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Simpson Strong-Tie Company, Inc.
12246 Holy Street
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Attn: Tim Kaucher, P. E.
(800) 999-5099

RESEARCH REPORT: RR 25818
(CSI #06090)

BASED UPON IAPMO EVALUATION
SERVICES REPORT NO. 0130

REEVALUATION DUE DATE:

August 1, 2014

Issued Date: May 1, 2011

Code: 2011 LABC

GENERAL APPROVAL – Reevaluation/Clerical modification - Simpson Strong-Tie LTT and HTT Holdown Framing Connectors

DETAILS

The above assemblies and/or products are approved when in compliance with the description, use, identification and findings of Evaluation Report No. 0130, revised February 17, 2011, of the IAPMO Evaluation Services. The report, in its entirety, is attached and made part of this general approval subject to the following conditions:

The parts of Evaluation Report No. 0130 marked with asterisk(s) have been deleted or added by the Los Angeles City Building Department from this approval.

The approval is subject to the following conditions:

1. Allowable loads shall not be increased for duration of load, except as specifically noted in the tables.
2. Approved products to be used shall be indicated on the approved set of plans.
3. All products involving welding shall be fabricated in the shop of a Los Angeles City licensed fabricator.

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Simpson Strong-Tie Company, Inc.

Re: Simpson Strong-Tie LTT and HTT Holdown Framing Connectors

4. Holdown Devices Used As Anchorage of Structural Walls: The values shown in Table-A of this report may be used in repair, retrofit and new construction of tilt-up wall or reinforced masonry wall anchorage (in tension) for the connection with the horizontal wood diaphragm.
5. Holdown Devices Used in Light Framed Shear Walls Sheathed with Wood Structural Panels: For holdown devices used in shear walls, a 25% reduction of the allowable loads specified in the IAPMO ES evaluation report shall be taken for all holdown devices in shear walls as required by 2305.5 of the 2011 City of Los Angeles Building Code.
6. Anchor bolts used to connect holdown anchors to concrete or masonry structural members must be designed. The grade of anchor bolt and anchor bolt embedment and edge distance must be specified by the engineer of record. Wood members shall be checked separately for structural capacity including the effects on the net area of the member.
7. Allowable loads in the tables are for LTT and HTT holdown anchors and do not include supporting members or anchor bolts. The supporting members and anchor bolt must be checked separately for structural adequacy.
8. Steel materials shall conform to the specification. Test data verifying the properties of the steel, by the mill or by an approved testing agency, shall be obtained for each shipment. The data shall be kept on file and submitted to the Department upon request.
9. Connections shall be fully detailed and dimensioned on approved plans showing anchor bolt embedment measured below slab/footing or bearing wall cold joint interface. The concrete or masonry footing must be checked to insure that it is capable of resisting the applied load.

Table A: Allowable Loads of Nail Holdowns Used for Connections of Horizontal Diaphragm-to-Wall Assemblies in the City of Los Angeles Per 2008 LABC Chapters 16, 91 & 96

Holdown Model No.	Fasteners			Minimum Wood Member Thickness (in.)	Allowable Tension Loads for Designs per Chapter 16		Allowable Tension Loads for Designs per Chapter 91 & 96	
	Anchor Bolt Dia (in.)	Fasteners			Load (lbs)	Governing Load Case	Load (lbs)	Governing Load Case
		QTY	Size					
LTT19	1/2, 5/8, or 3/4	8	10dx1-1/2	3	825	b	455	b
		8	10d		865	b	370	b
LTT20B	1/2, 5/8, or 3/4	10	10dx1-1/2	3	535	b	385	b
		10	10d		630	b	320	b
		2	1/2" Bolt		840	b	490	b
LTTI31	5/8	18	10dx1-1/2	3	490	b	265	b
HTT4	5/8	18	10dx1-1/2	3	3,610	a	2,665	c
		18	16dx2-1/2		3,650	a	2,645	b
HTT5	5/8	26	10dx1-1/2	3	3,685	a	2,110	b
		26	10d		3,685	a	3,095	a
		26	16dx2-1/2		3,685	a	3,085	b

1. For holdown dimensions, refer to Table 1 of IAPMO ES ER-0130
2. The wood member must be sized for the load carrying capacity.
3. Loads shall not be increased for short-term duration.
4. Anchor bolt type, length, and embedment to be specified by designer
5. Deflection of anchor bolt must be taken into consideration.
6. All other notes of Table 1 in the attached IAPMO ES ER-0130 apply.

Legend of Governing Criteria

a = ultimate load value on steel jig / (3 x 1.4) [for Chapter 16] or ultimate load value on steel jig / (5) [for Chapters 91 & 96]
 b = deflection on wood assembly at 3/8" / 3 [for Chapter 16] or deflection on wood assembly at 3/8" / 5 [for Chapters 91 & 96]

c = the fastener value in accordance with 2008 LABC

Note: Lowest load of 3 tested conditions or average load of 6 tested conditions were taken for criteria "a" and "b" above

Simpson Strong-Tie Company, Inc.
Re: Simpson Strong-Tie LTT and HTT Holdown Framing Connectors

DISCUSSION

The clerical modification is to change the company address and telephone number

This report is in compliance with the 2011 City of Los Angeles Building Code.

The technical modification is to add holdown connector to be used as the wall anchorage to flexible diaphragms.

The approval is based on tests in accordance with ICC ES Acceptance Criteria for Holdowns (Tie-downs) Attached to Wood Members (AC 155), dated on October 2005 (editorially revised April 2008).

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revision to the report must be submitted to this Department for review with appropriate fee to continue the approval of the revised report.

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.

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.

WILLIAM STUTSMAN, Chief
Engineering Research Section
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Attachment: IAPMO Report No. 0130 (7 Pages)



Report Number: 0130
Issued: 12/2008
Expires: 12/2011
Revised: 02/17/2011

DIVISION: 06—WOOD AND PLASTICS
Section: 06090—Wood and Plastics Fastenings

REPORT HOLDER:
SIMPSON STRONG-TIE COMPANY, INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 925-5099
www.strongtie.com

EVALUATION SUBJECT:

SIMPSON STRONG-TIE NAIL HOLD-DOWNS
(TENSION TIES)

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)
- 2006 *International Building Code*® (IBC)
- * • ~~2006 *International Residential Code*® (IRC)~~

1.2 Evaluated in accordance with

- *ICC-ES AC155, Acceptance Criteria for Hold-Downs attached to wood members, dated July 2010*

Property evaluated

- Structural

2.0 USES

Simpson Strong-Tie structural nail hold-down connectors (tension ties) are used as wood framing anchorage, such as to connect wood posts to concrete foundations or to connect an upper-story wood post to a lower-story supporting wood post, in accordance with the 2009 IBC Sections 2304.9.3, 2305.1, 2308.9.3.1, 2308.9.3.2, AF&PA SDPWS-2008 (Special Design Provisions for Wind and Seismic) Sections 4.3.6.4.2 and 4.3.6.1.2 (the 2006 IBC Sections 2304.9.3, 2305.1, 2305.3.2, 2305.3.7, 2305.3.8.2.4, and 2308.9.3.1), and are used as anchorage of concrete and masonry walls to structural wood elements to provide lateral support for the walls as required by IBC Section 1604.8.

When regulated under the IRC, the hold-down connectors may also be used when an engineered design is submitted in accordance with Section R301.1.3 of the IRC, ~~or in alternate braced wall panels per 2006 IRC Sections R602.10.6.1 or R602.10.6.2~~ and in the 2009 IRC Sections R502.2.2.3, R602.10.1.4.1(2), R602.10.3.2, R602.10.3.3, R602.10.4.4, and R602.10.5.3. *

The hold-down connectors may be used as anchorage of concrete and masonry walls to structural wood elements to provide lateral support for the walls in accordance with Section R606.12.2.3, R611.9.1 of 2009 IRC ~~or R606.12.2.2, R611.8.2.1 of 2006 IRC~~ *

3.0 DESCRIPTION

3.1 Product Information

3.1.1 LTT Nail Hold-downs: LTT Light Tension Ties are nail hold-downs consisting of a steel strap component with 90 degree angle bend at the end, and a base plate component installed in the bend which eliminates the need for a washer to transfer load. The hold-downs have pre-punched holes for installation of fasteners used to connect the hold-down to the wood member. The bodies of the LTT19, LTT20B and LTTI31 are formed from No.16, No.12, and No.18 gage galvanized steel, respectively. The base plate component for LTT's is No. 3 gage galvanized steel. Reference Figure 1 and Table 1 for product dimensions, required fasteners and allowable loads.

3.1.2 HTT Nail Hold-down: HTT Heavy Tension Ties are single-piece formed nail hold-downs consisting of a steel strap with a four-ply formed seat element for an anchor bolt. The straight-strap portion has pre-punched holes for installation of fasteners used to connect the hold-down to the wood member. The HTT is die-formed from No. 11 gage galvanized steel. Bearing plate BP5/8-2 is fabricated from 3/16 inch thickness steel and may be installed with HTT5 as a load transfer washer for additional capacity. Reference Figure 2 and Table 1 for product dimensions, required fasteners and allowable loads.

3.2 Materials

3.2.1 Steel: The LTT and HTT nail hold-downs described in this report are manufactured from ASTM A 653, SS Grade 33 galvanized steel with a minimum yield strength, F_y , of 33,000 psi (227 MPa) and a



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minimum ultimate tensile strength, F_u , of 45,000 psi (310 MPa). The load transfer base plates of the LTT series and bearing plate BP5/8-2 are fabricated from ASTM A 1011 SS Grade 33 steel having a minimum yield strength of 33,000 psi (227 MPa) and a minimum ultimate strength of 52,000 psi (359 MPa). Base metal thicknesses for the tension ties in this report are as follows:

GAGE	BASE METAL THICKNESS (in.)
3/16 inch	0.1775
No. 3	0.2285
No. 11	0.1105
No. 12	0.0975
No. 16	0.0555
No. 18	0.0445

For SI: 1 inch = 25.4 mm

The hold-downs have a minimum G90 zinc coating specification per ASTM A 653. 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/m^2), total for both sides in accordance with ASTM A 123 (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 lumber treater or holder of this report (Simpson Strong-Tie Company) 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 hold-down 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 minimum thickness (depth) of the wood members in the direction of the fastener penetration is 3 inches and the required minimum width of the wood members is 3 1/2 inches.

3.2.3 Fasteners

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

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

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

3.2.3.2 Bolts: Machine bolts must comply with ANSI/ASME Standard B18.2.1 and with ASTM A 307. The minimum bending yield strength, (F_{yb}), of the bolt must be 45,000 psi (310 MPa).

3.2.3.3 Threaded Anchor Rods: As a minimum, threaded steel anchor rods must comply with ASTM A 36 or ASTM F 1554, Grade 36.

3.2.3.4 Preservative-treated and fire-retardant-treated wood: Fasteners used in contact with preservative-treated or fire-retardant-treated lumber must comply with IBC Section 2304.9.5 2009 IRC Section R319.3 (~~2006 IRC Section R319.3~~), as applicable. The lumber treater or report holder should be contacted for recommendations 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

4.1.1 Hold-Down Assembly: The allowable loads shown in Table 1 of this report are for hold-down assemblies consisting of the following components: (1) hold-down device; (2) an anchor bolt/rod attached to the seat of the device; (3) a wood member, having minimum specified dimensions and properties; (4) quantity and size of fasteners used to attach the hold-down device to the wood member; and, in some cases as noted, (5) bearing plates or washers. The allowable loads shown in the product tables of this report are based on allowable stress design (ASD)

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and include the load duration factor, C_D , corresponding with the applicable loads in accordance with the National Design Specification (NDS) for Wood Construction.

Where design load combinations include earthquake loads or effects, story drifts of the structure must be determined in accordance with Section 12.8.6 of ASCE 7-05. The deflection of a shear wall restrained from overturning by hold-downs installed in accordance with this report may be calculated using Equation 23-2 shown in 2009 IBC Section 2305.3 (2006 IBC Section 2305.3.2), or Equation 4.3-1 shown in Section 4.3.2 of ANSI/AF&PA SDPWS (2009 IBC SDPWS-2008 and 2006 IBC SDPWS-2005). The total deflection values, Δ_{all} and Δ_s , at ASD-level and strength-level forces, respectively, for hold-down assemblies shown in Tables 1 of this report, include all sources of hold-down device extension and rotation, and anchor rod elongation where the length of the anchor rod is a maximum of 4 ½ inches (152 mm). The contribution of the hold-down anchor rod elongation to the total elongation (deflection) of the hold-down assembly needs to be considered when the actual diameter, length or ASTM steel specification of the anchor rod differs from that described in this report.

The symbol Δ_s as used in this report refers to the symbol d_a in section 2305.3.2 of the IBC and to the symbol Δ_a in Section 4.3.2 of ANSI/AF&PA SDPWS-2005.

When hold-downs are fastened to wood having a moisture content greater than 19 percent (16 percent for engineered lumber), or where wet service is expected, the allowable loads shown in Tables 1 of this report must be adjusted by the wet service factor, C_m , specified in the NDS.

Tabulated allowable loads are for hold-downs connected to wood used under continuously dry interior conditions, and where sustained temperatures are 100°F (37.8°C) or less.

When hold-down are fastened to wood that will experience sustained exposure to temperatures, exceeding 100°F (37.8°C), the allowable loads shown in Tables 1 in this report must be adjusted by the temperature factor, C_t , specified in the NDS.

The design of wood members fastened to LTT and HTT hold-down devices must consider combined stresses due to axial tension and flexural bending induced by eccentricity in the connection. Stresses shall be evaluated at the critical net section.

4.1.2 Anchorage to Concrete or Masonry: Adequate embedment length and anchorage details, including edge and end distances, must be determined by a registered design professional in accordance with Chapters 19 or 21 of the IBC, as applicable, for design of anchorage to concrete and masonry structural members.

Where design load combinations include earthquake loads or effects, the design strength of anchorage to concrete must be determined in accordance with Section 1912 of the IBC, except for detached one- and two-family dwellings assigned to Seismic Design Category A, B or C, or located where the mapped short-period spectral response acceleration, S_s , is less than 0.4g.

4.2 Installation: Installation of the Simpson Strong-Tie hold-down 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.

4.3 Special Inspection

4.3.1 IBC: A statement of special inspection shall be prepared by the registered design professional in responsible charge, and submitted to the code official for approval when required by Section 1705 of the 2009 IBC. A quality assurance plan shall be submitted to the code official for approval when required by Sections 1705 or 1706 of the 2006 IBC.

4.3.2: Periodic special inspection shall be conducted when the hold-downs are components within the main wind-force-resisting system of structures constructed in areas listed in IBC Section 1706.1 (Section 1705.4 for the 2006 IBC). Special inspection requirements do not apply to structures, or portions thereof, that qualify for exception under IBC Section 1704.1, 1704.4, 1706.2 or 1706.3 (Section 1704.1 and 1704.4 for the 2006 IBC).



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4.3.3: Periodic special inspection shall be conducted in accordance with the applicable sections of Section 1707 when the hold-downs are components within the seismic-force-resisting system of structures constructed in Seismic Design Category C, D, E or F. Special inspection requirements do not apply to structures, or portions thereof, that qualify for exception under IBC Section 1704.1, 1704.4, 1705.3, 1707.3 or 1707.4.

4.3.4: For installations under the IRC, special inspection is not normally required. However, for an engineered design where calculations are required to be signed by a registered design professional, periodic special inspection requirements and exemptions are as stated in Sections 4.3.1 and 4.3.2 as applicable for installations under the IRC.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie nail hold-down connectors 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:

5.1 The hold-downs 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.

5.2 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.

5.3 Adjustment factors noted in Section 4.1 and the applicable codes must be considered, where applicable.

5.4 Connected wood members and fasteners must comply, respectively, with Sections 3.2.2 and 3.2.3 of this report.

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

5.6 Anchorage to concrete or masonry structural members must be designed in accordance with Section 4.1.2 of this report.

6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES Acceptance Criteria for Hold-Downs (Tie-Downs) Attached to Wood Members (AC155), dated July 2010, inclusive of tests and calculations. Test results are from laboratories in compliance with ISO/IEC 17025.

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.



IAPMO ES ER-130

A handwritten signature in black ink, appearing to read 'Amir' followed by a stylized flourish.

Director of Evaluation Services

EVALUATION REPORT



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TABLE 1: ALLOWABLE LOADS FOR THE LTT AND HTT NAIL HOLD-DOWNS (TENSION TIES)

MODEL NO.	DIMENSIONS					FASTENERS		ALLOWABLE TENSION LOADS ⁵ , P _{all} (lbs) C _D = 1.6	DISPLACEMENT Δ AT MAXIMUM LOAD ^{6,7} (in.)	
	W	L	CL	B	SO	ANCHOR BOLT	FASTENER QUANTITY		Δ _{all}	Δ _s
LTT19	1¾	19⅝	1⅝	2¾	5/16	½, ⅝ or ¾	8-10dx1½	1310	0.180	0.248
							8-10d	1340	0.157	0.233
LTT20B	2	19¾	1½	3⅝	5/16	½, ⅝ or ¾	10-10dx1½	1355	0.195	0.250
							10-10d	1500	0.185	0.250
							2-½" Bolt ⁹	1625	0.183	0.250
LTTI31	3¾	31	1⅝	2¾	¼	⅝	18-10dx1½	1350	0.193	0.250
HTT4	2½	12⅝	1⅝	2	7/16	⅝	18-10dx1½	3610	0.086	0.135
							18-16dx2½	4235	0.123	0.201
HTT5	2½	16	1⅝	2	7/16	⅝	26-10dx1½	4350	0.120	0.209
							26-10d	4670	0.116	0.234
							26-16dx2½	5090 ¹⁰	0.135	0.250

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

1. Tabulated allowable loads are for a hold-down assembly consisting of the hold-down device attached to a minimum of a 3-inch thick wood structural member, or multiple members attached together to be 3-inches or greater in thickness, with the fasteners as specified in Table 1.
2. The allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C_D = 1.6, corresponding with wind/earthquake loading in accordance with the NDS. No further increase is allowed. Reduce where other load durations govern.
3. When using the basic load combinations in accordance with IBC Section 1605.3.1 the tabulated allowable loads for the hold-down assembly must not be increased for wind or earthquake loading. When using the alternate basic load combinations in IBC Section 1605.3.2 that includes wind or earthquake loads, the tabulated allowable loads for the hold-down assembly must not be increased by 33⅓ percent, nor can the alternative basic load combinations be reduced by a factor of 0.75.
4. Anchorage to concrete or masonry must be determined in accordance with Section 4.1.2 of this report.
5. The tabulated allowable (ASD) tension loads must be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ_s deformations.
6. Tabulated displacement values, Δ_{all} and Δ_s, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation, at ASD-level and strength level forces respectively.
7. Elongation of the hold-down anchor rod must be calculated when the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of this report or actual unbraced length is greater than 4 ½ inches. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 4 ½" to 18" above the concrete, it is permitted to add an additional anchor rod elongation of 0.01 to the tabulated hold-down deflection.
8. If a ½" or ⅝" anchor bolt is used for the LTT19 or LTT20B, add a standard cut washer to the seat. No additional washer is required for a ¾" anchor bolt. See table for specified anchor bolt sizes.
9. Wood member bolts shall be in accordance with Section 3.2.3.2 of this report.
10. Allowable tension load for HTT5 with bearing washer BP5/8-2 is 5295 lbs. (Δ_{all} = 0.126, Δ_s = 0.179).
11. 16d common nails are permitted to substitute for 16d×2½" nails.

**** The values shown in this table shall not be used in repair, retrofit and new construction of tilt-up wall or reinforced masonry wall anchorage (in tension) for the connection with the horizontal wood diaphragm. See Table A in the body of LARR 25818.**

EVALUATION REPORT

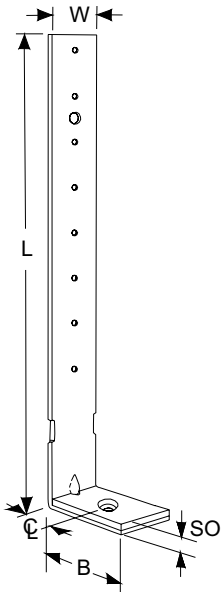


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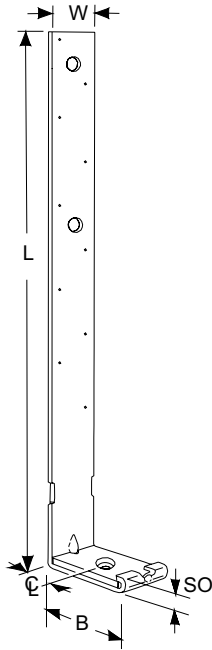
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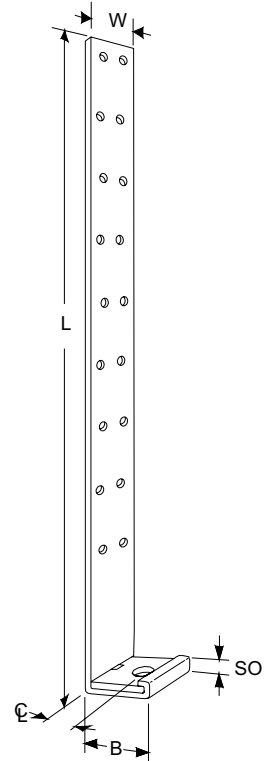
Revised: 02/17/2011



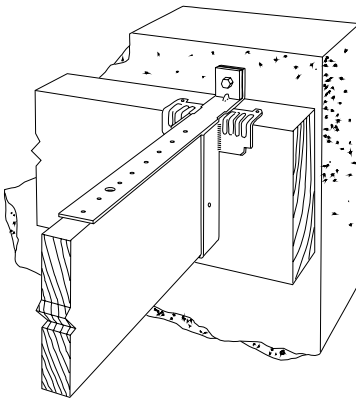
LTT19



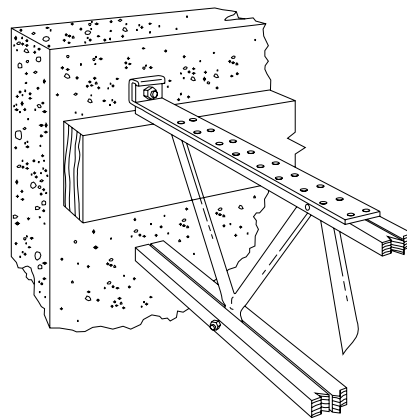
LTT20B



LTTI31



LTT19 Horizontal Installation
(LTT20B Similar)



LTTI31 Horizontal Installation

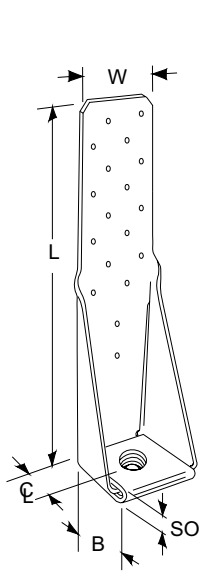
Figure 1 – LTT Nail Hold-Downs

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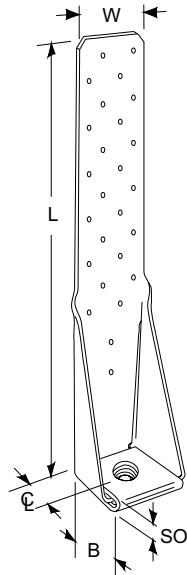
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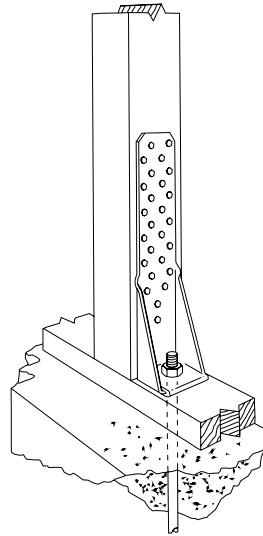
Revised: 02/17/2011



HTT4



HTT5



HTT5 Vertical Typical
Installation
(HTT4 Similar)

Figure 2 – HTT Nail Hold-Downs