, the codes listed above, subject to the provisions of Sections 8.2 through 8.7.

### 8.2 Uses:

**8.2.1 2003 IBC, 2003 IRC, 2000 IBC, and 2000 IRC:** See Section 2.0 of this report.

**8.2.2 1997 UBC:** Replace the information in Section 2.0 with the following: Simpson Strong-Tie stud shoes, plate ties, wall bracing, and joist bridging are used as wood framing connectors in accordance with applicable sections of the UBC as follows:

**8.2.2.1 Stud Shoe Connectors:** Simpson Strong-Tie stud shoes described in this report are used to reinforce structurally studs in exterior walls or interior bearing partitions that have been cut, notched or drilled according to Sections 2320.11.9 and 2320.11.10 of the UBC. When the size of the cut, notch, or drill hole exceeds the maximums specified in the code, the Simpson Strong-Tie stud shoes may be used provided an engineered design is submitted in accordance with Section 2316 of the UBC.

**8.2.2.2 Plate Tie Connectors:** Simpson Strong-Tie plate ties described in this report are used to connect wall top or bottom plates that have been cut to accommodate plumbing, heating or other pipes placed in or partly in the wall or partition in accordance with Section 2320.11.7 of the UBC.

**8.2.2.3 Wall Bracing Straps:** The Simpson Strong-Tie wall bracing straps described in this report are designed to be used as an alternate to the code prescribed nominal 1-inch-by-4-inch (25 mm by 102 mm) continuous diagonal wood brace let into wood walls designated as braced wall lines according to Section 2320.11.3 of the UBC.

**8.2.2.4 Bridging:** Simpson Strong-Tie bridging components described in this report are used to provide lateral support for wood joists (sawn lumber and prefabricated wood I-joists) in accordance with Amendment No. 18 specified in Section 2316.2 of the UBC.

### 8.3 Description:

**8.3.1 2003 IBC and 2003 IRC:** The same as Section 3.0 of this report.

**8.3.2 2000 IBC and 2000 IRC:** See Section 3.0 of this report, except modify Section 3.2.3 of this report to reference IRC Section R323.3.

**8.3.3 1997 UBC:** See Section 3.0 of this report, except modify the first sentence in the last paragraph of Section 3.2.3 as follows: Nails and bolts used in contact with preservative treated or fire retardant treated lumber must, as a minimum, comply with UBC Section 2304.3.

**8.3.4 Design and Installation: 2003 IBC, 2003 IRC, 2000 IBC, 2000 IRC, 1997 UBC:** The same as Section 4.0 of this report.

### 8.4 Conditions of Use:

**8.4.1 2003 IBC, 2003 IRC 2000 IBC, and 2000 IRC:** The Simpson Strong-Tie products described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 8.0, subject to the same conditions of use indicated in Section 5.0 of this report.

**8.4.2 UBC:** The Simpson Strong-Tie products described in this report comply with, or are suitable alternatives to what is specified in, the UBC, subject to the same conditions of use indicated in Section 5.0 of this report, except the last sentence of Section 5.5 is replaced with the following: Nails and bolts used in contact with preservative treated or fire retardant treated lumber must, as a minimum, comply with UBC Section 2304.3.

**8.5 Evidence Submitted: 2003 IBC, 2003 IRC 2000 IBC, 2000 IRC, and UBC:**

See Section 6.0 of this report.

**8.6 Identification: 2003 IBC, 2003 IRC 2000 IBC, 2000 IRC, and UBC:**

See Section 7.0 of this report.

TABLE 1—SS AND HSS STUD SHOES

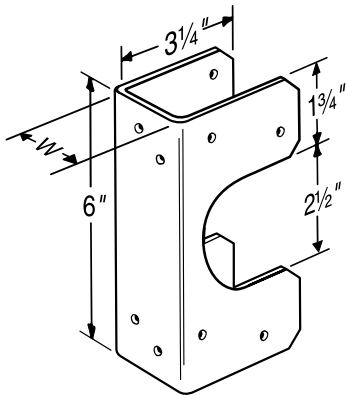
MODEL NO.	WIDTH (W) (in)	FASTENERS <sup>1</sup> (Quantity-Type)	ALLOWABLE LOADS <sup>2</sup> (lbs)			
			Uplift <sup>3</sup>	Download		
			C <sub>D</sub> = 1.33	C <sub>D</sub> = 1.0	C <sub>D</sub> = 1.15	C <sub>D</sub> = 1.25
SS1.5	1 <sup>9</sup> / <sub>16</sub>	12–10d x 1 <sup>1</sup> / <sub>2</sub>	—	500	500	500
SS2.5	2 <sup>9</sup> / <sub>16</sub>	12–10d x 1 <sup>1</sup> / <sub>2</sub>	—	500	500	500
SS3	3 <sup>1</sup> / <sub>16</sub>	12–10d	—	665	765	785
SS4.5	4 <sup>9</sup> / <sub>16</sub>	14–10d	—	665	765	785
HSS2-SDS1.5	1 <sup>9</sup> / <sub>16</sub>	12–SDS <sup>1</sup> / <sub>4</sub> x 1 <sup>1</sup> / <sub>2</sub>	1,025	1,215	1,215	1,215
HSS2-2-SDS3	3	12–SDS <sup>1</sup> / <sub>4</sub> x 3	1,025	1,215	1,215	1,215
HSS2-3-SDS3	4 <sup>9</sup> / <sub>16</sub>	12–SDS <sup>1</sup> / <sub>4</sub> x 3	970	1,000	1,000	1,000
HSS4-SDS3	3 <sup>9</sup> / <sub>16</sub>	12–SDS <sup>1</sup> / <sub>4</sub> x 3	1,025	1,215	1,215	1,215

For SI: 1 inch = 25.4 mm, 1lbs = 4.45 N.

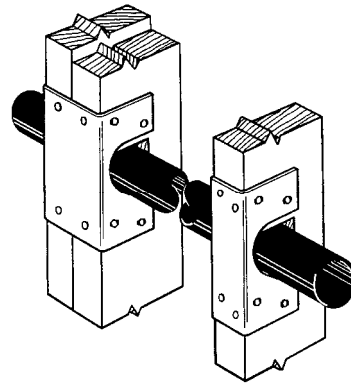
<sup>1</sup>Fasteners are common nails for the SS stud shoes and are SDS wood screws (recognized in evaluation report [ESR-2236](#)) for the HSS stud shoes.

<sup>2</sup>Tabulated allowable loads must be selected based on duration of load as permitted by the applicable building code.

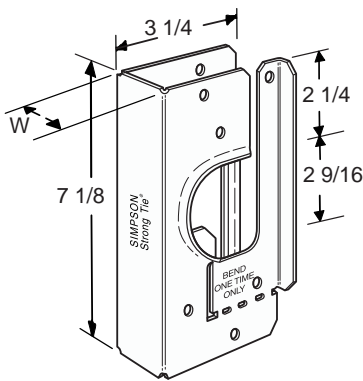
<sup>3</sup>The uplift loads have been increased for wind or earthquake loading with no further increase is allowed. Tabulated allowable uplift loads must be reduced when other load durations govern.



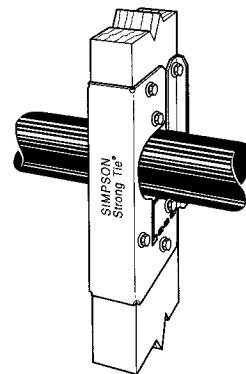
SS Stud Shoe



SS3 and SS1.5 Stud Shoe Installations



HSS Stud Shoe



HSS2-SDS1.5 Stud Shoe Installation

FIGURE 1—SS AND HSS STUD SHOES

TABLE 2—RPS (REPAIR PLATE STRAP) TIES

MODEL NO.	TIE DIMENSIONS (in.)		MAXIMUM NOTCH WIDTH IN WALL PLATES (inches)	FASTENERS <sup>1,2,3</sup> (Quantity–Type)	ALLOWABLE TENSION LOAD <sup>4,5</sup> (lbs) C <sub>D</sub> = 1.33 or C <sub>D</sub> = 1.6
	Width	Length			
RPS18	1 1/2	18 <sup>5/16</sup>	5 1/2	12–10d	905
				12–16d	1,080
RPS22	1 1/2	22 <sup>5/16</sup>	5 1/2	12–10d	905
				12–16d	1,080
				16–16d Box Nails	1,100
				16–16d	1,470
RPS28	1 1/2	28 <sup>5/16</sup>	12	12–10d	905
				12–16d	1,080
				16–16d Box Nails	1,100
				16–16d	1,470

For SI: 1 inch = 25.4 mm, 1lbs = 4.45 N.

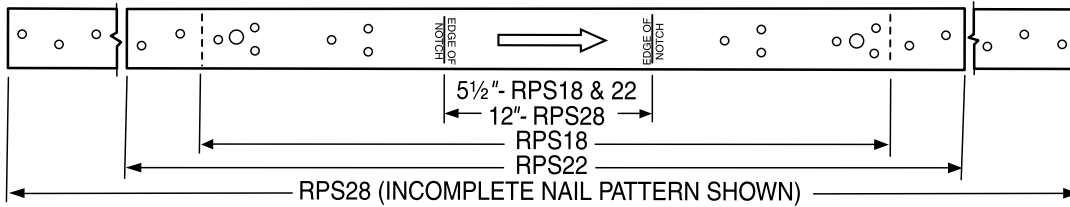
<sup>1</sup>When top plates or sill plates of exterior walls or interior bearing walls have been cut, drilled, or notched by more than 50 percent of its width, the RPS strap may be used to comply with the prescriptive requirements of the IRC, provided the RPS strap is placed across the opening and fastened to the wood plate at each side of opening with not less than eight 16d nails. The nails may be either common (0.162-inch shank diameter by 3 1/2-inch long) or box (0.135-inch shank diameter by 3 1/2-inch long).

<sup>2</sup>Where plumbing, heating or other pipes are placed in (drilled holes in wood plates) or partly in a wood wall or partition (notched as shown in Figure 2), the RPS strap may be used to comply with the prescriptive requirements of the IBC or UBC, as applicable, provided the RPS strap is fastened to each plate across and to each side of the opening with not less than six 16d nails. The nails may be either common (0.162-inch shank diameter by 3 1/2-inch long) or box (0.135-inch shank diameter by 3 1/2-inch long).

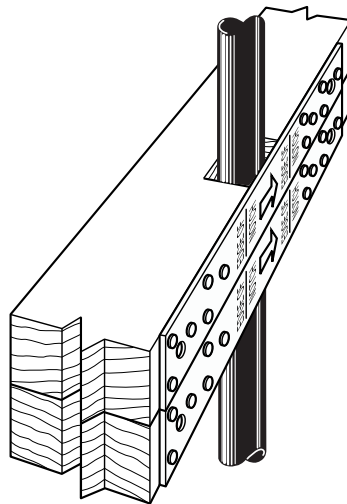
<sup>3</sup>All nails are common unless otherwise noted.

<sup>4</sup>The loads have been increased for wind or earthquake loading with no further increase is allowed. Tabulated allowable tension loads must be reduced when other load durations govern.

<sup>5</sup>For installations on both sides of the top plate, the RPS arrows should always point to the right.



RPS (REPAIR PLATE STRAP) TIE SHOWING THE DIMENSION BETWEEN NOTCH LINES



Two RPS (REPAIR PLATE STRAP) ties are fastened, one RPS tie strap for each plate of the double top plate that has been cut for plumbing, heating or other pipes placed in the wall (see footnote 2 to Table 2).

FIGURE 2—RPS (REPAIR PLATE STRAP) TIES

TABLE 3—RCWB WALL BRACING<sup>1,2,3,4</sup>

MODEL NO.	STRAP LENGTH (feet - inch)	WALL HEIGHT (feet)	REQUIRED INSTALLATION ANGLE OF THE RCWB BRACE FROM THE HORIZONTAL <sup>5</sup> (degree)	FASTENERS (Quantity-Type)	
				Top and Bottom Plates	Each Stud
RCWB10	9' - 9"	8	55°	2-16d	1-8d
RCWB12	11' - 4"	8	45°	2-16d	1-8d
RCWB14	14' - 2"	10	45°	2-16d	1-8d

For **SI**: 1 inch = 25.4 mm, 1 lbs = 4.45 N.

<sup>1</sup>RCWB wall bracing strap can be used as an alternate only to the code prescribed braced wall panel construction identified as a nominal 1x4 diagonal wood brace let into studs. The RCWB wall bracing strap is not recognized to replace or be used as an alternate to other braced wall construction methods described in the code.

<sup>2</sup>The allowable in-plane racking shear load of a wall braced with the RCWB strap installed in accordance with this table is 290 lbs. The RCWB strap resists tension and compression loads. The allowable 290 lbs racking shear load must not be increased for short term loading, and must not be combined with other shear resisting elements or components. Summing shear capacities of the RCWB wall brace with dissimilar materials applied to either side of the same wall is not allowed.

<sup>3</sup>The wall studs must be spaced 16 inches on center, maximum.

<sup>4</sup>A minimum 2x6 stud is required for exterior walls and interior load bearings that are braced with the RCWB strap. For interior, nonload-bearing walls braced with the RCWB strap, minimum 2x4 studs may be used.

<sup>5</sup>The RCWB wall bracing strap must be installed at the installation angle specified in the table.

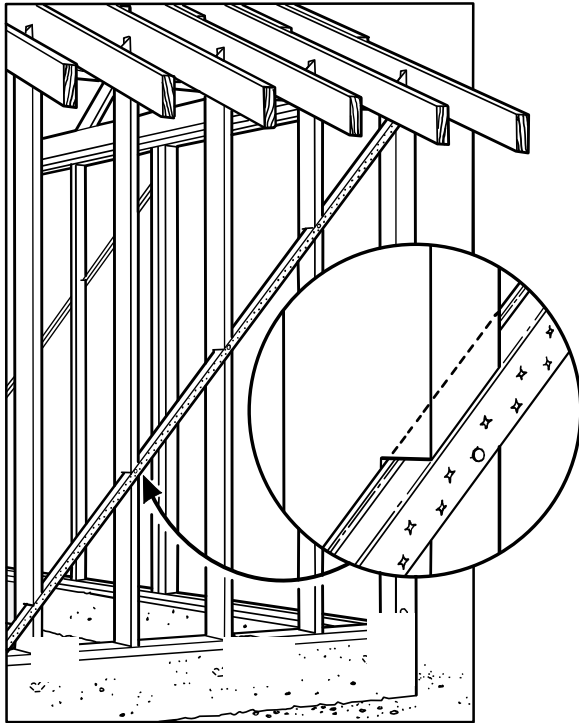


FIGURE 3a—RCWB WALL BRACING STRAP INSTALLATION  
(Maximum 1/8-inch deep saw kerf in studs)

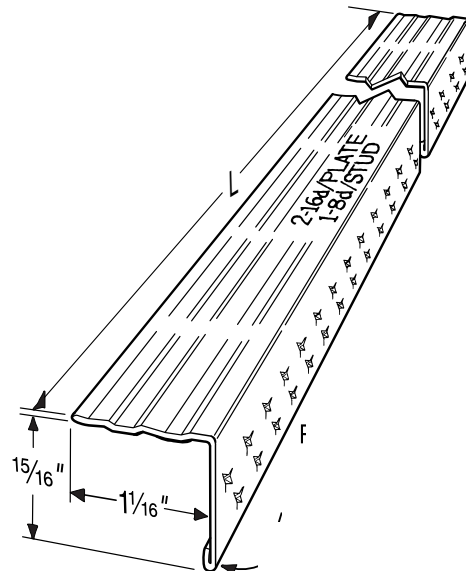


FIGURE 3b—RCWB WALL BRACING STRAP DIMENSIONS

TABLE 4—CWB WALL BRACE<sup>1,2,3,4</sup>

MODEL NO.	BRACE LENGTH (L) (feet – inches)	WALL HEIGHT (feet)	REQUIRED INSTALLATION ANGLE OF THE CWB BRACE FROM THE HORIZONTAL <sup>5</sup> (degree)	FASTENERS (Quantity-Type)	
				Top and Bottom Plates	Each Stud
CWB106	9' – 5 <sup>3</sup> / <sub>4</sub> "	8	60°	2–16d	1–8d
CWB126	11' – 4 <sup>3</sup> / <sub>8</sub> "	8	45°	2–16d	1–8d

For SI: 1 inch = 25.4 mm, 1lbs = 4.45 N.

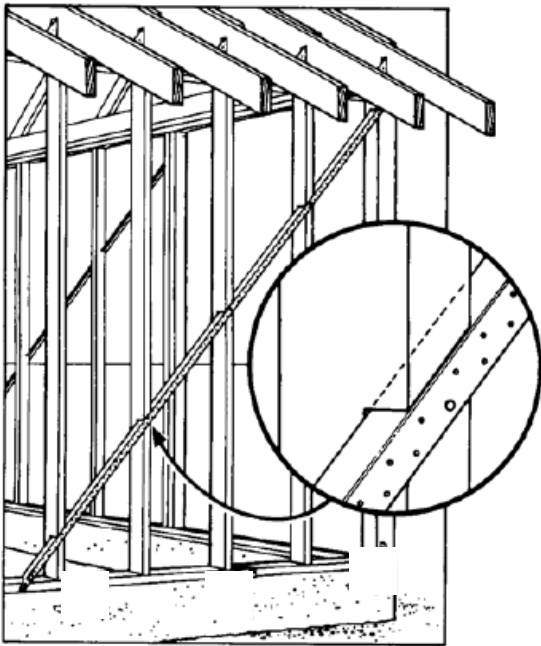
<sup>1</sup>The CWB wall bracing strap can be used as an alternate only to the code prescribed braced wall panel construction identified as a nominal 1x4 diagonal wood brace let into studs. The CWB wall bracing strap is not recognized to replace or be used as an alternate to other braced wall construction methods described in the code.

<sup>2</sup>The allowable in-plane racking shear load of a wall braced with the CWB strap installed in accordance with this table is 200 lbs. The CWB strap resists tension and compression loads. The allowable 200 lbs racking shear load must not be increased for short term loading, and must not be combined with other shear resisting elements or components. Summing shear capacities of the CWB wall brace with dissimilar materials applied to either side of the same wall is not allowed.

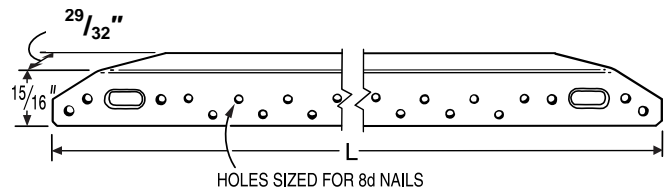
<sup>3</sup>The wall studs must be spaced 16 inches on center, maximum.

<sup>4</sup>May be used with nominal 2x4 load-bearing studs provided the maximum saw kerf is 25% of the depth of the stud, that is, the maximum saw kerf in nominal 2x4 studs braced with the CWB strap is 7/8-inch deep. If the saw kerf is greater than 7/8-inch deep, then the nominal size of the load-bearing studs must be 2x6. For interior, nonload-bearing walls braced with the CWB strap, minimum 2x4 studs may be used.

<sup>5</sup>The CWB wall bracing strap must be installed at the installation angle specified in the table.



**CWB Installation**  
(Maximum 7/8-inch deep saw kerf in studs)



**CWB Wall Bracing Strap Dimensions**

FIGURE 4—CWB WALL BRACING

TABLE 5—WB AND WBC WALL BRACING<sup>1,2,3</sup>

MODEL NO.	STRAP LENGTH (feet – inches)	WALL HEIGHT (feet)	REQUIRED INSTALLATION ANGLE OF THE WB AND WBC BRACES FROM THE HORIZONTAL <sup>4</sup> (degree)	FASTENERS (Quantity Type)	
				Top and Bottom Plates	Each Stud
WB106	9' – 5 <sup>5</sup> / <sub>8</sub> "	8	60°	2–16d	1–8d
WB126	11' – 4 <sup>3</sup> / <sub>8</sub> "	8	45°	2–16d	1–8d
WB106C	9' – 6"	8	60°	2–16d	1–8d
WB126C	11' – 4 <sup>13</sup> / <sub>16</sub> "	8	45°	2–16d	1–8d
WB143C	14' – 3"	10	45°	2–16d	1–8d

For SI: 1 inch = 25.4 mm, 1lbs = 4.45 N.

<sup>1</sup>The WB and WBC wall bracing straps can be used as alternates only to the code prescribed braced wall panel construction identified as a nominal 1x4 diagonal wood brace let into studs. The WB and WBC wall bracing straps are not recognized to replace or be used as alternates to other braced wall construction methods described in the code.

<sup>2</sup>The WB and WBC resist tension loads only. Consequently, the WB and WBC straps must be installed in pairs, as shown in Figure 5c. The allowable in-plane racking shear load of a wall braced with the CWB strap installed in "X" pairs or in opposing "V" fashion is 180 lbs, and must not be combined with other shear resisting elements or components. This allowable racking shear load must not be increased for short term loading. Summing shear capacities of the WB or WBC wall braces with dissimilar materials applied to either side of the same wall is not allowed.

<sup>3</sup>The wall studs may be spaced 16 inches on center or 24 inches on center.

<sup>4</sup>The WB and WBC wall bracing straps must be installed at the installation angle specified in the table.

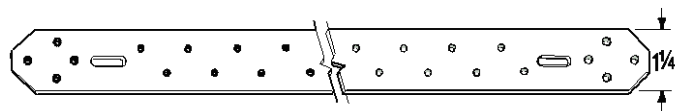
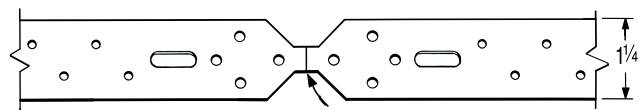


Figure 5a—WB Wall Brace Strap



BREAK OFF WBC AT PREDETERMINED LENGTH

Figure 5b—WBC Wall Brace Strap

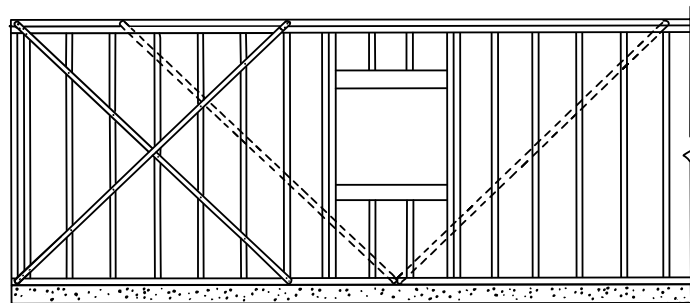


Figure 5c—WB and WBC Wall Bracing "X" and "V" Applications

FIGURE 5—WB AND WBC WALL BRACING STRAPS

TABLE 6—TWB (T-TYPE) WALL BRACING<sup>1,2,3</sup>

MODEL NO.	BRACE LENGTH (L) (feet – inches)	WALL HEIGHT (feet)	REQUIRED INSTALLATION ANGLE OF THE TWB (T-TYPE) BRACE FROM THE HORIZONTAL <sup>4</sup> (degree)	FASTENERS (Quantity-Type)	
				Top and Bottom Plates	Each Stud
TWB10	9' – 9"	8	55°	2–16d	1–8d
TWB12	11' – 4"	8	45°	2–16d	1–8d
TWB14	14' – 2"	10	45°	2–16d	1–8d

For **SI**: 1 inch = 25.4 mm, 1lbs = 4.45 N.

<sup>1</sup>The TWB wall bracing strap is not recognized to replace or be used as an alternate to braced wall construction methods described in the code.

<sup>2</sup>The allowable in-plane racking shear load of a wall braced with the TWB10 strap installed in accordance with this table is 160 lbs. The allowable in-plane racking shear load of a wall braced with the TWB12 or TWB14 strap installed in accordance with this table is 190 lbs. The TWB straps resist tension and compression loads, and must not be combined with other shear resisting elements or components. The allowable racking shear load must not be increased for short term loading. Summing shear capacities of the TWB wall brace with dissimilar materials applied to either side of the same wall is not allowed.

<sup>3</sup>The wall studs must be spaced 16 inches on center, maximum.

<sup>4</sup>The TWB wall bracing strap must be installed at the installation angle specified in the table.

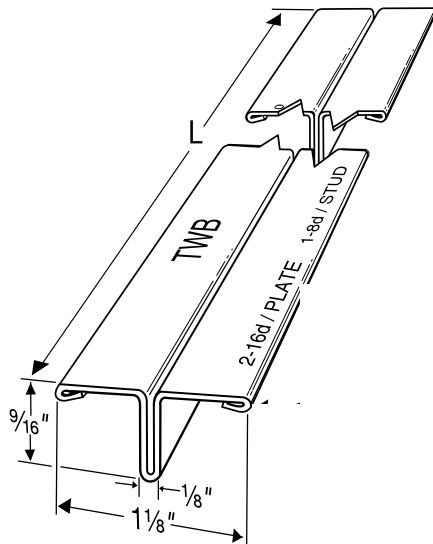


Figure 6a—TWB (T-Type) Brace Dimensions

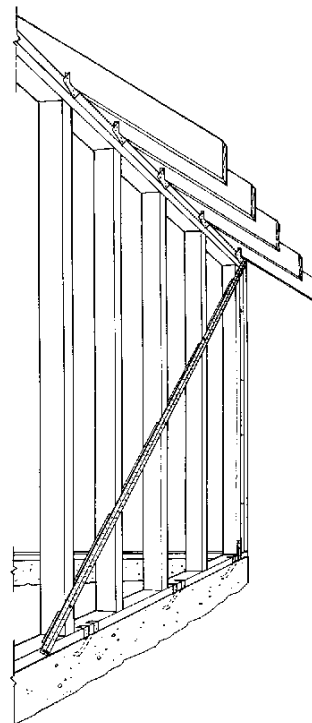


Figure 6b—Typical TWB (T-Type) Exterior Wall Brace Installation  
(Maximum <sup>5</sup>/<sub>8</sub>-inch deep saw kerf in studs)

FIGURE 6—TWB (T-TYPE) WALL BRACE

TABLE 7—LTB BRIDGING<sup>1</sup>

MODEL NO.	FASTENERS (Quantity-Type)
LTB20 <sup>2</sup>	4-6d
LTB40 <sup>3</sup>	4-6d

For SI: 1 inch = 25.4 mm.

<sup>1</sup>LTB bridging device must be installed in pairs (cross pairs as shown in Figure 7). The nominal size of joists that can be bridged with the LTB devices is either 2x8 or 2x10 spaced 16 inches on center.

<sup>2</sup>The LTB20 is installed with each end of the bridging device nailed to the top and bottom of adjacent joists as shown in Figure 7 (this page).

<sup>3</sup>The LTB40 is installed with the centerline of the bridging device bent over the middle joist and each end nailed to the adjacent joists with two 6d common nails.

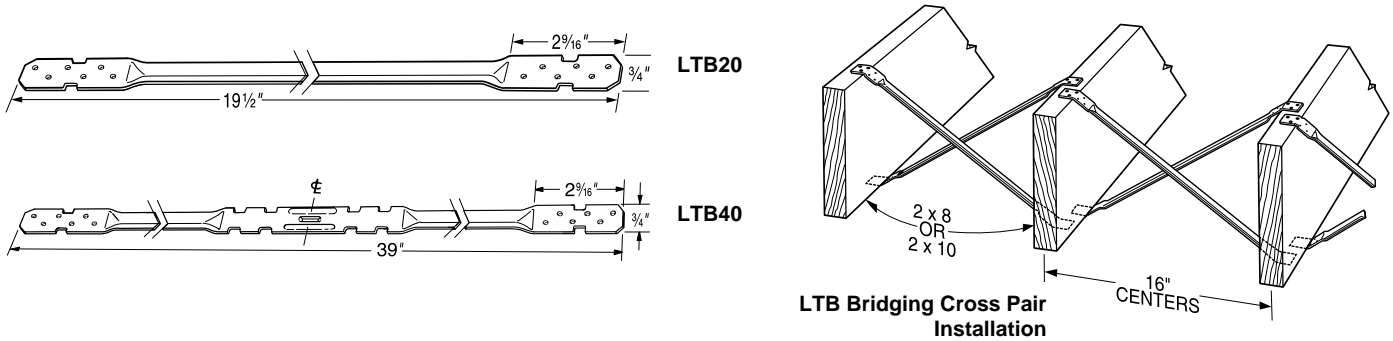


FIGURE 7—LTB BRIDGING

TABLE 8—NCA AND NC NAILLESS BRIDGING<sup>1,2,3</sup>

BRIDGING SERIES	MODEL NO.	BRIDGING DEVICE LENGTH (L) (inch)	NOMINAL JOIST SIZE	JOIST SPACING (inch)
NCA	NCA2 x 8-12	11 <sup>9</sup> / <sub>19</sub>	2x8	12
	NCA2 x 10-12	12 <sup>1</sup> / <sub>2</sub>	2x10	
	NCA2 x 12-12	13 <sup>5</sup> / <sub>8</sub>	2x12	
	NCA2 x 8-16	15 <sup>1</sup> / <sub>4</sub>	2x14	
	NCA2 x 10-16	15 <sup>13</sup> / <sub>16</sub>	2x16	16
	NCA2 x 8-16	15 <sup>1</sup> / <sub>4</sub>	2x8	
	NCA2 x 10-16	15 <sup>13</sup> / <sub>16</sub>	2x10	
NC	NC2 x 10-16	16	2x10	16

For SI: 1 inch = 25.4 mm.

<sup>1</sup>Prongs at each end of the bridging device are driven into the wood joists with a strong hammer blow (See Figures 8a and 8b).

<sup>2</sup>The bridging devices may be installed either from the top or bottom before the sheathing is installed, or from the bottom after the sheathing is installed.

<sup>3</sup>NCA and NC bridging devices must be installed in pairs (cross pairs as shown in Figure 8c).

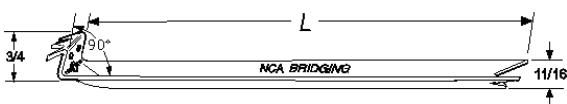


FIGURE 8a—NCA and NC Nail-less Bridging Devices

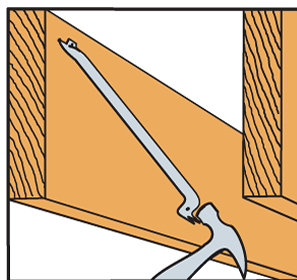


FIGURE 8b—NCA and NC Bridging are installed from below as shown, or from above. The upper end is hammered into the joist approximately 1 inch from the top.

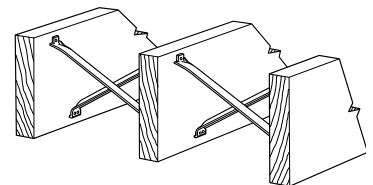


FIGURE 8c—NCA and NC Bridging Cross Pair Installation

TABLE 9A—TB TENSION BRIDGING FOR SOLID-SAWN WOOD JOISTS<sup>1,2</sup>

MODEL NO.	BRIDGING DEVICE LENGTH (L) (inches)	NOMINAL SOLID-SAWN WOOD JOIST SIZE	JOIST SPACING (inch)	FASTENERS <sup>3</sup> (Total Quantity-Type)
TB20	20	2x8 through 2x12	12	4 - 10d
TB27	27	2x14 through 2x16	12	4 - 10d
TB27	27	2x8 through 2x16	16	4 - 10d
TB36	36	2x10 through 2x16	24	4 - 10d

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

<sup>1</sup>The allowable tension load is 235 lbs, which must not be increased for short term loading.

<sup>2</sup>TB bridging device must be installed in pairs (cross pairs as shown in Figure 7).

<sup>3</sup>Although each end of a TB tension bridge has seven nail holes, actual installation requires two 10d nails at each end.

TABLE 9B—TB TENSION BRIDGING FOR PREFABRICATED WOOD I-JOISTS<sup>1,2,3</sup>

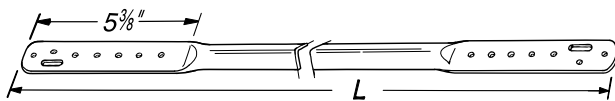
I-JOIST DEPTH (in.)	I-JOIST SPACING (inches)								
	12	16	19.2	24	30	32	36	42	48
	TB BRIDGING MODEL NO.								
9 <sup>1</sup> / <sub>2</sub>	TB20	TB27	TB27	TB30	TB36	TB36	TB42	TB48	TB54
10									
11 <sup>7</sup> / <sub>8</sub>									
12	TB27	TB30	TB30	TB36	TB42	TB42	TB48	TB54	TB56
14									
16									
18	TB30	TB36	TB36	TB42	TB42	TB48	TB54	TB54	TB56
20									
22									
24	TB36	TB36	TB42	TB42	TB48	TB48	TB54	TB56	TB60
26									
28									
30	TB42	TB42	TB42	TB48	TB48	TB54	TB54	TB56	TB60
32									

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

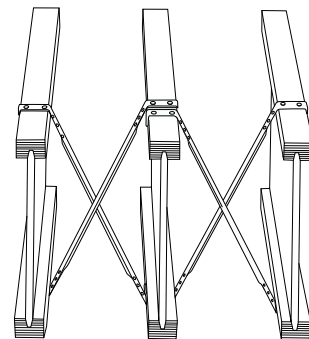
<sup>1</sup>The allowable tension load is 235 lbs, which must not be increased for short term loading.

<sup>2</sup>TB bridging device must be installed in pairs (cross pairs as shown in Figure 9).

<sup>3</sup>Although each end of a TB tension bridge has seven nail holes, actual installation requires only two 10d nails installed at each end, provided the nails are installed perpendicular to the laminations of LVL flanges, as shown in Figure 9.



TB Bridging Device



TB Bridging Installation

FIGURE 9—TB TENSION BRIDGING