



Report Number: 0112

Issued: 08/2009

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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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www.strongtie.com

EVALUATION SUBJECT:

SIMPSON STRONG-TIE ANGLES, CLIPS, AND TIES

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

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

1.2 Evaluated in accordance with:

- EC 002-2007

Property evaluated:

- Structural

1.0 USES

Simpson Strong-Tie structural angles, clips and ties are used as wood framing connectors in accordance with Section 2304.9.3 of the IBC. The products may be used in structures regulated under the IRC when an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 Product Information:

3.1.1 A34 and A35 Framing Angles: The A34 and A35 framing angles are used to attach wood

framing members and are fabricated from No. 18 gage steel. The connectors have cutouts on each leg and a prong to aid in installation. Table 1 and Figure 1 list model types, dimensions, fastener schedules and allowable loads.

3.1.2 DSP and SSP Stud Plate Tie Connectors:

The SSP stud plate ties are designed to transfer uplift forces between a double top plate to a stud or a stud to sill plate. The SSP is formed from 18 gage steel. The DSP is a double wood stud to a single wood or double wood plate connector and is formed from 18 gage steel. Table 2 and Figure 2 list model types, dimensions, fastener schedules and allowable loads.

3.1.3 FSC Floor Span Connector:

The FSC connector transfers tension forces from member to member and may be used as an alternative to the floor to floor strap connectors. The connector is formed from 12 gage steel. Table 3 and Figure 3 list model types, dimensions, fastener schedules and allowable loads.

3.1.4 H2A, H2.5T, H10A, H10S and H14 Hurricane Ties:

The H2A, H2.5T, H10A, H10S and H14 Hurricane Ties are designed to tie wood rafters or trusses to wood wall plates or studs and are formed from 18 gage steel. Table 4 and Figure 4 list model types, dimensions, fastener schedules and allowable loads.

3.1.5 LCE4 Post Cap:

The LCE4 post cap transfers uplift and lateral forces from a beam to a post and is formed from 20 gage steel. Table 5 and Figure 5 list model types, dimensions, fastener schedules and allowable loads.

3.1.6 LTP5 Lateral Tie Plate:

The LTP5 lateral tie plate transfers shear force from the wood top plate to wood rim joist or blocking members and is formed from No. 20 gage steel. Table 6 and Figure 6 list model types, dimensions, fastener schedules and allowable loads.

3.1.7 LS Skewable Angles:

The LS skewable angles are used to transfer lateral loads between wood framing members and are formed from No.



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18 gage steel. The angle is designed to allow field skewing from 0 to 135 degrees. Table 7 and Figure 7 list model types, dimensions, fastener schedules and allowable loads.

3.1.8 RBC and RBCP Roof Boundary Clips:

The RBC/RBCP roof boundary clip transfers lateral loads between the roof diaphragm perimeter blocking and wall top plates and are formed from 20 gage steel. Table 8 and Figure 8 list model types, dimensions, fastener schedules and allowable loads.

3.1.9 TJC37 Jack Truss Connector: The TJC37 is a field skewable connector and transfer forces from jack trusses, joists, rafters and blocking members to supporting members and is formed from 16 gage steel. Table 9 and Figure 9 list model types, dimensions, fastener schedules and allowable loads.

3.2 Materials:

3.2.1 Steel: The A34, A35, FSC, H2A, H10A, H10S, LS and TJC37 connectors described in this report are manufactured from galvanized steel complying with ASTM A 653, SS designation with a minimum yield strength of 33,000 psi (227 MPa) and a minimum ultimate tensile strength of 45,000 psi (310 MPa). The DSP, H2.5T, H14, LCE4, LTP5, RBC, RBCP and TSP connectors described in this report are manufactured from galvanized steel complying with ASTM A 653, SS designation with a minimum yield strength of 40,000 psi (227 MPa) and a minimum ultimate tensile strength of 55,000 psi (358 MPa). Base metal thicknesses for the connectors in this report are as follows:

GAGE	BASE METAL THICKNESS (in.)
No. 12	0.0975
No. 16	0.0555
No. 18	0.0445
No. 20	0.0335

For SI: 1 inch = 25.4 mm

The connectors have a minimum G90 zinc coating specification per ASTM A653. Some models may also be available with either a G185 zinc coating (denoted by model numbers ending in the letter Z)

or with a batch hot-dipped galvanized coating with a minimum specified coating weight of 2.0 ounces of zinc per square foot of surface area (600 g/m²), total for both sides in accordance with ASTM A123 (denoted by model numbers ending with the letters HDG). Model numbers in this report do not list the Z or HDG ending, but the information shown applies.

The holder of this report (Simpson Strong-Tie Company) or lumber treater should be contacted for recommendations on minimum corrosion resistance of 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). The thickness (depth) of the wood main member must be equal to or greater than the length of the fasteners specified in the tables in this report, unless the reduced penetration effect on the load calculation per the applicable National Design Specification for Wood Construction and its Supplement (NDS) is taken into account, or as required by wood member design, whichever is greater.

3.2.3 Fasteners: Common nails must comply with ASTM F 1667 when used with connectors in this report and have the following minimum fastener dimensions and bending yield strengths (F_{yb}):

FASTENER	SHANK DIAMETER (inches)	FASTENER LENGTH (inches)	F_{yb} (psi)
8d x 1½	0.131	1½	100,000
8d	0.131	2½	100,000
10d x 1½	0.148	1½	90,000
10d	0.148	3	90,000
16d	0.162	3 1/2	90,000

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

Fasteners used in contact with fire-retardant-treated or preservative-treated lumber must comply with IBC Section 2304.9.5 or IRC Section R319.3, as applicable. The report holder or lumber treater should be contacted for recommendations



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on minimum corrosion resistance and 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 connector loads shown in this report are for allowable stress design 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). Further load duration increases are not permitted other than those shown.

Tabulated allowable loads apply to products connected to wood used where sustained temperatures are 100°F (37.8°C) or less and under dry conditions. The allowable loads must be adjusted by the wet service factor, C_M , specified in the NDS for dowel-type fasteners, 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 in this report must be adjusted by the temperature factor, C_t , specified in the NDS when connectors are installed in wood that will experience sustained exposure to temperatures exceeding 100°F (37.8°C),

4.2 Installation: Installation of the connectors shown in this report must be in accordance with the manufacturer's published installation instructions and this evaluation report. If there is a conflict between this report and the manufacturer's published installation instructions, this report prevails.

4.3 Special Inspection:

4.3.1 IBC: In accordance with Section 1707.3 or 1707.4, with the exception of those structures qualifying under Section 1704.1, periodic inspection is required for installation of connectors described in this report that are designated as components of the seismic-force-resisting system for a structure in Seismic Design Category C, D, E, or F.

4.3.2 IRC: Special inspections are not required.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie products described in this report are in compliance with, or are acceptable alternatives to what is specified in those codes listed in Section 1.0 of this report subject to the following conditions:

5.1 The connectors must be manufactured, identified and installed in accordance with the manufacturer's published installation instructions and this report. A copy of the instructions must be available at the jobsite continuously during installation.

5.2 Where applicable, adjustment factors noted in Section 4.1 and the applicable codes must be considered.

5.3 Fasteners and connected wood members must be in compliance, respectively, with Sections 3.2.2 and 3.2.3 of this report.

5.4 Use of connectors with fire-retardant-treated or preservative- lumber must be in accordance with Section 3.2.1 of this report. Use of fasteners with fire-retardant-treated or preservative- lumber must be in accordance with Section 3.2.3 of this report.

6.0 EVIDENCE SUBMITTED

Data in accordance with IAPMO ES Evaluation Criteria for the Testing and Analysis of Joist Hangers and Miscellaneous Connectors (EC 002-2007), inclusive of tests and calculations.

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 the index evaluation report (ER-102) which identifies products recognized in this report.

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Director of Evaluation Services

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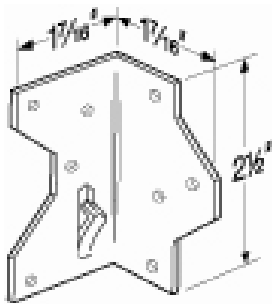
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TABLE 1: ALLOWABLE LOADS FOR THE A34 / A35 FRAMING ANGLES

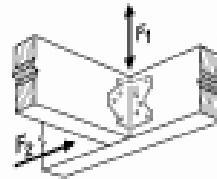
MODEL NO.	FASTENERS (Quantity-Type)		DIRECTION OF LOAD	ALLOWABLE LOADS ^{1,23} (lbs)			
	Joist	Header/Plate		C _D =1.00	C _D =1.15	C _D =1.25	C _D =1.60
A34	4-8dx1½	4-8dx1½	F ₁	395	450	485	515
	4-8dx1½	4-8dx1½	F ₂	395	450	455	455
A35	3-8dx1½	6-8dx1½	A ₁	295	335	365	395
	3-8dx1½	6-8dx1½	C ₁	210	210	210	210
	3-8dx1½	6-8dx1½	E	295	335	365	425
	6-8dx1½	6-8dx1½	A ₂	295	335	365	380
	6-8dx1½	6-8dx1½	C ₂	295	335	365	370
	6-8dx1½	6-8dx1½	D	230	230	230	230
	6-8dx1½	6-8dx1½	F ₁	595	670	695	695
	6-8dx1½	6-8dx1½	F ₂	595	670	670	670

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

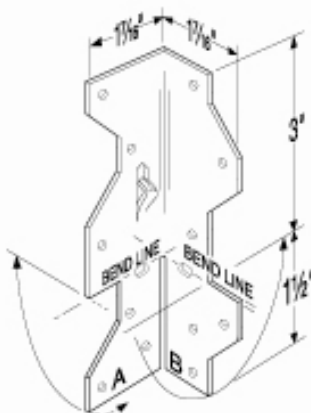
1. Tabulated allowable loads shall be chosen based on duration of load as permitted by the applicable building code.
2. Connectors are required on both sides of joist to achieve F₂ loads in both directions.



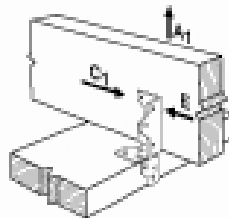
A34



A34 Typical Installation



A35



A35 Typical Installations

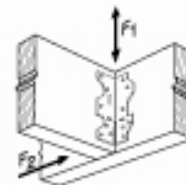
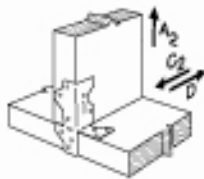


Figure 1 – A Angles

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TABLE 2: ALLOWABLE LOADS FOR SSP AND DSP STUD PLATE TIES

MODEL NO.	FASTENERS (Quantity-Type)			ALLOWABLE UPLIFT LOADS ¹ (lbs)	
	Studs	Double Top Plate	Sill Plate	Double Top Plate ³	Sill Plate ⁴
				C _D =1.60	C _D =1.60
SSP	4-10dX1½	3-10dX1½	-	350	-
		-	1-10dX1½	-	420
	4-10d	3-10d	-	435	-
		-	1-10d	-	455
DSP	8-10dX1½	6-10dX1½	-	775	-
		-	2-10dX1½	-	660
	8-10d	6-10d	-	825	-
		-	2-10d	-	825

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

1. The uplift loads have been increased for wind or earthquake loading no further increase allowed. Reduce loads when other load durations govern.
2. When cross-grain bending or cross-grain tension cannot be avoided, mechanical reinforcement to resist such forces should be considered.
3. For Sill Plate allowable load, fill all round nail holes.
4. For Double Top Plate allowable load, fill all round and triangle nail holes.

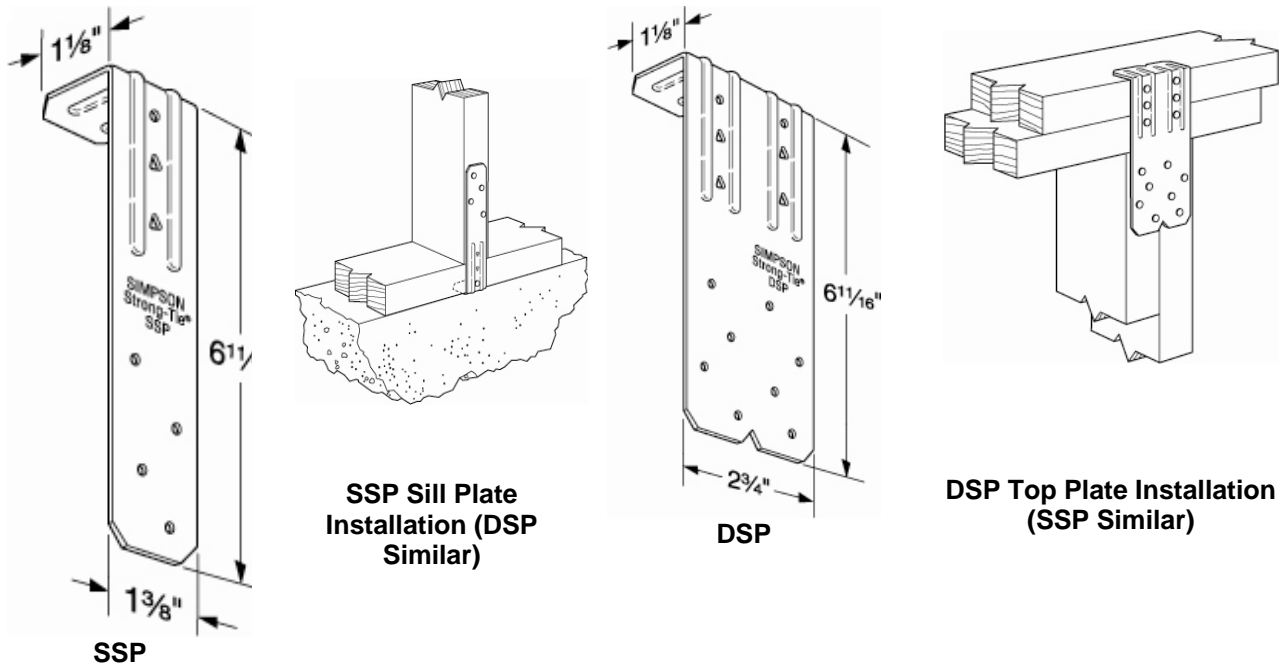


Figure 2 – SSP and DSP Stud Plate Ties

TABLE 3: ALLOWABLE LOADS FOR FSC FLOOR STRAP CONNECTOR

MODEL NO.	ALLOWABLE UPLIFT LOADS ¹ (lbs)		
	Stud	Anchor	C _D =1.60
FSC	15-10dx1 ½	3/8" ATR	1830

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

1. The uplift loads have been increased for wind or earthquake loading no further increase allowed. Reduce loads when other load durations govern.
2. Load values are based on a minimum lumber thickness of 1½".
3. Standard cut washer is required with the 3/8" all thread rod.

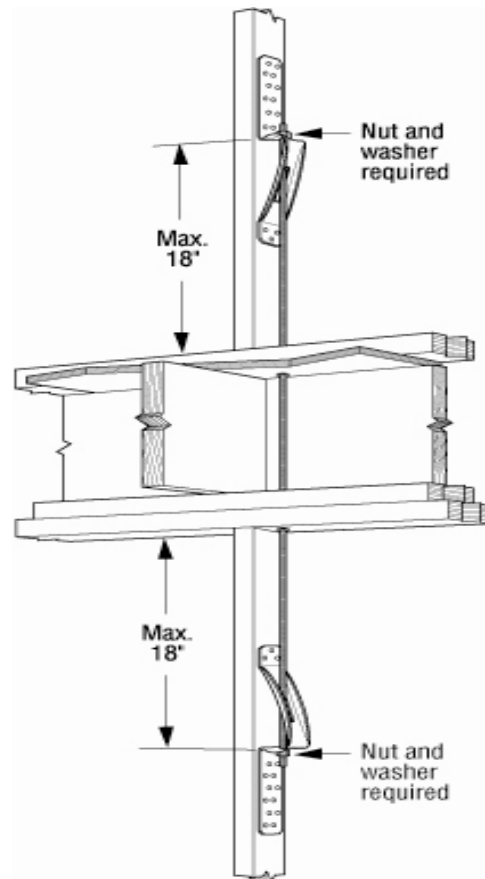
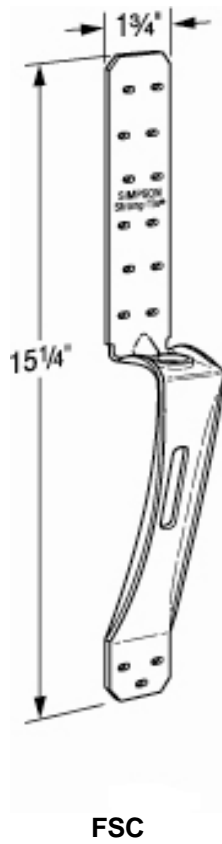


Figure 3 – FSC Stud to Stud Installation

TABLE 4: ALLOWABLE LOADS FOR H HURRICANE TIES

MODEL NO.	FASTENERS (Quantity-Type)			ALLOWABLE LOADS ^{1,2} (lbs)		
	To Rafter	To Plates	To Studs	Uplift ³ C _D =1.60	Lateral C _D =1.60	
					F ₁ ⁴	F ₂
H2A	5 - 8d x 1½	2 - 8d x 1½	5 - 8d x 1½	575	130	55
H2.5T	5 - 8d	5 - 8d	-	545 ⁶	135	145
H10A	9 - 10d x 1½	9 - 10d x 1½	-	1140	590	285
H10S	8 - 8d x 1½	8 - 8d x 1½	8 - 8d	1010 ⁸	660 ⁸	215
H14	12 - 8d x 1½	1 13 - 8d	-	1350	725	285
	12 - 8d x 1½	2 15 - 8d	-	1465	670	230

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

1. Allowable loads are for one anchor. A minimum rafter thickness of 2 ½ inches must be used when framing anchors are installed on each side of the rafter and on the same side of the plate.
2. Allowable simultaneous loads in more than one direction on a single connector must be evaluated as follows: Design Uplift/Allowable Uplift + Design Lateral Parallel to Plate/Allowable Lateral Parallel to Plate + Design Lateral Perpendicular to Plate/Allowable Lateral Perpendicular to Plate < 1.0. The number of terms considered in the equation is dependant on the designer's method of calculating wind forces and the utilization of the connector in the structural system.
3. The loads have been increased for wind or earthquake loading with no further increase is allowed. Reduce loads when other load durations govern.
4. Allowable loads in the F₁ direction are not intended to replace diaphragm boundary members or prevent cross grain bending of the truss or rafter members.
5. When cross-grain bending or cross-grain tension cannot be avoided in the members, mechanical reinforcement to resist such forces shall be considered.
6. Hurricane Ties are shown installed on the outside of the wall for clarity. Installation on the inside of the wall is acceptable. For uplift Continuous Load Path, connections in the same area (i.e. truss to plate connector and plate to stud connector) must be on same side of the wall.
7. Allowable uplift load for the H2.5T and H10S with 8dX1½ fasteners is 425 lbs and 550 lbs, respectively.
8. H10S nails to plates are optional for uplift but required for lateral loads.
9. Stud can be offset 1" maximum from center of rafter for a reduced uplift and F₁ load capacities of 890 lbs and 545 lbs, respectively.

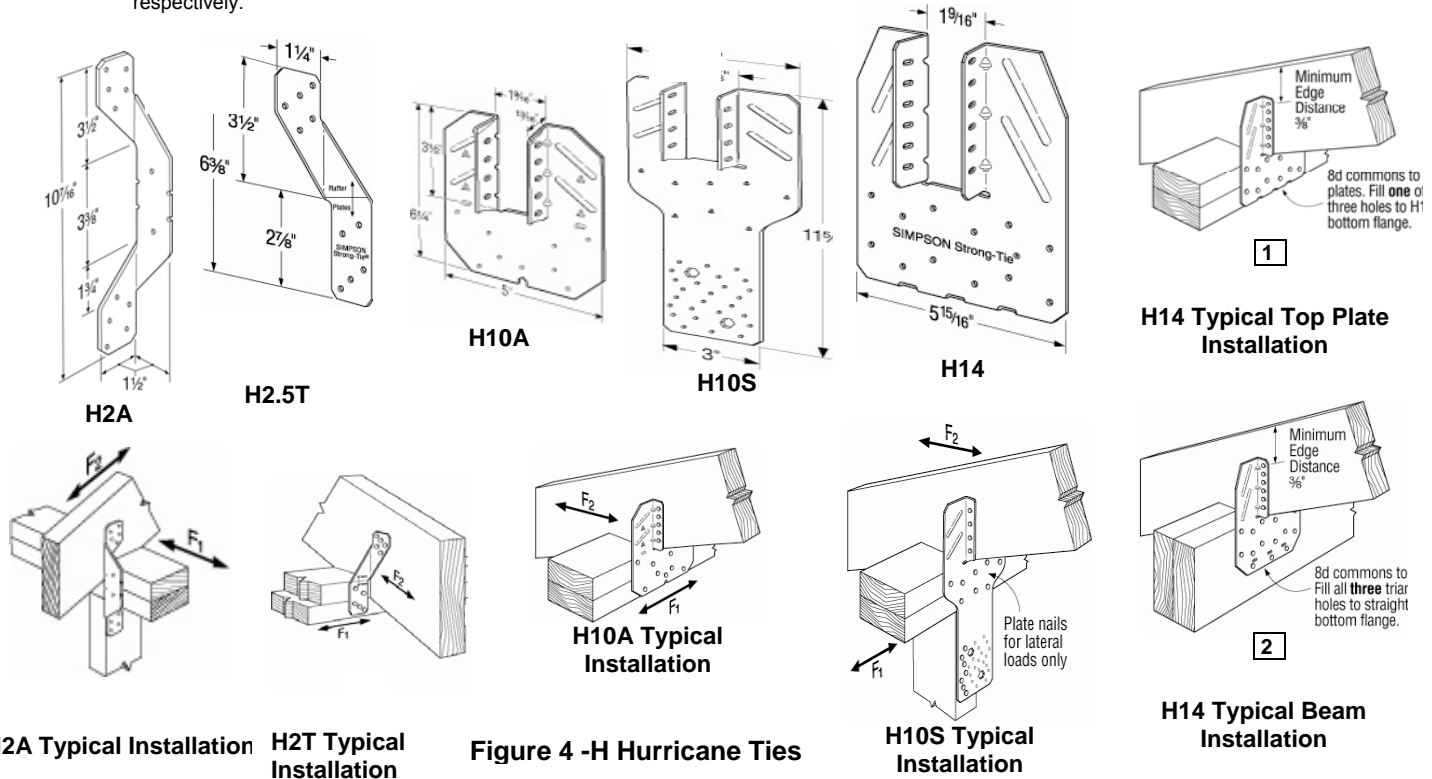


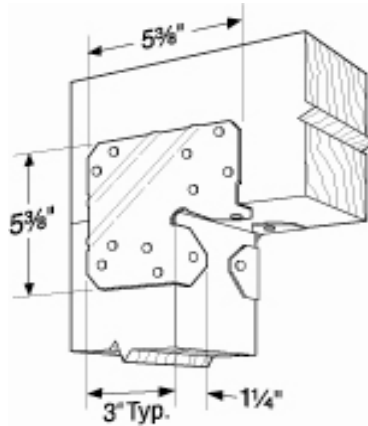
Figure 4 - H Hurricane Ties

TABLE 5: ALLOWABLE LOADS FOR LCE4 POST CAP

MODEL NO.	FASTENERS (Quantity-Type)		ALLOWABLE LOADS ^{1,2} (lbs)	
			Uplift ³	Lateral
	Beam	Post	C _D =1.60	C _D =1.60
LCE4	14-16d	10-16d	1905	1425

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

1. The loads have been increased for wind or earthquake loading no further increase allowed. Reduce loads when other load durations govern.
2. Loads apply only when used in pairs.
3. Uplift loads to not apply to splice conditions.



LCE4

Figure 5 – LCE4 Post Cap

TABLE 6: ALLOWABLE LOADS FOR LTP5 LATERAL TIE PLATE

MODEL NO.	LOAD DIRECTION	FASTENERS (Quantity-Type)		ALLOWABLE LATERAL LOADS ¹ (lbs) C _D =1.60
		Rim Board	Plates	
LTP5	G	6-8dx1 ½	6-8dx1 ½	620
	H	6-8dx1 ½	6-8dx1 ½	545

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

1. The loads have been increased for wind or earthquake loading no further increase allowed. Reduce loads when other load durations govern.
2. The LTP5 may be installed over wood structural panel sheathing no greater than ½" thick.

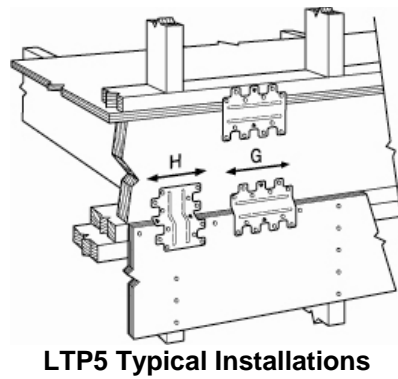
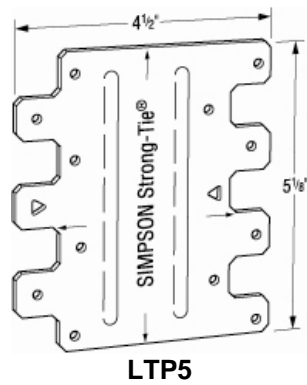


Figure 6 – LTP5 Lateral Tie Plate

TABLE 7: ALLOWABLE LOADS FOR LS SKEWABLE ANGLES

MODEL NO.	L (inches)	FASTENERS (Quantity-Type)		Allowable Download ¹ (lbs)			
		Carried Member	Carrying Member	C _D =1.00	C _D =1.15	C _D =1.25	C _D =1.60
LS30	3 3/8	3-10d	3-10d	355	395	395	395
LS50	4 7/8	4-10d	4-10d	475	540	585	730
LS70	6 3/8	5-10d	5-10d	595	675	730	915
LS90	7 7/8	6-10d	6-10d	715	810	875	1040

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

1. Tabulated allowable load capacities shall be selected based on duration of load as permitted by the applicable building code.

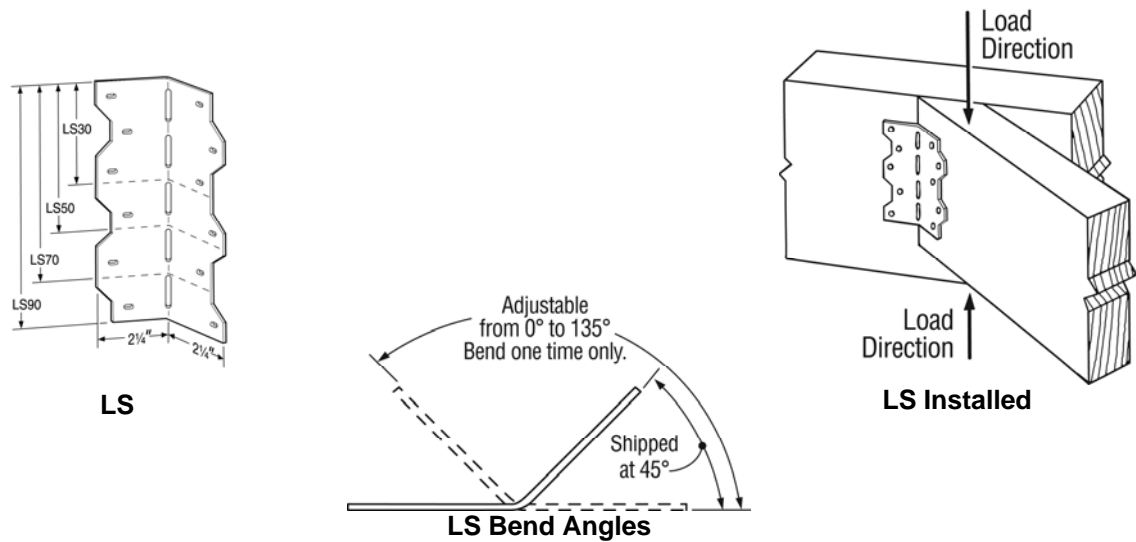


Figure 7 – LS Skewable Angles

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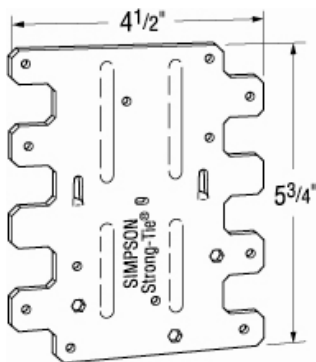
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TABLE 8: ALLOWABLE LOADS FOR RBC/RBCP ROOF BOUNDARY CLIPS

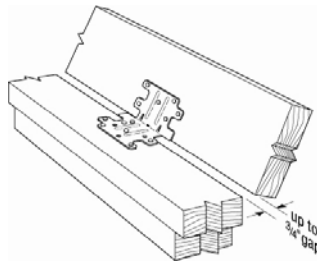
MODEL NO.	CONNECTION TYPE	BEND ANGLE ⁴	FASTENERS (Quantity-Type)		Allowable Lateral Loads ^{1,2,3} (lbs) C _D =1.60
			Plate	Blocking	
RBC	Inside	45 to 90°	6-10dx1 ½	6-10dx1 ½	445
	Outside	0 to 29°			435
		30 to 45°			480

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

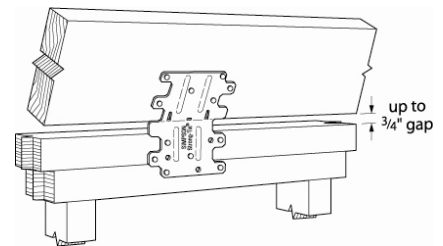
1. The loads have been increased for wind or earthquake loading no further increase allowed. Reduce loads when other load durations govern.
2. Allowable loads are for one anchor attached to blocking minimum 1½" thick.
3. RBCP replaces blocking fasteners with prongs. All load values are identical.
4. RBC/RBCP is shipped flat. Bending angle is measured from initial flat orientation. For inside installation, the bend angle = 90° - roof slope. For outside installation, the bend angle = roof slope.



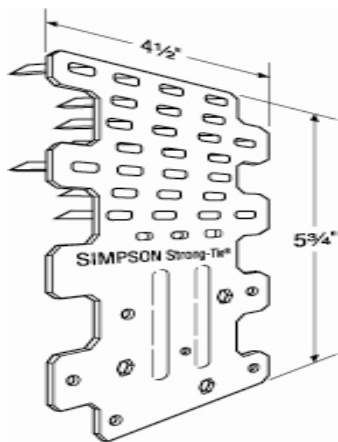
RBC



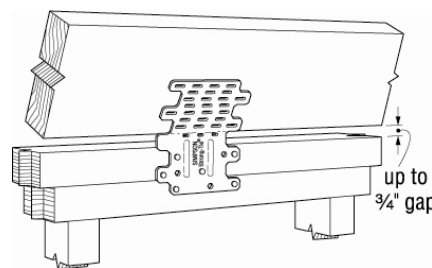
**RBC Inside Installation
(RBCP Similar)**



RBC Outside Installation



RBCP



RBCP Outside Installation

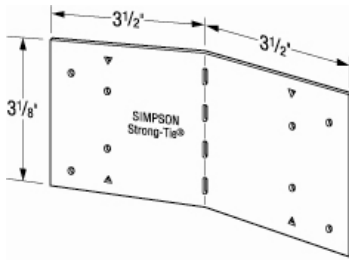
Figure 8 – RBC and RBCP Roof Boundary Clips

TABLE 9: ALLOWABLE LOADS FOR TJC37 TRUSS JACK CONNECTOR

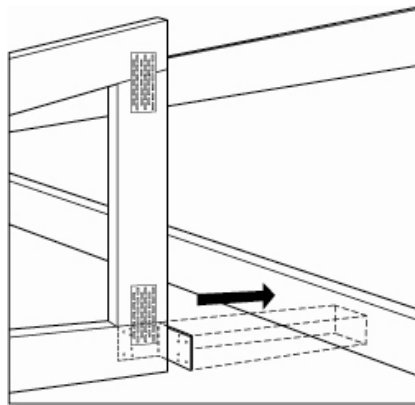
MODEL NO.	FASTENERS (Quantity-Type)		ALLOWABLE LOADS ^{1,2} (lbs) $C_D=1.00/1.15/1.25/1.60$		
	Carrying Member	Carried Member	0° Skew	1 to 60° Skew	61 to 67.5° Skew
TJC37	4-8dx1 ½	4-8dx1 ½	340	300	320
	6-8dx1 ½	6-8dx1 ½	580	485	425

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

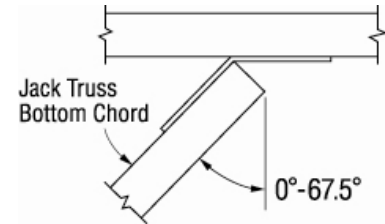
1. No load duration increase allowed.
2. Allowable loads are for vertical direction (uplift or download).



TJC37



TJC37 Typical Installation



TJC37 Bend Angles

Figure 9 – TJC37 Truss Jack Connector