

ICC-ES Evaluation Report

ESR-2762*

Reissued January 1, 2012

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**DIVISION: 06 00 00—WOOD, PLASTICS AND
COMPOSITES**
Section: 06 17 53—Shop-Fabricated Wood Trusses

REPORT HOLDER:

SIMPSON STRONG-TIE CO., INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(925) 560-9000
(800) 999-5099
www.strongtie.com

EVALUATION SUBJECT:

**SIMPSON STRONG-TIE METAL CONNECTOR PLATES
FOR WOOD TRUSSES: AS-20 AND AS-18-HS**

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

- 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2012, 2009 and 2006 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

Simpson Strong-Tie AS-20 and AS-18-HS metal connector plates are used as joint connectors for wood roof and floor trusses.

3.0 DESCRIPTION**3.1 AS-20:**

Simpson Strong-Tie AS-20 metal connector plates are staggered-tooth metal plates manufactured from minimum No. 20 gage [0.0356 inch (0.904 mm) total thickness] steel complying with ASTM A 653, SS Grade 40 with G60 galvanization coating [0.0005 inch on each side (0.013 mm)] and having a base-metal thickness of 0.0346 inch (0.879 mm). Each plate has eight teeth per square inch, and each tooth is 0.375 inch (9.5 mm) long. The teeth are punched in pairs and formed at right angles to the face of the parent metal so that two teeth per hole occur along the length. The spacing along the longitudinal direction of each punched slot is 1 inch on center (25.4 mm), and the pairs are spaced 0.25 inch on center (6.35 mm) along the width of the plate. Alternating rows of teeth are staggered 0.125 inch (3.18 mm) from adjacent rows.

3.2 AS-18-HS:

Simpson Strong-Tie AS-18-HS metal connector plates are staggered-tooth metal plates manufactured from minimum No. 18 gage [0.0466 inch (1.184 mm) total thickness] steel complying with ASTM A 653, HSLAS Grade 60 with G60 galvanization coating [0.0005 inch on each side (0.013 mm)] and having a base-metal thickness of 0.0456 inch (1.158 mm). Each plate has eight teeth per square inch, and each tooth is 0.375 inch (9.5 mm) long. The teeth are punched in pairs and formed at right angles to the face of the parent metal so that two teeth per hole occur along the length. The spacing along the longitudinal direction of each punched slot is 1 inch on center (25.4 mm), and the pairs are spaced 0.25 inch on center (6.35 mm) along the width of the plate. Alternating rows of teeth are staggered 0.125 inch (3.18 mm) from adjacent rows.

4.0 DESIGN AND INSTALLATION**4.1 General:**

The design, manufacture and installation of wood trusses employing the metal connector plates must comply with IBC Section 2303.4 and IRC Section R502.11 or R802.10, as applicable. All truss plates are pressed into the wood for the full depth of their teeth by hydraulic-platen embedment presses, multiple roller presses that use partial embedment followed by full-embedment rollers, or combinations of partial embedment roller presses and hydraulic-platen embedment presses that feed trusses into a stationary finish roller press. Trusses must be assembled within the tolerances provided by the Truss Plate Institute (TPI) Quality Criteria for the Manufacture of Metal Plate Connected Wood Trusses, shown as Chapter 3 in ANSI/TPI 1, National Design Standard for Metal Plate Connected Wood Truss Construction.

4.2 Design Values:

Allowable design values for Simpson Strong-Tie metal connector plates to be used in the design of metal-plate-connected wood roof and floor trusses are shown in Tables 1 and 2 of this report. Allowable design values are applicable when the connection is made with identical plates on opposite sides of the joint. This evaluation report is limited to the evaluation of connection capacity of the Simpson Strong-Tie Stamping metal connector plates listed in this report.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie Co., Inc., metal connector plates for wood trusses 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:

***Revised February 2012**

- 5.1 This evaluation report and the manufacturer’s published installation instructions, when required by the code official, must be submitted at the time of permit application. In the event of a conflict between the manufacturer’s published installation instructions and this report, this report governs.
- 5.2 Each application for a building permit, where these metal connector plates are to be used, must be accompanied by calculations, details and other documentation showing that the design, manufacture and proposed installation conforms with the requirements of the applicable code.
- 5.3 This report establishes plate design values only. For items not covered by this report, such as truss design, fabrication, quality assurance and inspection, refer to ANSI/TPI 1, engineering drawings and the applicable code.
- 5.4 The design values (lateral resistance values, effective tension strength ratios, and effective shear resistance ratios) used in the design of trusses using Simpson Strong-Tie metal connector plates, must not exceed those listed in Tables 1 and 2 of this report. Load combination reductions must be in accordance with the applicable code.
- 5.5 All lumber used in the fabrication of trusses using Simpson Strong-Tie metal connector plates must be graded in compliance with the applicable building

code, and must have a moisture content not exceeding 19 percent at the time of assembly. Wet service factors from ANSI/TPI 1 Section 6.4.5 must be applied to the table values when the lumber moisture content exceeds 19 percent. Allowable values shown in the tables of this report are not applicable to metal connector plates embedded in either fire-retardant-treated lumber or preservative-treated lumber.

- 5.6 Metal connector plates must be installed in pairs, on opposite faces of truss members.
- 5.7 Galvanized G60 metal connector plates subject to corrosive environments must be protected in accordance with ANSI/TPI 1 Section 6.5.

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the National Design Standard for Metal-plate-connected Wood Truss Construction, ANSI/TPI 1-2002 and 2007.
- 6.2 Quality Documentation.

7.0 IDENTIFICATION

Each Simpson Strong-Tie metal truss connector plate is identified by the product name (AS-20 or AS-18-HS) embossed into the surface of the plate. Additionally, boxes containing the Simpson Strong-Tie metal connector plates are identified with the name of the manufacturer (Simpson Strong-Tie Co., Inc.), the product name (AS-20 or AS-18-HS) and the evaluation report number (ESR-2762).

TABLE 1—AS-20 AND AS-18-HS ALLOWABLE LATERAL RESISTANCE VALUES^{1, 2, 3} (lb/in²/PLATE)

LUMBER SPECIES	SG ⁴	AA	EA	AE	EE
Spruce-pine-fir	0.42	211	170	154	136
Southern yellow pine	0.55	246	195	186	185

For SI: 1lb/in² = 6.9 kPa.

¹Tooth holding units = psi for a single plate (double for plates on both faces when applying to area on only one face). To achieve values, plates of equal size must be installed on opposite sides of the joint with the teeth oriented in the same direction

²AA = Plate parallel to load, wood grain parallel to load.

EA = Plate perpendicular to load, wood grain parallel to load.

AE = Plate parallel to load, wood grain perpendicular to load.

EE = Plate perpendicular to load, wood grain perpendicular to load.

³All truss plates are pressed into the wood for the full depth of their teeth by hydraulic-platen embedment presses, multiple roller presses that use partial embedment followed by full-embedment rollers, or combinations of partial embedment roller presses and hydraulic-platen presses that feed trusses into a stationary finish roller press.

⁴Specific gravity.

TABLE 2—EFFECTIVE TENSION AND SHEAR RESISTANCE ALLOWABLE DESIGN VALUES¹

PROPERTY FORCE DIRECTION	AS-20		AS-18-HS	
	Efficiency	Pounds/ inch/Pair of Connector Plates	Efficiency	Pounds/ inch/Pair of Connector Plates
Tension Values in Accordance with Chapter 5.4.4.2 of TPI 1-2002 (Minimum Net Section over the Joint) ²				
Tension @ 0°	0.51	901	0.50	1728
Tension @ 90°	0.51	901	0.50	1728
Tension Values in Accordance with TPI-1-2002 with a Deviation [see Chapter 5.4.9 (e)] Maximum Net Section Occurs over the Joint ³				
Tension @ 0°	0.63	1113	0.63	2177
Tension @ 90°	0.52	919	0.51	1763
Shear Values				
Shear at 0°	0.57	671	0.58	1336
Shear at 30°	0.65	765	0.66	1521
Shear at 60°	0.82	966	0.75	1728
Shear at 90° (Minimum) ²	0.46	542	0.50	1152
Shear at 90° (Maximum) ³	0.56	659	0.58	1336
Shear at 120°	0.50	589	0.46	1060
Shear at 150°	0.57	671	0.52	1198

For SI: 1 lb/inch = 0.175 n/mm, 1 inch = 25.4 mm.

¹Minimum coated thickness for 20 gage is 0.0356 inch (0.904 mm) and for 18 gage is 0.0466 inch (1.184 mm), in accordance with Chapter 4.3.4 of ANSI/TPI 1-2002. Minimum coating thickness for G60 is 0.0010 inch (0.025 mm), total, for both sides in accordance with Chapter 4.3.6 of ANSI/TPI 1-2002.

²Minimum Net Section – A line through the plate’s tooth pattern with the minimum amount of steel for a specified orientation. For these plates, this line passes through a line of slots.

³Maximum Net Section – A line through the plate’s tooth pattern with the maximum amount of steel for a specified orientation. For these plates, this line passes through a section of the plate with no slots.

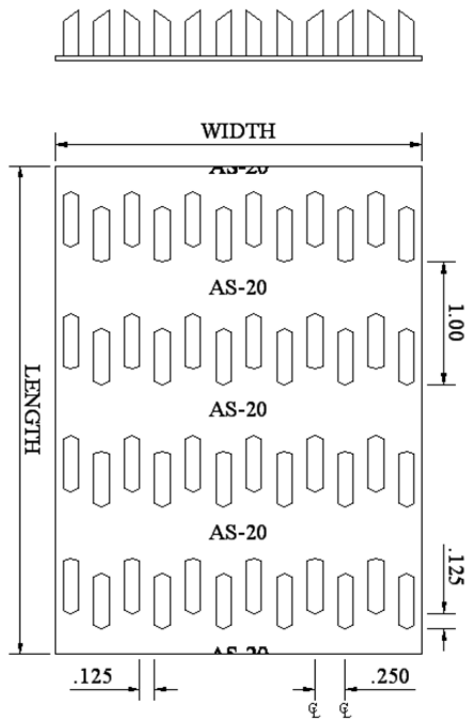


FIGURE 1—AS-20 PLATE PATTERN (DIMENSIONS IN INCHES)

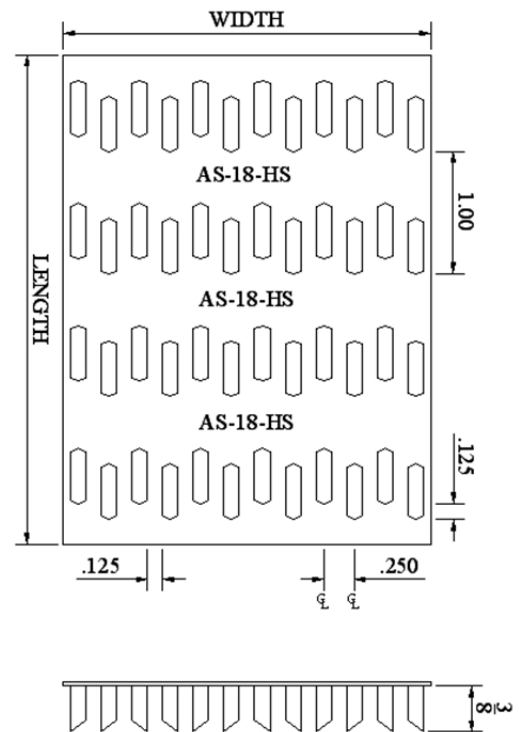


FIGURE 2—AS-18-HS PLATE PATTERN (DIMENSIONS IN INCHES)