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RESEARCH REPORT: RR 25489  
(CSI #06090)

BASED UPON ICBO ES LEGACY  
REPORT NO. ER-5275

REEVALUATION DUE DATE:  
September 1, 2008

**GENERAL APPROVAL** - Simpson Metal to Metal Connectors, S/HD8, S/HD10, S/LTT20, S/LHTT14, L30, L50, L70, S/LS 50, S/LS 70, A21, S/A23, S/H1, S/H2, S/H2.5, S/H3, LTS12, MTS12, ST, S/MST, CMST, CS and TB & LTB bridging.

## DETAILS

The above products are approved when in compliance with the description, identification, and conditions of use in Legacy Report No. ER-5275 dated March 1, 2004, of the ICC Evaluation Service Incorporated. The report, in its entirety, is attached and made a part of this general approval.

The parts of the Legacy Report No. ER-5275 marked by the asterisks are deleted or revised by the Los Angeles City Building Department from this approval.

### The approval is subject to the following conditions:

1. Hold down connections shall be fully detailed and dimensioned on approved plans showing anchor bolt embedments measured below slab/footing or bearing wall cold joint interface. The concrete footing must be checked to insure that it is capable of resisting the applied load.
2. The required spacing and size of the framing connectors shall be determined by a licensed civil engineer or structural engineer or architect registered in the State of California.
3. The spacing, size and location of the anchors shall be detailed on the approved set of plans.
4. Allowable loads shall not be increased for duration of loading.

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Simpson Strong-Tie Co., Inc.  
RE: Simpson Metal to Metal Connectors.

5. The allowable loads in the Tables are for the metal fastening devices and does not include the supporting members its structural adequacy. The metal studs shall be checked separately.
6. A 25% reduction in all allowable loads, specified in this research report shall be taken in hold down devices as required by 91.2315.5.6 of the Los Angeles City Building Code.
7. Products requiring structural welding shall be fabricated in the shop of a Los Angeles City licensed fabricator.
8. The values down in this report shall not used in repair, retrofit and new construction of tilt-up and/or masonry wall anchorage (in tension) for the connection with the horizontal metal diaphragm.

## DISCUSSION

The approval is based on tests and analyses.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

The status of the referenced Legacy Report No. ER-5275 dated March 1, 2004, which is currently beyond its reexamination date is still valid. The validity of the evaluation report was verified with ICC.

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RB:elcm  
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R08/24/07  
5D2/2318

Attachments: ICC ES Legacy Report No.ER-5275 (16 pages).

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\* Legacy report on the 1997 Uniform Building Code™, the 2000 International Building Code® and the 2000 International Residential Code®

DIVISION: 05—METALS
Section: 05090—Metal Fastenings

SIMPSON METAL-TO- METAL CONNECTORS

SIMPSON STRONG-TIE COMPANY, INC.
4120 DUBLIN BOULEVARD, SUITE 400
DUBLIN, CALIFORNIA 94568

1.0 SUBJECT

Simpson Metal-to-Metal Connectors.

2.0 DESCRIPTION

2.1 General:

The Simpson metal-to-metal connectors are an alternate means of providing connections that comply with Section E of the Specifications for the Design of Cold-formed Steel Structural Members, 1986 (1989 Addendum), as referenced in Chapter 22, Division VII, of the 1997 Uniform Building Code™ (UBC), and Section E of the Specification for the Design of Cold-formed Steel Structural Members, 1996 edition, as referenced in Section 2205 of the 2000 International Building Code® (IBC).

2.2 Materials:

2.2.1 Connectors: The Simpson metal-to-metal connectors are fabricated from cold-formed or hot-rolled steel complying with the material descriptions shown in Table 1.

2.2.2 Cold-formed Structural Steel Members: The allowable loads for the connectors described in this evaluation report are based cold-formed structural steel members having the following properties:

2.2.2.1 No. 20 gage [0.0329-inch (0.84 mm) base-metal thickness]; ASTM A 653, grade 33; Fy = 33 ksi; Fu = 45 ksi

2.2.2.2 No. 18 gage [0.0428-inch (1.09 mm) base-metal thickness]; ASTM A 653, grade 40; Fy = 40 ksi; Fu = 55 ksi

2.2.2.3 No. 16 gage [0.0538 inch (1.37 mm) base-metal thickness]; ASTM A 653, grade 40; Fy = 40 ksi; Fu = 55 ksi

2.2.3 Metal Screws: All screws must comply with SAE (Society of Automotive Engineers) Standard J 78, Steel Self Drilling Tapping Screws, and must have a Type II coating in accordance with ASTM B 633, Electrodeposited Coatings of Zinc on Iron and Steel. Additionally, the screws must have allowable shear strength in accordance with Section E4.3.2 of the 1996 AISI specifications and as shown in Table 2.

\* When the connectors are governed by the International Residential Code® (IRC), the screws must also comply with SAE (Society of Automotive Engineers) Standard J 78, Steel Self Drilling Tapping Screws, and must have a Type II coating in accordance with ASTM B 633, Electrodeposited Coatings of Zinc on Iron and Steel. When governed by the IRC, the minimum screw size for steel-to-steel connections must comply with Table R603.2c of the IRC.
2.3 MAS Mudsill Anchor:
The MAS mudsill anchor connects No. 20 gage [0.0352 inch base-metal thickness (0.894 mm)] or heavier-gage steel sill-plate members to concrete foundations. The anchor has an overall length of 5 5/8 inches (143 mm), terminating in a 1-inch-long (25.4 mm) hook. The hooked end of the anchor is installed into a concrete foundation with a minimum embedment depth of 4 inches (101 mm). The portion of the anchor extending from the concrete has two 3/4-inch-by-4 1/4-inch (18 mm by 108 mm) legs spaced 1 1/2 inches (38 mm) apart, which are screw attached to the steel sill track. The concrete in which the anchors are embedded must have a minimum compressive strength of 3000 psi (20.7 MPa) at 28 days.
The anchor must be screw attached to a box-shaped sill plate. Metal sill plates formed by a single C-shaped steel section require the placement of a 12-inch-long (305 mm) C-shaped steel section inserted into the sill plate to form a box section. The box section is necessary for attachment of the screws that are required for the MAS anchor installation. Refer to Table 3 for installation requirements and allowable loads.
MAS mudsill anchors must not be used where a horizontal cold joint exists between the slab and foundation wall or footing beneath, unless provisions are made to transfer the load.
2.4 S/PAHD, S/HPAHD, and HPAHD Holddown Anchors:
S/PAHD42, S/HPAHD22, and HPAHD22-2P holddown straps are used to connect vertical No. 20 gage [0.0352 inch (0.841 mm)] or heavier vertical steel members to concrete foundations. The straps are permitted to be installed at the edge of the concrete. The S/PAHD42 has a 16 9/16-inch-long (420.69 mm) vertical strap with 1 1/64-inch-diameter (4.37 mm) holes punched along the edges. The anchoring section of the strap is bent 35 degrees from the vertical and is 7 3/8 inches (187.33 mm) long. At the end of the embedded anchor, the strap is bent again at a 90-degree angle and is 2 1/8 inches (53.98 mm) long. The S/HPAHD22 and S/HPAHD22-2P have

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~~similar design to the S/PAHD42 with the exception of the length of the vertical strap and the bent angle of the embedment section of the strap. See Table 4 for dimensions, required fasteners, installation requirements, and allowable loads.~~

## 2.5 S/HD Holddown Anchor:

S/HD8, S/HD10 and S/HD15 holddown anchors are used to transfer tension loads between floors or from structural members to a foundation. The S/HD8 and S/HD10 holddowns are die-formed from No. 10 gage [0.131 inch (3.36 mm)] hot-rolled steel. ~~The S/HD15 is die-formed from No. 7 gage [0.174 inch (4.3 mm)] hot-rolled steel.~~ The S/HD 8 and S/HD 10 have an additional  $\frac{3}{8}$ -inch (0.953 mm) thick bearing plate, ~~and the S/HD15 has an additional  $\frac{1}{2}$ -inch thick (12.7 mm) bearing plate.~~ The bearing plate is cut out of hot-rolled steel conforming to ASTM A 36 specifications with minimum yield strength of 36 ksi (248.3 MPa) and a minimum ultimate strength of 58 ksi (400.0 MPa). The holddowns are attached to minimum No. 20 gage [0.035 inch (0.841 mm)] or heavier steel members. See Table 5 for holddown anchor dimensions, required fasteners, and allowable loads.

## 2.6 S/LTT and S/HTT Tension Ties:

S/LTT20 and S/HTT14 tension ties are used to connect vertical No. 20 gage [0.0352 inch (0.841 mm)] or heavier steel members to concrete foundations. The S/HTT14 is formed from No. 11 gage [0.1163 inch (2.95 mm)] galvanized steel. The S/LTT20 is formed from No. 12 gage [0.1026 inch (2.61 mm)] galvanized steel. The S/LTT20 tension tie has a 90-degree bend at the end. A No. 3 gage [0.2405 inch (6.11 mm)] load transfer plate is installed in the bend, which eliminates the need for a washer. The bend is  $2\frac{3}{4}$  inches (69.85 mm) long with a  $\frac{9}{16}$ -inch-diameter (14.29 mm) hole at the center for a  $\frac{1}{2}$ -inch-diameter (12.7 mm) bolt. Holes having an  $\frac{11}{64}$ -inch (4.37 mm) diameter are punched along the 15-inch-high (381 mm) strap to accommodate No. 10 screws. The anchor hole diameter is  $\frac{11}{16}$  inch (17.46 mm) to accommodate a  $\frac{5}{8}$ -inch-diameter (15.88 mm) bolt. See Table 6 for connector material, dimensions, required fasteners, and allowable loads.

## 2.7 L and S/LS Reinforcing Angles:

The L30, 50, and 70 are formed from No. 16 gage [0.0584 inch (1.48 mm)] galvanized steel and are prepunched for No. 10 screws. They are right-angle sections measuring  $2\frac{3}{8}$  inches (60.33 mm) by  $1\frac{3}{8}$  inches (34.93 mm) by 3 inches (76.20 mm), 5 inches (127 mm), or 7 inches (177.80 mm). The S/LS50 and S/LS70 are skewable angles formed from No. 18 gage [0.0468 inch (1.19 mm)] galvanized steel. The LS is similar in design to the L angles. Its difference is the slots at the bend to allow for field-skewing from 0 to 135 degrees. See Table 7 for connector dimensions, required fasteners, and allowable loads.

## 2.8 A and S/A Angles:

A angles are versatile angles used to attach steel-framing members together. A21 is a right-angle section measuring 2 inches (50.80 mm) by  $1\frac{1}{2}$  inches (38.10 mm) by  $1\frac{3}{8}$  inches (34.93 mm) in length. The S/A 23 is similar in design to the A21 with dimensions of 2 inches (50.80 mm) by  $1\frac{1}{2}$  inches (38.10 mm) by  $2\frac{3}{4}$  inches (69.85 mm) in length. The angles provide holes for No. 10 screws. See Table 8 for angle dimensions, required fasteners, and allowable loads.

## 2.9 S/H Seismic and Hurricane Ties:

S/H seismic and hurricane ties are designed to connect trusses and rafters to studs formed from No. 20 gage [0.0352 inch base-metal thickness (0.894 mm)] steel. S/H1, 2, 2.5,

and 3 are formed from No. 18 gage [0.0468 inch (1.19 mm)] galvanized steel. S/H1 is formed from a 4-inch (101.6 mm) square plate and has a  $1\frac{9}{16}$ -inch-wide-by- $2\frac{5}{8}$ -inch-deep (39.69 mm by 66.68 mm) slot formed in the upper half of the plate at a diagonal to the edge. The slot material is bent to form a  $\frac{3}{4}$ -inch (19.05 mm) flange of each side. The S/H1 shall be installed with the slot on top and the plate screwed to the sides of a top plate and to a stud. A rafter or truss shall then be placed in the slot and screwed to one of the flanges of the S/H1.

The S/H2 is formed from a flat plate into an A-shaped section, and is  $9\frac{7}{16}$  inches (239.71 mm) long. The plate has a right-angle bend along its longitudinal axis to permit straddling a top plate. The S/H2 must be screwed to the side of a rafter at the top and to the sides of a stud immediately below the top plate at the bottom.

The S/H2.5 is a twisted strap tie that is used to attach a rafter to the side of the top plate. The S/H2.5 must be screwed to the sides of a rafter at the top and to the sides of the top plate and stud immediately below at the bottom. The S/H3 is identical to the S/H2.5 except for shorter lower length and fewer fastener holes.

The ties are available in either left- or right-hand types. See Table 9 for required fasteners, installation requirements, and allowable loads.

## 2.10 LTS and MTS Twist Straps:

The LTS and MTS twist straps provide a tension connection between steel rafters and studs. The MTS8 twist strap has a length of 8 inches (203.20 mm) and a width of  $1\frac{1}{4}$  inches (31.75 mm). The LTS8 is of similar dimensions and design. See Table 10 for connector dimensions and allowable loads.

## 2.11 ST and S/MST Strap Ties:

ST and S/MST straight strap ties act as tension ties between two butting members. The ST292, ST2122, and ST2215 are straps that are  $1\frac{13}{16}$  inches (46.04 mm) wide, with jagged edges. The straps are punched with two rows of  $\frac{11}{64}$ -inch-diameter (4.37 mm) holes. The ST6215 and ST6224 are similar in design to the ST292, ST2122, and ST2215 straps.

The S/MST27, S/MT37 and S/MT48 straps are  $2\frac{1}{16}$  inches (52.39 mm) wide, and are punched with two rows of  $\frac{11}{64}$ -inch-diameter (4.37 mm) holes staggered at  $1\frac{3}{4}$  inches (44.45 mm) on center spacing. The S/MST60 and S/MST72 are similar in design to the S/MST27, S/MST37 and S/MST48. See Table 11 for connector dimensions, required fasteners and allowable loads.

## 2.12 CMST and CS Coil Straps:

The CMST12, CMST14 and CS16, CS18, CS20, and CS22 are coiled straps that are cut to the desired length. CMST straps are 3 inches (76.20 mm) wide, punched with  $\frac{11}{64}$ -inch-diameter (4.37 mm) holes spaced at  $3\frac{1}{2}$  inches (88.90 mm) on center with  $\frac{11}{64}$ -inch (4.37 mm) triangle holes also spaced at  $3\frac{1}{2}$  inches (88.90 mm) on center. CS straps are  $1\frac{1}{4}$  inches (31.75 mm) wide, punched with  $\frac{5}{32}$ -inch-diameter (2.38 mm) holes spaced at 2 inches (50.80 mm) on center. Both straps are continuous straps that can be cut to length on site, and are supplied coiled in cartons. See Table 12 for strap materials, dimensions, required fasteners, and allowable loads.

## 2.13 LTB and TB Tension Bridging:

The TB tension bridging has a right-angled section with flattened ends 1 inch (25.40 mm) wide. The tension bridging is available in several lengths from 20 inches (508 mm) to 60 inches (1.524 m), with screw holes at each end. The LTB is

similar in design and is available only in the 20-inch (0.058 m) length. Both products must be installed in pairs with two No. 10 screws at each end. See Table 13 for available sizes.

#### 2.14 STHD Strap Holdown Series:

STHD Strap Holdown series are designed to anchor vertical steel members to concrete foundations. The strap holdowns are formed from No. 12 gage [0.1026 inch (2.6 mm)], G90, galvanized steel. The vertical portion of the holdown is 3 inches (76.2 mm) wide and pre-punched with a staggered, oblong holes. The round holes are  $1\frac{1}{64}$  inch by  $\frac{1}{4}$  inch (4.3 mm by 6.4 mm) and countersunk for lower nail head profile. The embedded portion of the holdown has a curled 90 degree edge approximately  $1\frac{1}{2}$ -inches (38.1 mm) long, which is embossed for added stiffness. Approximately a quarter of the way down the embedded portion there is a  $\frac{1}{2}$ -inch-by-1-inch (12.7 mm by 25.4 mm) oblong hole, and approximately halfway down there is a  $\frac{7}{8}$ -inch-by- $1\frac{7}{8}$ -inch (22.2 mm by 47.6 mm) oblong out hole. Additionally, there is a keyhole feature that provides a point of bracing to prevent the STHD from tilting or twisting during concrete pour. See Table 14 for dimensions of the various sizes, connection requirements, and allowable loads.

#### 2.15 ICFLC Ledger Tie:

The ICFLC Ledger Tie is a  $10\frac{3}{8}$ -inch (264 mm) tall L-shaped connector that is used to connect steel ledgers to the concrete core of ICF (insulated concrete forms) walls without removing the foam plastic insulation of the ICF. The ICFLC Ledger Tie is formed from No. 14 gage [0.0721 inch (1.8 mm)], G90 galvanized steel. The L-shaped connector has a perforated leg that penetrates through the ICF where it embeds into concrete once the cells are filled. The shorter leg bears flat against the outside face of the ICF. The perforated leg is  $5\frac{7}{8}$  inches (149 mm) long while the other leg is  $2\frac{1}{4}$  inches (57 mm) long. An area of  $2\frac{1}{2}$  inches by  $10\frac{3}{8}$  inches (57 mm by 264 mm) is exposed on the ICF surface. It serves as a structural surface for attachment of a light gage steel ledger. Maximum foam plastic insulation thickness of the ICF face board is  $2\frac{5}{8}$  inches (66.7 mm). See Table 15 for allowable loads.

#### 2.16 S/JTC8-14 Joist Tie:

The S/JTC8-14 is used to tie a light gage joist channel to a light gage header. The joist tie is die-formed from No. 14 gage [0.0721 inch (1.8 mm)], G90, galvanized steel. The tie is 8 inches (203.2 mm) tall with a  $3\frac{1}{8}$ -inch-wide-by- $1\frac{5}{8}$ -inch-deep (79.4 mm by 41.3 mm) top flange. Two side flanges, one on each side and staggered from each other, provides additional surfaces for attachment of fasteners to the face of a light gage header. A fourth flange, perpendicular to the side flanges is provided for attachment to a light gage joist member. The S/JTC8-14 is pre-punched with  $1\frac{1}{64}$ -inch-diameter (4.3 mm) round holes and  $1\frac{1}{64}$  inch (4.3 mm) triangular holes to receive No. 10 screws. The round holes are required for minimum capacity. The triangular holes are for installation of additional fasteners for maximum capacity. See Table 16 for fastener requirements and allowable loads.

#### 2.17 Design:

Allowable loads in this report are based on cold-formed steel complying with AISI specifications. When using the alternate basic load combinations specified in Section 1612.3.2 of the UBC or Section 1605.3.2 of the IBC, whichever is applicable, a one-third increase is included in allowable capacities for the

connectors recognized in this evaluation report. No further increase in allowable loads is permitted. The design load must not exceed the allowable loads shown in the tables.

The allowable loads in this report are based on the lowest load obtained from comparing:

- The test load under which  $\frac{1}{8}$ -inch (3.2 mm) deflection occurs.
- The lowest ultimate test load, divided by a safety factor of 3.0.
- Allowable loads for metal screws installed in steel, calculated in accordance with the Section E4.3.1 of the AISI Specifications.

The S/PAHD, S/HPAHD, and S/HD holddown anchors and S/LTT and S/HTT tension ties must also be investigated for the effects of eccentric loading on the members attached to the holddown and tension devices.

#### 2.18 Installation:

Connectors and hangers must be installed in accordance with this report and the building plans approved by the building official.

#### 2.19 Identification:

The Simpson metal-to-metal connectors are embossed with the Simpson Strong-Tie logo, the evaluation report number (ER-5275), and the model designation.

### 3.0 EVIDENCE SUBMITTED

Reports of structural testing, calculations, and material specifications; and a quality control manual.

### 4.0 FINDINGS

**That the Simpson Strong-Tie Metal-to-Metal Connectors described in this report comply with 1997 Uniform Building Code™, ~~the 2000 International Building Code®~~, and ~~the 2000 International Residential Code®~~, subject to the following conditions:**

- 4.1 The products are identified and installed in accordance with this report and the manufacturer's instructions.
- 4.2 Allowable loads used in design comply with this report.
- 4.3 Calculations for connection design demonstrating compliance with this report shall be submitted to the building official. The calculations shall be prepared by a registered design professional where required by the statues of the jurisdiction in which the project is to be constructed.
- 4.4 The steel members comply with this evaluation report.
- 4.5 The S/HD holddown connectors are fabricated by Simpson Strong-Tie Company, Inc., and the welding procedures used to fabricate the holddown connectors are under a quality control program with inspections by Testing Engineers, Inc. (AA-532).

This report is subject to re-examination in two years.

\* TABLE 1—MATERIAL SPECIFICATIONS

MODEL	SECTION OF THIS EVALUATION REPORT	ASTM STEEL SPECIFICATION	MINIMUM YIELD STRENGTH (ksi)	MINIMUM TENSILE STRENGTH (ksi)	THICKNESS	
					Gage	Inches (base-metal thickness)
<del>MAS</del>	<del>2.3</del>	<del>A 653, SS</del>	<del>28</del>	<del>38</del>	<del>16</del>	<del>0.058</del>
<del>S/PAHD</del>	<del>2.4</del>	<del>A 653, SS</del>	<del>33</del>	<del>44</del>	<del>12</del>	<del>0.108</del>
<del>S/HPAHD AND HPAHD</del>	<del>2.4</del>	<del>A 653, SS</del>	<del>42</del>	<del>56</del>	<del>10</del>	<del>0.1342</del>
<del>S/HD8 AND S/HD10</del>	<del>2.5</del>	<del>A 570</del>	<del>33</del>	<del>52</del>	<del>10</del>	<del>0.1342</del>
<del>S/HD15</del>	<del>2.5</del>	<del>A 1011</del>	<del>33</del>	<del>45</del>	<del>7</del>	<del>0.171</del>
S/LTT	2.6	A 653, SS	33	45	12	0.1026
S/HTT	2.6	A 653, SS	33	45	11	0.1163
L	2.7	A 653, SS	28	38	16	0.0584
S/LS	2.7	A 653, SS	33	45	18	0.0468
A	2.8	A 653, SS	28	38	18	0.0468
S/A	2.8	A 527	28	38	18	0.0468
S/H	2.9	A527	28	38	18	0.0468
LTS	2.10	A 653, SS	28	38	18	0.047
MTS	2.10	A 653, SS	28	38	16	0.0584
ST	2.11	A 653, SS	See Table 10			
S/MST	2.11	A 653, SS	See Table 10			
CMST	2.12	A 653, SS	50	65	See Table 11	
CS	2.12	A 653, SS	40	55	See Table 11	
LTB	2.13	A 653, SS	33	45	22	0.029
TB	2.13	A 653, SS	28	38	18	0.046
<del>STHD</del>	<del>2.14</del>	<del>A 653, Grade 33</del>	<del>33</del>	<del>45</del>	<del>12</del>	<del>0.1026</del>
<del>ICFLC</del>	<del>2.15</del>	<del>A 570, Grade 33</del>	<del>33</del>	<del>52</del>	<del>14</del>	<del>0.0721</del>
<del>S/JCT</del>	<del>2.16</del>	<del>A 653, FS</del>	<del>28</del>	<del>38</del>	<del>14</del>	<del>0.0721</del>

TABLE 2—REQUIRED SHEAR STRENGTH OF SCREWS

SCREW SIZE	MEMBER THICKNESS (gage)		MINIMUM REQUIRED ALLOWABLE SHEAR STRENGTH PER SCREW PER SECTION E4.3.2 OF 1996 AISI SPECIFICATIONS (pounds)
	In Contact with Screw Head	Not in Contact with Screw Head	
#10	No. 22	No. 22	169
	No. 20	No. 20	226
	No. 20	No. 18	402
	No. 18	No. 20	205
	No. 18	No. 18	348
	No. 16	No. 20	226
	No. 16	No. 18	401
	No. 16	No. 16	474
	No. 14	No. 20	226
	No. 14	No. 18	401
	No. 14	No. 16	534
	No. 12	No. 20	221
	No. 12	No. 18	401
	No. 10	2-No. 20	583
	No. 10	No. 20	221
	No. 10	No. 18	401
No. 10	No. 16	485	
#8	No. 14	No. 16	496
$1/4-14x3/4$	No. 16	No. 14	783

TABLE 3—ALLOWABLE LOADS FOR MAS MUDSILL ANCHOR<sup>1,2,3,4</sup>

INSTALLATION METHOD OF MAS CONNECTOR	FASTENERS			ALLOWABLE LOADS (lbs.) (133)		
	Side of Sill Plate	Top of Sill Plate	Vertical Stud	Uplift	Parallel to Plate	Perpendicular to Plate
Typical MAS installation with both legs attached to the box-shaped sill plate	2 - #10	4 - #10	—	700	800	290
Alternate MAS installation with one leg attached to box-shaped sill plate and one leg attached to vertical stud	2 - #10	2 - #10	2 - #10	435	465	220

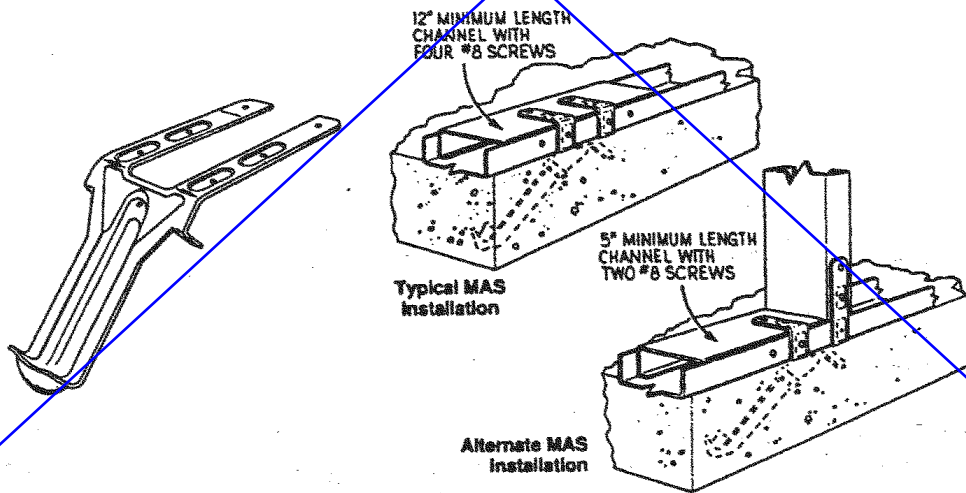
For SI: 1 lb = 4.45 N.

<sup>1</sup>Allowable loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed.

<sup>2</sup>Allowable loads are based on the inverted No. 20 gage (0.035 inch) thick C-shaped channel nested between the flanges of the C-shaped sill plate, forming a box-shaped section where the MAS connector is located. The flanges of the C-channel must be connected to flanges of the sill member with minimum four #8, 1/2-inch-long, panhead, self-drilling screws. The screws must be located 1 1/2 inches from the legs of the MAS connector.

<sup>3</sup>Allowable loads are based on anchors installed in normal-weight concrete having a 28-day compressive strength of 3000 psi.

<sup>4</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness).



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TABLE 4—ALLOWABLE LOADS FOR S/PAHD, HPAHD AND S/HPAHD HOLDDOWN ANCHORS<sup>1,2,3,4,5,6</sup>

MODEL NO.	MINIMUM FOOTING WIDTH	SCREWS	ALLOWABLE LOADS (lbs.) (133) (x 4.45 for N)	MODEL NO.	MINIMUM FOOTING WIDTH	SCREWS	ALLOWABLE LOADS (lbs.) (133) (x 4.45 for N)
Edge Installation—2,500 psi Concrete				Corner Installation—2,500 psi Concrete			
Single pour—see installation 1—8" minimum from corner				Single pour—see installation 2—1/2" from corner			
S/PAHD42	6	10 - #10	2,205	S/PAHD42	6	4 - #10	920
	8	13 - #10	2,945		8	5 - #10	1,050
S/HPAHD22	6	14 - #10	3,335	S/HPAHD22	6	7 - #10	1,610
	8	22 - #10	5,160		8	9 - #10	2,030
Double pour—see installation 3—8" minimum from corner				Double pour—see installation 4—1/2" minimum from corner			
S/PAHD42	6	10 - #10	2,205	S/PAHD42	6	4 - #10	920
	8	13 - #10	2,945		8	5 - #10	1,050
S/HPAHD22	6	14 - #10	3,335	S/HPAHD22	6	7 - #10	1,610
	8	22 - #10	5,160		8	9 - #10	2,030
HPAHD22-2P	6	14 - #10	3,335	HPAHD22-2P	6	7 - #10	1,610
	8	22 - #10	5,160		8	9 - #10	2,030

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N, 1 psi = 6.89 kPa

<sup>1</sup>S/HPAHD22 is permitted to be embedded 4 inches into the slab and 6 inches into the 8-inch footing beneath, for a maximum load of 2,810 pounds when the anchor is located 8 inches from the closest corner, and 1,400 pounds when the anchor is located 1/2 inch from the closest corner.

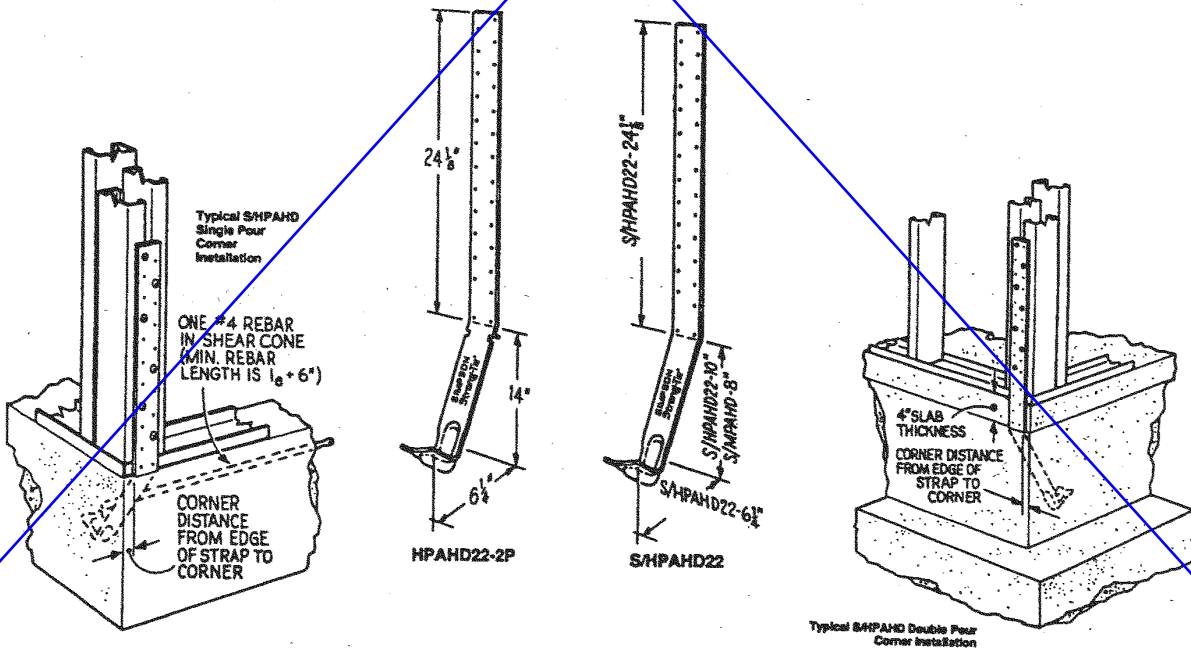
<sup>2</sup>Edge-installation distance is a minimum of 8 inches, and is measured from the edge of the corner of the concrete foundation to the nearest edge of the connector.

<sup>3</sup>Corner-installation distance is a minimum of 1/2 inch, and is measured from the edge of the corner of the concrete foundation to the nearest edge of the connector.

<sup>4</sup>Allowable loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed.

<sup>5</sup>Allowable loads for anchors installed between 1/2 inch and 8 inches from the foundation edge must be derived. Allowable loads are determined by using straightline interpolation between the tabulated allowable loads shown for corner installation (1/2 inch) and edge installation (8 inches).

<sup>6</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness).



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**\*\*** TABLE 5—ALLOWABLE LOADS FOR S/HD HOLDDOWN ANCHORS

MODEL NO.	DIMENSIONS (inches)			Anchor Bolt Diameter	FASTENERS			ALLOWABLE LOAD (lbs.)
	W	H	CL		Screw Quantity per Base-metal Thickness			
					2 Sheets of 20 Gage Steel (0.066 inch)	18 Gage (0.047 inch)	16 Gage (0.058 inch)	
S/HD8	2 1/2	13 7/8	1 1/2	7/8	16 - #10	27 - #10	19 - #10	9,665
S/HD10	2 1/2	16 1/8	1 1/2	7/8	16 - #10	27 - #10	19 - #10	9,665
<del>S/HD15</del>	<del>2 3/4</del>	<del>21 1/2</del>	<del>1 1/2</del>	<del>1</del>	<del>24 - #10</del>	<del>39 - #10</del>	<del>28 - #10</del>	<del>14,405</del>

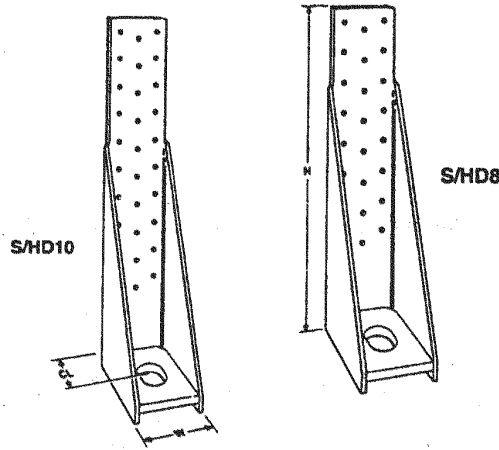
5535  
5535

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

<sup>1</sup>Anchor bolt size and embedment must be specified by the engineer of record.

<sup>2</sup>Allowable loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed. Allowable loads must be reduced where other load durations govern.

<sup>3</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness).



**\*\*** TABLE 6—ALLOWABLE LOADS FOR S/LTT AND S/HTT TENSION TIES

MODEL NO.	MATERIAL		DIMENSIONS (inches)			FASTENERS (Quantity—Size)		ALLOWABLE LOADS (lbs.) (133)
	Strap	Plate	W	H	CL	Anchor Bolts	Screws	
S/LTT20	12 gage	3 gage	2	20	1 1/2	1 - 1/2" φ	8 - #10	4,220
S/HTT14	11 gage	—	2 1/2	15	1 1/4	1 - 5/8" φ	16 - #10	3,860

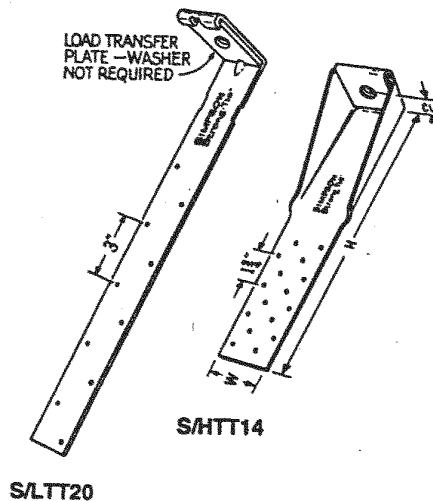
1025  
2870

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

<sup>1</sup>Anchor bolt type, length and embedment must be specified by the engineer of record.

<sup>2</sup>Allowable loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed.

<sup>3</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness).



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TABLE 7—ALLOWABLE LOADS FOR L AND S/LS REINFORCING ANGLES

MODEL NO.	LENGTH (inches)	SCREWS (total)	ALLOWABLE LOADS (lbs.)	
			F <sub>1</sub>	F <sub>2</sub>
L30	3	4 - #10	200	60
L50	5	6 - #10	750	110
L70	7	8 - #10	1,100	100
S/LS50	4 <sup>7</sup> / <sub>8</sub>	4 - #10	500	—
S/LS70	6 <sup>3</sup> / <sub>8</sub>	6 - #10	715	—

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

<sup>1</sup>Load duration increase is not allowed.

<sup>2</sup>Tabulated allowable loads are for one connector only and an equal number of screws into each leg of the connector.

<sup>3</sup>L30 loads are based on No. 20 gage [0.035 inch (0.89 mm)] and heavier connected members. All other loads are based on 16 gage [0.057 inch (1.4 mm)] and heavier connected members.

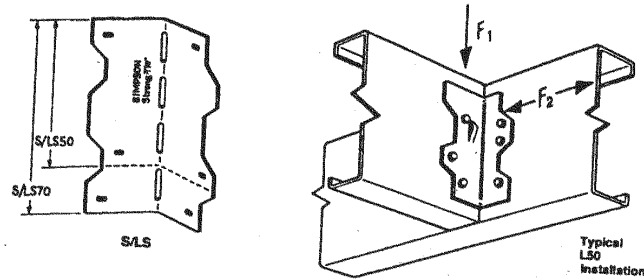


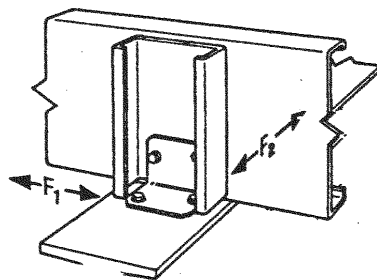
TABLE 8—ALLOWABLE LOADS FOR A AND S/A ANGLES

MODEL NO.	DIMENSIONS (inches)			TOTAL NUMBER OF SCREWS	ALLOWABLE LOADS <sup>1</sup> (lbs.)	
	W <sub>1</sub>	W <sub>2</sub>	L		F <sub>1</sub>	F <sub>2</sub>
A21	2	1 <sup>1</sup> / <sub>2</sub>	1 <sup>3</sup> / <sub>8</sub>	4 - #10	125	50
S/A23	2	1 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	4 - #10	235	70

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

<sup>1</sup>Load duration increase is not allowed.

<sup>2</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness).



Typical S/A23 installation (A21 similar)



TABLE 10—ALLOWABLE LOADS FOR LTS AND MTS TWIST STRAPS

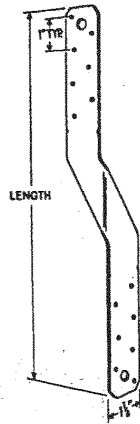
MODEL NO.	LENGTH (inches)	SCREWS (Total)	ALLOWABLE TENSION LOADS (lbs.)
LTS12	12	6 - #10	315
MTS12	12	6 - #10	500

For SI: 1 lb = 4.45 N.

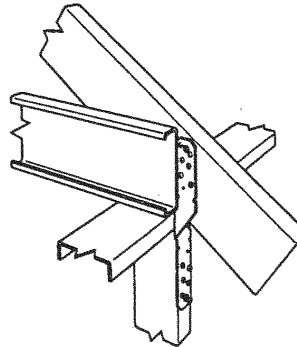
<sup>1</sup>Tabulated allowable loads are based on one half of the fasteners installed on each end of the strap.

<sup>2</sup>Loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed.

<sup>3</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness).



LTS12  
(MTS12 similar)



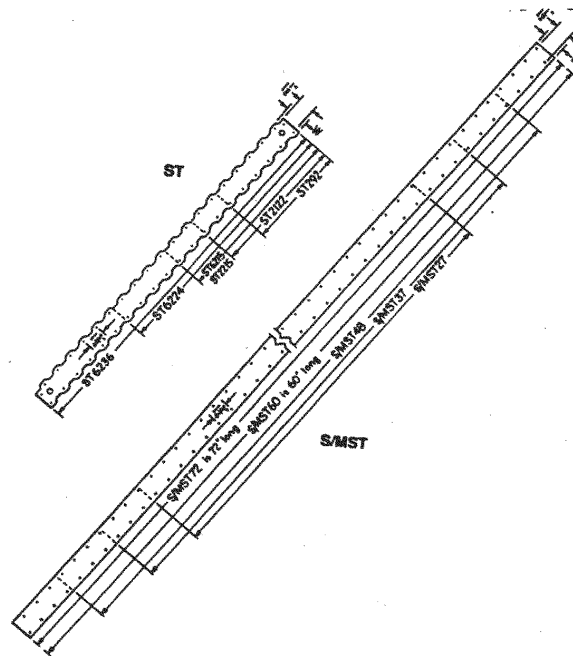
Typical LTS Installation  
Truss to Steel Stud

TABLE 11—ALLOWABLE LOADS FOR ST AND S/MST COIL STRAPS

MODEL NO.	STEEL				STRAP DIMENSIONS (inches)		ALLOWABLE LOADS (lbs.) BASED ON THICKNESS OF CONNECTED MEMBERS			
	Thickness		Yield Strength (ksi)	Tensile Strength (ksi)	W	L	20 Gage Base Metal (0.0352 inch)		18 Gage Base Metal (0.0468 inch)	
	Gage	Inches					Screws (total)	Allowable Load (133)	Screws (total)	Allowable Load (133)
ST292	20	0.0352	33	45	2 <sup>1</sup> / <sub>16</sub>	9 <sup>5</sup> / <sub>16</sub>	12 - #10	1,265 820	—	—
ST2122	20	0.0352	40	50	2 <sup>1</sup> / <sub>16</sub>	12 <sup>13</sup> / <sub>16</sub>	14 - #10	1,530 1025	—	—
ST2115	20	0.0352	50	65	3/4	16 <sup>5</sup> / <sub>16</sub>	6 - #10	640 410	—	—
ST2215	20	0.0352	50	65	2 <sup>1</sup> / <sub>16</sub>	16 <sup>5</sup> / <sub>16</sub>	16 - #10	1,855 1025	—	—
ST6215	16	0.0580	33	45	2 <sup>1</sup> / <sub>16</sub>	16 <sup>5</sup> / <sub>16</sub>	18 - #10	2,090 1230	10 - #10	2,090
ST6224	16	0.0580	40	55	2 <sup>1</sup> / <sub>16</sub>	23 <sup>5</sup> / <sub>16</sub>	22 - #10	2,535 1640	12 - #10	2,535
ST6236	14	0.0721	50	65	2 <sup>1</sup> / <sub>16</sub>	33 <sup>13</sup> / <sub>16</sub>	28 - #10	3,210 2050	18 - #10	3,210
S/MST27	12	0.1026	40	55	2 <sup>1</sup> / <sub>16</sub>	27	32 - #10	3,775 1845	22 - #10	4,710
S/MST37	12	0.1026	40	55	2 <sup>1</sup> / <sub>16</sub>	37	44 - #10	5,070 2255	24 - #10	5,070
S/MST48	12	0.1026	42	56	2 <sup>1</sup> / <sub>16</sub>	48	44 - #10	5,190 2665	26 - #10	5,200
S/MST60	10	0.1342	42	56	2 <sup>1</sup> / <sub>16</sub>	60	52 - #10	6,135 3485	32 - #10	6,800
S/MST72	10	0.1342	42	56	2 <sup>1</sup> / <sub>16</sub>	72	58 - #10	6,800 3485	32 - #10	6,800

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N, 1 ksi = 6.89 MPa.

- \* <sup>1</sup>Maximum loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed.
- <sup>2</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035-inch base-metal thickness) and an equal number of screws at each connected member.



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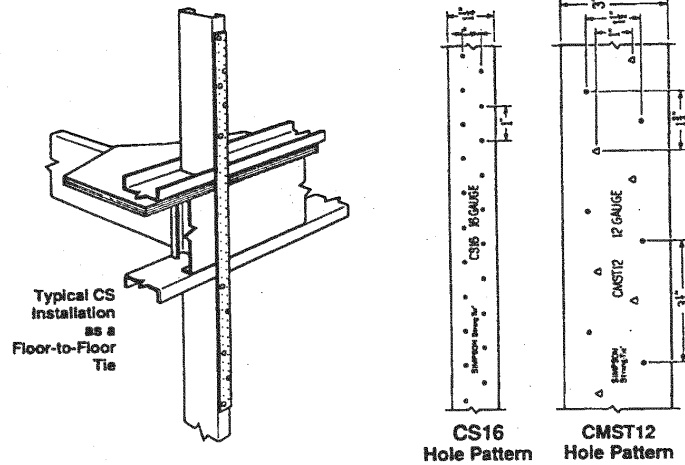
**\*\*** TABLE 12—ALLOWABLE LOADS FOR CMST AND CS COIL STRAPS

MODEL NO.	STEEL				TOTAL LENGTH (ft.)	SCREW QUANTITY PER BASE METAL THICKNESS OF CONNECTED MEMBERS		ALLOWABLE LOADS (lbs.) (133)
	Thickness		Yield Strength (ksi)	Tensile Strength (ksi)		No. 20 Gage (0.0352 inch)	No. 18 Gage (0.0468 inch)	
	Gage	Inches						
CMST12	12	0.1026	50	65	40	78 - #10	44 - #10	9,165 <b>5535</b>
CMST14	14	0.0721	50	65	52	56 - #10	32 - #10	6,440 <b>3895</b>
CS16	16	0.0580	40	55	150	14 - #10	8 - #10	4,600 <b>1025</b>
CS18	18	0.0468	40	55	100 & 200	12 - #10	6 - #10	4,280 <b>820</b>
CS20	20	0.0352	40	55	250	10 - #10	6 - #10	965 <b>615</b>
CS22	22	0.0289	40	55	300	10 - #10	6 - #10	790

For **SI**: 1 lb = 4.45 N, 1 foot = 304.8 mm, 1 ksi = 6.89 MPa.

<sup>1</sup>Loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed. Tabulated allowable loads must be reduced where other loads govern.

<sup>2</sup>Loads are based on attachment of cold-formed steel members having a minimum thickness of No. 20 gage (0.035 inch base-metal thickness) and an equal number of screws at each connected member.



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TABLE 13—TB AND LTB BRIDGING

JOIST SPACING (inches on center)	TB BRIDGING		LTB BRIDGING	
	Model No.	Length (inches)	Model No.	Length (inches)
12	TB20	20	LTB20	20
12	TB20	20	LTB20	20
12	TB20	20	LTB20	20
12	TB27	27	—	—
16	TB27	27	—	—
16	TB27	27	—	—
16	TB27	27	—	—
16	TB27	27	—	—
24	TB36	36	—	—
24	TB36	36	—	—

For SI: 1 inch = 25.4 mm.

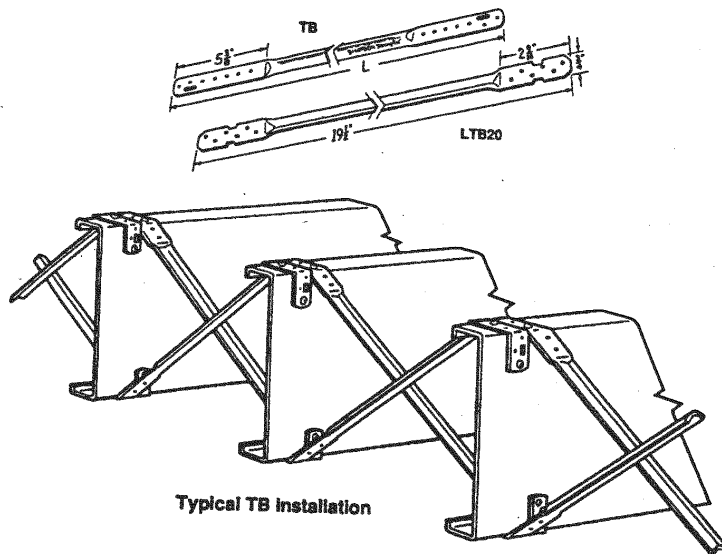


TABLE 14—ALLOWABLE LOADS FOR THE STHD STRAP HOLDDOWN SERIES (STANDARD AND RIMJOIST MODELS)

MODEL NO. (Standard/ Rim Joist) <sup>1</sup>	MIN. STEM WALL WIDTH (inch)	STRAP LENGTH (inches)		L <sub>e</sub> (inches)	SCREWS (Quantity-size)	ALLOWABLE TENSION LOADS <sup>2,3,4,5</sup> (pounds)								
		Standard Model	Rim Joist Model			End Distance			End Distance			End Distance		
						1/2 inch	1 1/2 inch	L <sub>e</sub>	1/2 inch	1 1/2 inch	L <sub>e</sub>	1/2 inch	1 1/2 inch	L <sub>e</sub>
						2,000 psi Concrete			2,500 psi Concrete			3,000 psi Concrete		
STHD8	6	21 <sup>5</sup> / <sub>8</sub>	35 <sup>1</sup> / <sub>8</sub>	8	8 - #10	1,760	2,050	2,345	1,950	2,210	2,385	2,135	2,370	2,425
STHD10	6	23 <sup>1</sup> / <sub>8</sub>	36 <sup>5</sup> / <sub>8</sub>	10	11 - #10	2,035	2,575	3,185	2,610	2,880	3,185	3,185	3,185	3,185
STHD14	6	31 <sup>5</sup> / <sub>8</sub>	39 <sup>5</sup> / <sub>8</sub>	14	16 - #10	3,235	4,220	4,805	3,800	4,295	4,805	4,365	4,365	4,805
STHD8	8	21 <sup>5</sup> / <sub>8</sub>	35 <sup>1</sup> / <sub>8</sub>	8	11 - #10	2,170	2,170	3,195	2,370	2,370	3,195	2,370	2,370	3,195
STHD10	8	23 <sup>1</sup> / <sub>8</sub>	36 <sup>5</sup> / <sub>8</sub>	10	12 - #10	2,745	2,745	3,000	2,760	2,760	3,222	3,230	3,230	3,725
STHD14	8	31 <sup>5</sup> / <sub>8</sub>	39 <sup>5</sup> / <sub>8</sub>	14	19 - #10	3,885	4,430	5,785	4,380	4,656	5,785	4,875	4,875	5,785

For SI: 1 lb = 4.45 N, 1 foot = 304.8 mm, 1 ksi = 6.89 MPa.

- <sup>1</sup>“RJ” designation after the model number indicates the STHD model is intended for rim joist applications.
- <sup>2</sup>Loads have been increased 33 percent for wind or earthquake loading in accordance with UBC Section 1612.3.2 and IBC Section 1605.3.2, with no further increase allowed. Tabulated allowable loads must be reduced where other loads govern.
- <sup>3</sup>Tabulated allowable loads are for STHD connector installed in a single-pour concrete footing.
- <sup>4</sup>The STHD14 and STHD10 are permitted to be installed in concrete footings that have a maximum 4-inch-thick, two-pour concrete slab under the following conditions:
  - a) The allowable load for the STHD14 installed with 1/2-inch edge distance in 2,000 psi minimum concrete is 3,165 lbs.
  - b) The allowable load for the STHD10 installed with 1/2-inch edge distance in 2,000 psi minimum concrete is 2,035 lbs.
- <sup>5</sup>Loads are based on attachment of the STHD connector to cold-formed steel members having a minimum thickness of No. 20 gage (0.035-inch base-metal thickness), and are based on the STHD connector embedded in normal weight concrete stem walls reinforced with No. 4 rebar, top and bottom, as shown in the figures below.

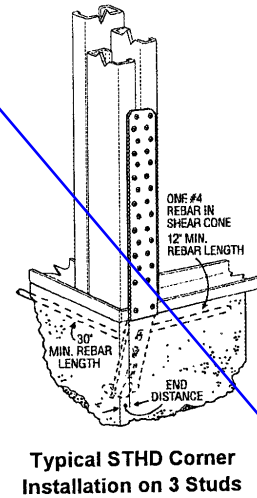
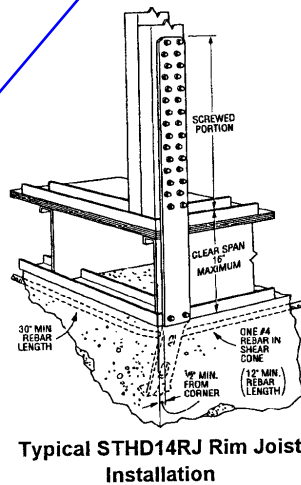
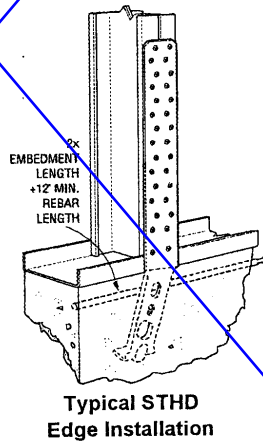
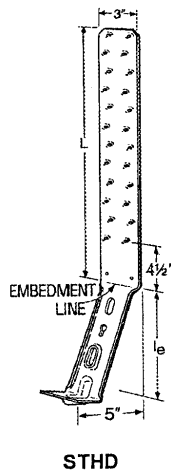


TABLE 15—ALLOWABLE LOAD FOR THE ICFLC LEDGER TIE CONNECTOR

MODEL NO.	SCREWS (Quantity-Size)	ALLOWABLE DOWN LOAD (pounds)
ICFLC	3 - 1/4"-14x3/4" (#3 drill pit screws)	1,880

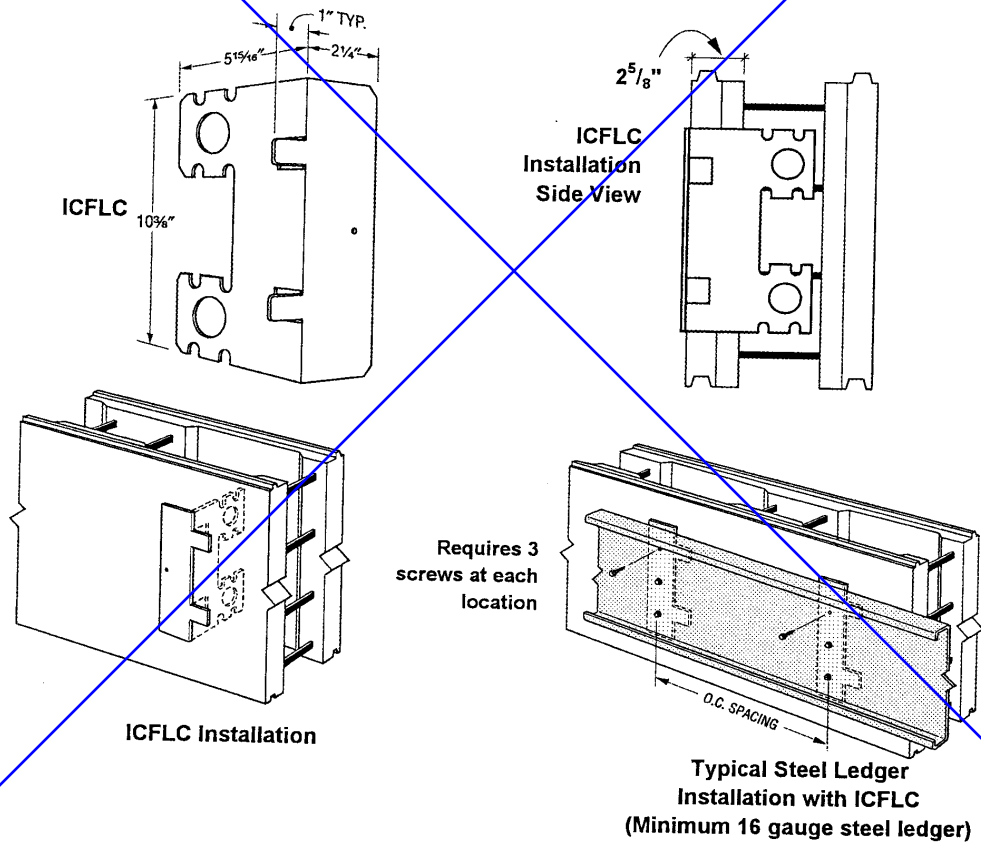
For SI: 1 lb = 4.45 N, 1 foot = 304.8 mm, 1 ksi = 6.89 MPa.

<sup>1</sup>Allowable load is based on the ICFLC Ledger Tie connected to cold-formed steel ledger, having a minimum thickness of 0.0584 inch (No. 16 gage) and minimum tensile and yield strength of 33 and 52 ksi, respectively. Additionally, the allowable load is based on the ICFLC Ledger Tie embedded in normal weight concrete having a minimum compressive strength of 2,500 psi.

<sup>2</sup>Maximum thickness of the ICF foam plastic insulation shall be 2.625 inches.

<sup>3</sup>The steel ledger shall be braced to prevent web buckling per the designer specification.

<sup>4</sup>No load duration increase is allowed.



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TABLE 16—ALLOWABLE LOADS FOR THE S/JCT8-14 JOIST TIE

MODEL NO.	SCREWS (Quantity–Size)			ALLOWABLE LOAD (pounds)
	Top	Face	Joist	
<b>Straight Hanger</b>				
S/JCT8-14 (Min.)	1 - #8	2 - #10	4 - #10	1,045
S/JCT8-14 (Max.)	1 - #8	4 - #10	4 - #10	1,510
<b>Skewed Hanger</b>				
S/JCT8-14	1 - #8	2 - #10	4 - #10	965

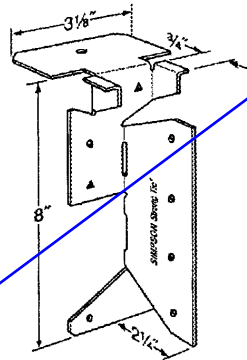
For **SI**: 1 lb = 4.45 N.

<sup>1</sup>Allowable loads are based on the S/JCT8-14 Joist Tie connected to cold-formed steel members, having a minimum thickness of 0.0584 inch (No. 16 gage) and minimum tensile and yield strength of 33 and 52 ksi, respectively.

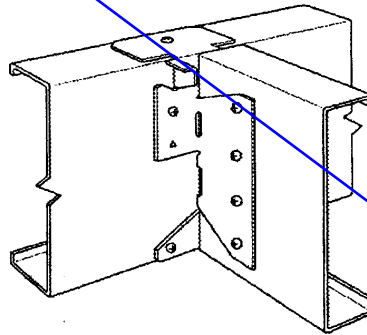
<sup>2</sup>Steel header shall be braced to prevent web buckling and the steel joist shall be laterally braced per the designer's specification.

<sup>3</sup>Allowable load for S/JCT8-14 (Min) is based on all round holes filled with the screws specified in this table.

<sup>4</sup>Allowable load for S/JCT8-14 (Max) is based on all holes filled with the screws specified in this table.



S/JCT8-14



S/JCT8-14 Installation with a steel header