

ICC-ES Evaluation Report

ESR-2104

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

REPORT HOLDER:

UNITED STEEL PRODUCTS COMPANY
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EVALUATION SUBJECT:

USP STRUCTURAL CONNECTORS: A3 FRAMING ANGLES; AC FRAMING ANGLES; HTW, MTW AND LTW TWIST STRAP TIES; JH JOIST HANGERS; LFTA6 STRAP TIES; PHXU BEAM AND PURLIN HANGERS; SNP SKEWABLE NAILER PLATES; SW, SWH AND KHW TOP MOUNT HANGERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Property evaluated:

Structural

2.0 USES

The USP structural connectors described in this report are used for connecting wood framing members in accordance with Section 2304.9.3 of the IBC. They may also be used in jurisdictions implementing the IRC when an engineered design is used in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 A3 Framing Angles:

A3 framing angles are used to support wood members meeting the requirements of Section 3.9.2. The angles are manufactured from No. 18 gage [minimum 0.044 inch (1.1 mm) base-metal thickness], ASTM A 653 SS Grade 33, G90 or G185 galvanized steel. See Table 1 and Figure 1 for nailing schedules, dimensions and allowable loads.

3.2 AC Framing Angles:

AC framing angles are used for connecting two framing members as depicted in Figure 2. They are manufactured

from No. 16 gage [minimum 0.055 inch (1.4 mm) base-metal thickness], ASTM A 653 SS Grade 33, G90 or G185 galvanized steel. See Table 2 and Figure 2 for nailing schedules, dimensions and allowable loads.

3.3 HTW, MTW and LTW Twist Strap Ties:

HTW, MTW and LTW twist strap ties are used for connecting roof trusses to top plates, or wall studs to sill plates and rim joists. HTW twist strap ties are manufactured from No. 14 gage [minimum 0.070 inch (1.8 mm) base-metal thickness], ASTM A 653 SS Grade 40, G90 galvanized steel, except the steel has a minimum yield strength of 42 ksi (290 MPa) and a minimum tensile strength of 56 ksi (386 MPa). MTW twist strap ties are manufactured from No. 16 gage [minimum 0.055 inch (1.4 mm) base-metal thickness], ASTM A 653 SS Grade 33, G90 or G185 galvanized steel. LTW twist strap ties are manufactured from No. 18 gage [minimum 0.044 inch (1.1 mm) base-metal thickness], ASTM A 653 SS Grade 33, G90 or G185 galvanized steel. See Table 3 and Figure 3 for nailing schedules, dimensions and allowable loads.

3.4 JH Joist Hangers:

JH joist hangers are used for connecting joists to the face of header members. They are manufactured from No. 18 gage [minimum 0.044 inch (1.1 mm) base-metal thickness], ASTM A 653 SS Grade 33, G90 galvanized steel. See Table 4 and Figure 4 for nailing schedules, dimensions and allowable loads.

3.5 LFTA6 Strap Ties:

The LFTA6 strap tie is used to connect roof trusses to top plates, or wall studs to sill plates and rim joists. The tie is manufactured from No. 16 gage [minimum 0.055 inch (1.4 mm) base-metal thickness], ASTM A 653 SS Grade 33, G90 or G185 galvanized steel. See Table 5 and Figure 5 for nailing schedules, dimensions and allowable loads.

3.6 PHXU Beam and Purlin Hangers:

PHXU beam and purlin hangers are used for connecting sawn lumber or structural composite lumber (SCL) joists, beams and purlins to sawn lumber or SCL headers. The hangers are manufactured from No. 7 gage [minimum 0.171 inch (4.3 mm) base-metal thickness], ASTM A 653 SS Grade 40, G90 galvanized steel. See Table 6 and Figure 6 for nailing schedules, dimensions and allowable loads.

3.7 SNP Skewable Nailer Plates:

The SNP skewable nailer plate is used to connect two framing members at angles ranging from 45 to 90 degrees to one another. The nailer plates are manufactured from No. 16 gage [minimum 0.055 inch (1.4 mm) base-metal

thickness], ASTM A 653 SS Grade 33, G90 galvanized steel. See Table 7 and Figure 7 for nailing schedules, dimensions and allowable loads.

3.8 SW, SWH and KHW Top Mount Hangers:

The SW, SWH and KHW top mount hangers consist of “U” shaped straps welded to bent top flanges in a variety of widths and heights, and are used to connect joists to header members. The hangers are manufactured from Nos. 12, 10, 7 and 3 gage [minimum 0.099 inch (2.5 mm); 0.129 inch (3.3 mm); 0.171 inch (4.3 mm); and 0.24 inch (6.1 mm) base-metal thicknesses, respectively], ASTM A 1011 SS Grade 33 hot-rolled steel, ASTM A 653 SS Grade 33 G90 galvanized steel, and ASTM A 36 steel. See Table 8 and Figure 8 for nailing schedules, dimensions and allowable loads.

3.9 Materials:

3.9.1 Steel: The USP structural connectors described in this report are manufactured from steel having the minimum base-metal thicknesses, specifications, strengths, and coatings noted in Sections 3.1 through 3.8.

3.9.2 Wood: Wood members with which the connectors are used must be nominally dimensioned sawn lumber or approved structural composite lumber (SCL). Allowable loads given in this report are for connectors nailed into sawn lumber or SCL having a minimum equivalent specific gravity of 0.50 (such as Douglas fir–larch), and a moisture content not exceeding 19 percent in sawn lumber or 16 percent in SCL. Beams, headers, rim joists and other framing members to which the connectors are attached must have a dimension of 1.5 inches (38 mm) or greater, in the direction parallel to the longitudinal axis of the nail.

3.9.3 Fasteners: Nails must conform to ASTM F 1667, unless otherwise noted, and must have lengths, diameters and bending yield strengths, F_{yb} , as indicated in the following table:

NAIL DESIGNATION	DIAMETER (inch)	LENGTH (inches)	MINIMUM REQUIRED F_{yb} (psi)
8d x 1½	0.131	1.5	100,000
8d common	0.131	2.5	100,000
10d x 1½	0.148	1.5	90,000
10d common	0.148	3.0	90,000
16d common	0.162	3.5	90,000
20d x 2½	0.192	2.5	80,000

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

3.9.4 Use in Treated Wood: Connectors and fasteners used in contact with preservative-treated or fire-retardant-treated wood are outside the scope of this report, and must comply with IBC Section 2403.9.5 or IRC Section R319.3. The report holder or wood treatment manufacturer should be contacted for recommendations on minimum corrosion resistance and connection capacities of fasteners and connectors used with the specific proprietary preservative-treated or fire-retardant-treated wood.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Allowable loads given in this report are based on allowable stress design. Tabulated allowable loads are for normal duration and short durations, based on load duration factors, C_D , in accordance with the NDS. No further increases in allowable loads are permitted.

Tabulated allowable loads are for connections with sawn lumber seasoned to a moisture content not exceeding 19 percent, or SCL with a moisture content not exceeding 16

percent, used in continuously dry interior conditions where sustained temperatures are 100°F (37.8°C) or less. When connections are used under conditions exceeding these limitations, the allowable loads in this evaluation report must be adjusted by the applicable adjustment factors given in the NDS.

Connected wood members must be checked for load-carrying capacity in accordance with Section 10.1.2 of the NDS.

4.2 Installation:

Installation of the connectors must be in accordance with this evaluation report and the manufacturer's published installation instructions. See Figures 1 through 8 for installation details.

4.3 Special Inspection:

4.3.1 IBC: Periodic special inspection is required for installation of connectors described in this report that are designated as components of the seismic-force-resisting system for structures in Seismic Design Categories C, D, E or F in accordance with IBC Section 1707.3 or 1707.4, with the exception of those structures that qualify under the Exceptions to Section 1704.1.

4.3.2 IRC: Special Inspections are not required.

5.0 CONDITIONS OF USE

The USP structural 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 connectors must be manufactured, identified, designed and installed in accordance with this report and the manufacturer's published instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

5.2 Lumber and fasteners used with the connectors must comply with Section 3.9.

5.3 Structural members to which the connectors are attached must be checked for load-carrying capacity at connections in accordance with Section 10.1.2 of the NDS.

5.4 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.

5.5 The SW, SWH and KHW top mount hanger series are manufactured by United Steel Products Company in Montgomery, Minnesota, Livermore, California, and Largo, Florida, under a quality control program with inspections by PFS Corporation (AA-652).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated October 2010.

7.0 IDENTIFICATION

Each connector described in this report is identified by a stamp bearing the manufacturer's name (USP), and a label bearing the model (stock) number and the number of an ICC-ES index evaluation report ([ESR-2685](#)). Labels on connectors within the SW, Shanger series also bear the name of the third-party inspection agency (PFS Corporation).

TABLE 1—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR A3 FRAMING ANGLES

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)			FASTENER SCHEDULE				LOAD DIR.	ALLOWABLE LOADS (lbs.) ^{1,2,4,5}			
					Header		Joist			C _D = 1.00	C _D = 1.15	C _D = 1.25	C _D = 1.60
		W1	W2	L	Qty	Type ³	Qty	Type ³					
A3	18	1 ⁷ / ₁₆	1 ⁷ / ₁₆	2 ³ / ₄	4	10d x 1 ¹ / ₂	4	10d x 1 ¹ / ₂	F1	450	515	560	590
	18	1 ⁷ / ₁₆	1 ⁷ / ₁₆	2 ³ / ₄	4	10d x 1 ¹ / ₂	4	10d x 1 ¹ / ₂	F2	450	515	560	600
	18	1 ⁷ / ₁₆	1 ⁷ / ₁₆	2 ³ / ₄	4	10d x 1 ¹ / ₂	4	10d x 1 ¹ / ₂	F3	210	240	260	335

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

- ¹Allowable loads shown are for a single angle. When angles are installed on both sides of the joist, the angles must be offset so that the nails from opposing sides do not touch.
- ²Allowable loads have been adjusted for load duration factors, C_D, as shown, in accordance with the NDS, and are not permitted to be adjusted for other load durations. See Section 4.1 for additional design requirements.
- ³See Section 3.9.3 for required nail dimensions and mechanical properties.
- ⁴Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.
- ⁵If a single angle is installed on each end of a supported member, the angles must be installed on opposite sides of the supported member, or wood blocking must be installed to prevent rotation.

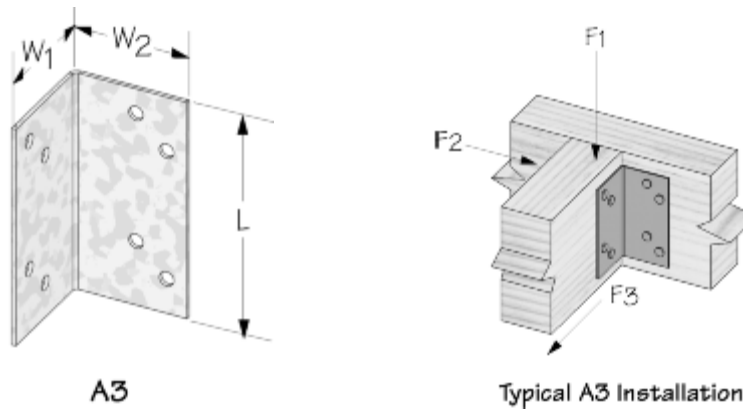


FIGURE 1—DIMENSIONS AND INSTALLATION OF A3 FRAMING ANGLE

TABLE 2—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR AC FRAMING ANGLES

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)			FASTENER SCHEDULE				LOAD DIR.	ALLOWABLE LOADS (lbs.) ^{1,2,4,5}			
					Header		Joist			C _D = 1.00	C _D = 1.15	C _D = 1.25	C _D = 1.60
		W1	W2	L	Qty	Type3	Qty	Type3					
AC5	16	1 ⁵ / ₁₆	2 ³ / ₈	4 ⁷ / ₈	3	10d common	3	10d common	F1	340	390	425	540
	16	1 ⁵ / ₁₆	2 ³ / ₈	4 ⁷ / ₈	3	10d common	3	10d common	F2	340	390	425	540
	16	1 ⁵ / ₁₆	2 ³ / ₈	4 ⁷ / ₈	3	10d common	3	10d common	F3 ⁶	155	180	195	250
	16	1 ⁵ / ₁₆	2 ³ / ₈	4 ⁷ / ₈	3	16d common	3	16d common	F1	380	440	475	610
	16	1 ⁵ / ₁₆	2 ³ / ₈	4 ⁷ / ₈	3	16d common	3	16d common	F2	380	440	475	610
	16	1 ⁵ / ₁₆	2 ³ / ₈	4 ⁷ / ₈	3	16d common	3	16d common	F3 ⁶	175	205	220	280
AC7	16	1 ⁵ / ₁₆	2 ³ / ₈	6 ¹⁵ / ₁₆	4	10d common	4	10d common	F1	450	520	565	725
	16	1 ⁵ / ₁₆	2 ³ / ₈	6 ¹⁵ / ₁₆	4	10d common	4	10d common	F2	450	520	565	725
	16	1 ⁵ / ₁₆	2 ³ / ₈	6 ¹⁵ / ₁₆	4	10d common	4	10d common	F3 ⁶	210	240	260	335
	16	1 ⁵ / ₁₆	2 ³ / ₈	6 ¹⁵ / ₁₆	4	16d common	4	16d common	F1	510	585	635	770
	16	1 ⁵ / ₁₆	2 ³ / ₈	6 ¹⁵ / ₁₆	4	16d common	4	16d common	F2	510	585	635	815
	16	1 ⁵ / ₁₆	2 ³ / ₈	6 ¹⁵ / ₁₆	4	16d common	4	16d common	F3 ⁶	235	270	295	375
AC9	16	1 ⁵ / ₁₆	2 ³ / ₈	8 ⁷ / ₈	5	10d common	5	10d common	F1	565	650	705	905
	16	1 ⁵ / ₁₆	2 ³ / ₈	8 ⁷ / ₈	5	10d common	5	10d common	F2	565	650	705	905
	16	1 ⁵ / ₁₆	2 ³ / ₈	8 ⁷ / ₈	5	10d common	5	10d common	F3 ⁶	260	300	325	415
	16	1 ⁵ / ₁₆	2 ³ / ₈	8 ⁷ / ₈	5	16d common	5	16d common	F1	635	730	795	1015
	16	1 ⁵ / ₁₆	2 ³ / ₈	8 ⁷ / ₈	5	16d common	5	16d common	F2	635	730	795	920
	16	1 ⁵ / ₁₆	2 ³ / ₈	8 ⁷ / ₈	5	16d common	5	16d common	F3 ⁶	295	340	370	470

For S1: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Allowable loads shown are for a single angle.

²Allowable loads have been adjusted for load duration factors, C_D, as shown, in accordance with the NDS, and are not permitted to be adjusted for other load durations. See Section 4.1 for additional design requirements.

³See Section 3.9.3 for required nail dimensions and mechanical properties.

⁴Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.

⁵If a single angle is installed on each end of a supported member, the angles must be installed on opposite sides of the supported member, or wood blocking must be installed to prevent rotation.

⁶Allowable loads in the F3 load direction are for installations in 2-by nominal dimension lumber having a minimum dimension of 1.5 inches (38 mm) in the direction parallel to the longitudinal axis of the nails. For installations in 4-by nominal dimension lumber having a minimum dimension of 3.5 inches (89 mm) in the direction parallel to the longitudinal axis of the nails, allowable loads in the F3 load direction may be increased by the following factors:

For 10d Common nails: 1.94

For 16d Common nails: 1.68

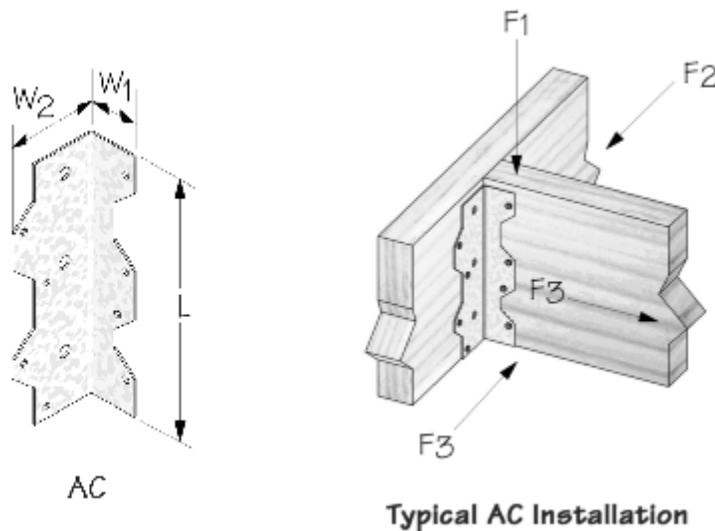


FIGURE 2—DIMENSIONS AND INSTALLATION OF AC FRAMING ANGLE

TABLE 3—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR HTW, LTW AND MTW TWIST STRAP TIES

STOCK NUMBER	STEEL GAGE	STRAP DIMENSIONS (in.)				FASTENER SCHEDULE		ALLOWABLE UPLIFT ^{1,4} (lbs.)
		W	L	L1	L2	Qty ³	Type ²	C _D = 1.60
HTW16	14	1 ¹ / ₄	16	5 ¹ / ₈	5 ¹ / ₈	16	10d x 1 ¹ / ₂	1260
						16	10d common	1260
HTW20	14	1 ¹ / ₄	20	7 ¹ / ₈	7 ¹ / ₈	24	10d x 1 ¹ / ₂	1530
						20	10d common	1530
HTW24	14	1 ¹ / ₄	24	9 ¹ / ₈	9 ¹ / ₈	24	10d x 1 ¹ / ₂	1530
						20	10d common	1530
HTW28	14	1 ¹ / ₄	28	11 ¹ / ₈	11 ¹ / ₈	24	10d x 1 ¹ / ₂	1530
						20	10d common	1530
HTW30	14	1 ¹ / ₄	30	7	17 ¹ / ₄	24	10d x 1 ¹ / ₂	1530
						20	10d common	1530
HTW30C	14	1 ¹ / ₄	30	12 ¹ / ₈	12 ¹ / ₈	24	10d x 1 ¹ / ₂	1530
						20	10d common	1530
LTW12	18	1 ¹ / ₄	12	4 ¹ / ₂	4 ¹ / ₂	12	10d x 1 ¹ / ₂	775
						12	10d common	775
LTW16	18	1 ¹ / ₄	16	6 ¹ / ₂	6 ¹ / ₂	12	10d x 1 ¹ / ₂	775
						12	10d common	775
LTW18	18	1 ¹ / ₄	18	7 ¹ / ₂	7 ¹ / ₂	12	10d x 1 ¹ / ₂	775
						12	10d common	775
LTW20	18	1 ¹ / ₄	20	8 ¹ / ₂	8 ¹ / ₂	12	10d x 1 ¹ / ₂	775
						12	10d common	775
MTW12	16	1 ¹ / ₄	12	4 ¹ / ₂	4 ¹ / ₂	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW16	16	1 ¹ / ₄	16	6 ¹ / ₂	6 ¹ / ₂	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW18	16	1 ¹ / ₄	18	7 ¹ / ₂	7 ¹ / ₂	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW20	16	1 ¹ / ₄	20	8 ¹ / ₂	8 ¹ / ₂	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW24C	16	1 ¹ / ₄	24	10 ⁷ / ₁₆	10 ⁷ / ₁₆	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW28C	16	1 ¹ / ₄	28	12 ⁷ / ₁₆	12 ⁷ / ₁₆	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW30C	16	1 ¹ / ₄	30	13 ⁷ / ₁₆	13 ⁷ / ₁₆	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195
MTW30	16	1 ¹ / ₄	30	8 ⁵ / ₁₆	18 ⁹ / ₁₆	14	10d x 1 ¹ / ₂	1195
						14	10d common	1195

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

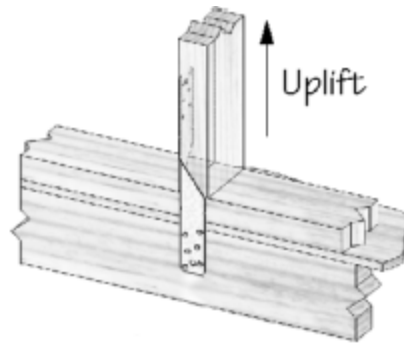
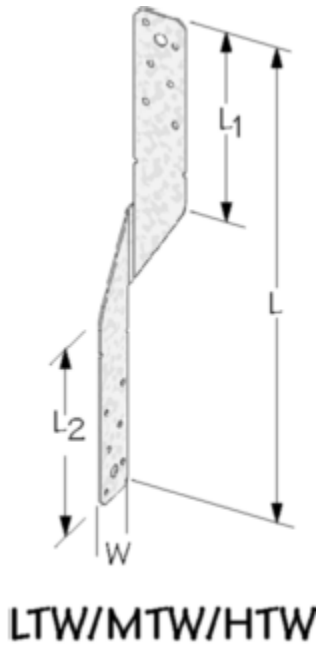
¹Allowable uplift loads have been adjusted for a load duration factor, C_D, of 1.60, corresponding to a ten-minute load duration (i.e., wind or earthquake loading), in accordance with the NDS. The allowable uplift loads do not apply to loads of other durations. See Section 4.1 for additional design requirements.

²See Section 3.9.3 for required nail dimensions and mechanical properties. HTW, LTW and MTW twist strap ties may be installed with either 10d x 1¹/₂ or 10d common nails.

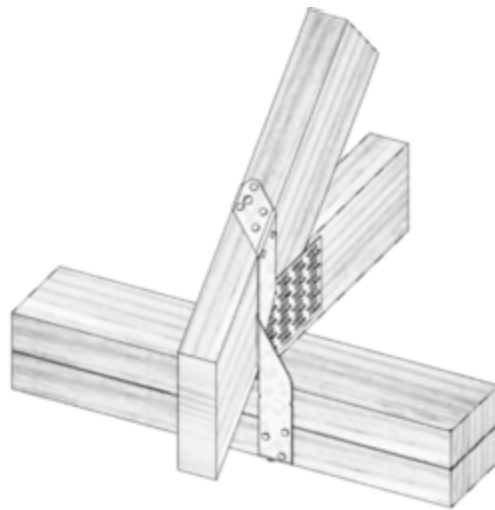
³Listed fastener quantity is the total required for the connection, with half the tabulated quantity at each end.

⁴Allowable uplift loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.

⁵Some illustrations for the twist straps show connection that could cause cross-grain tension or bending of the wood during loading if not reinforced sufficiently. In such cases, mechanical reinforcement should be considered.



Typical LTW/MTW/HTW
Stud-to-rim joist installation



Typical LTW/MTW/HTW
Truss-to-top plate installation

FIGURE 3—DIMENSIONS AND INSTALLATION OF LTW, MTW AND HTW TWIST STRAP TIES

TABLE 4—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR JH JOIST HANGER

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)					HEADER SIZE	FASTENER SCHEDULE						ALLOWABLE LOADS (lbs.) ^{1,3}			
								Header			Joist						
		W	H	D	B	TF		Top		Face		Joist		Download			Uplift
								Qty	Type ²	Qty	Type ²	Qty	Type ^{2,4}	C _D = 1.00	C _D = 1.15	C _D = 1.25	C _D = 1.60
JH20	18	1 ⁹ / ₁₆	10 ¹ / ₁₆	2 ¹ / ₄	5 ¹ / ₈	1 ³ / ₁₆	2 x 6	2	10d common	4	10d common	6	10d common	1900	2060	2165	1285
						1 ⁷ / ₁₆	2 x 8	2	10d common	8	10d common	6	10d common	2540	2765	2900	1285
						7 ⁷ / ₁₆	2 x 10	2	10d common	12	10d common	6	10d common	2270	2565	2760	1285
						--	2 x 12	--	--	14	10d common	6	10d common	2185	2510	2730	1285

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

¹Allowable loads have been adjusted for load duration factors, C_D, as shown, in accordance with the NDS, and are not permitted to be adjusted for other load durations. See Section 4.1 for additional design requirements.

²See Section 3.9.3 for required nail dimensions and mechanical properties.

³Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.

⁴Joist nails must be driven horizontally into the joist at a 30- to 45-degree angle, such that they penetrate through the joist, and into the header.

⁵The hangers provide torsional resistance up to a maximum joist depth of H + 1 inch (H + 25.4 mm), where torsional resistance is defined as a moment not less than 75 pounds (334 N) times the depth of the joist at which the lateral movement of the top or bottom of the joist with respect to the vertical position of the joist is 0.125 inch (3.2 mm).

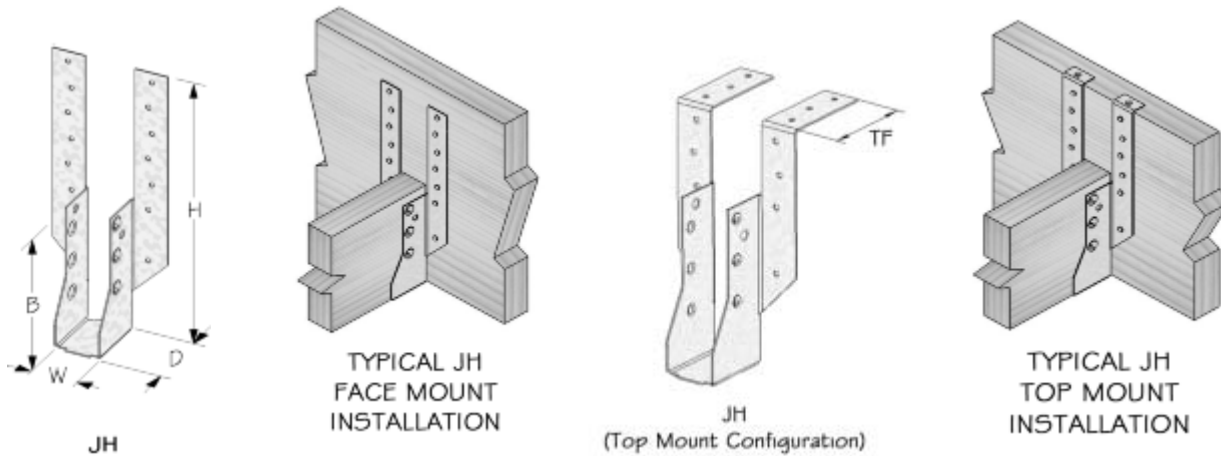


FIGURE 4—DIMENSIONS AND INSTALLATION OF JH JOIST HANGER

TABLE 5—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR LFTA6 STRAP TIE

STOCK NUMBER	STEEL GAGE	DIMENSIONS (in.)				FASTENER SCHEDULE		ALLOWABLE LOADS (lbs.) ^{1,4,5}		
		W	L	L1	L2	Qty ³	Type ²	Uplift	Lateral F ₁	Lateral F ₂
								C _D = 1.60	C _D = 1.60	C _D = 1.60
LFTA6	16	2 ¹ / ₄	19 ¹ / ₈	8 ³ / ₈	6 ¹ / ₂	16	8d common	1210	700	90
						16	8d x 1 ¹ / ₂	1210	700	90

For S1: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Allowable loads have been adjusted for a load duration factor, C_D, of 1.60, corresponding to a ten-minute load duration (i.e., wind or earthquake loading), in accordance with the NDS. The allowable loads do not apply to loads of other durations. See Section 4.1 for additional design requirements.

²See Section 3.9.3 for required nail dimensions and mechanical properties.

³Listed fastener quantity is the total required for the connection, with half the quantity at each end.

⁴Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.

⁵Lateral F₁ and F₂ load directions do not apply to roof truss-to-top plate installations.

⁶Some illustrations for the strap tie show connection that could cause cross-grain tension or bending of the wood during loading if not reinforced sufficiently. In such cases, mechanical reinforcement should be considered.

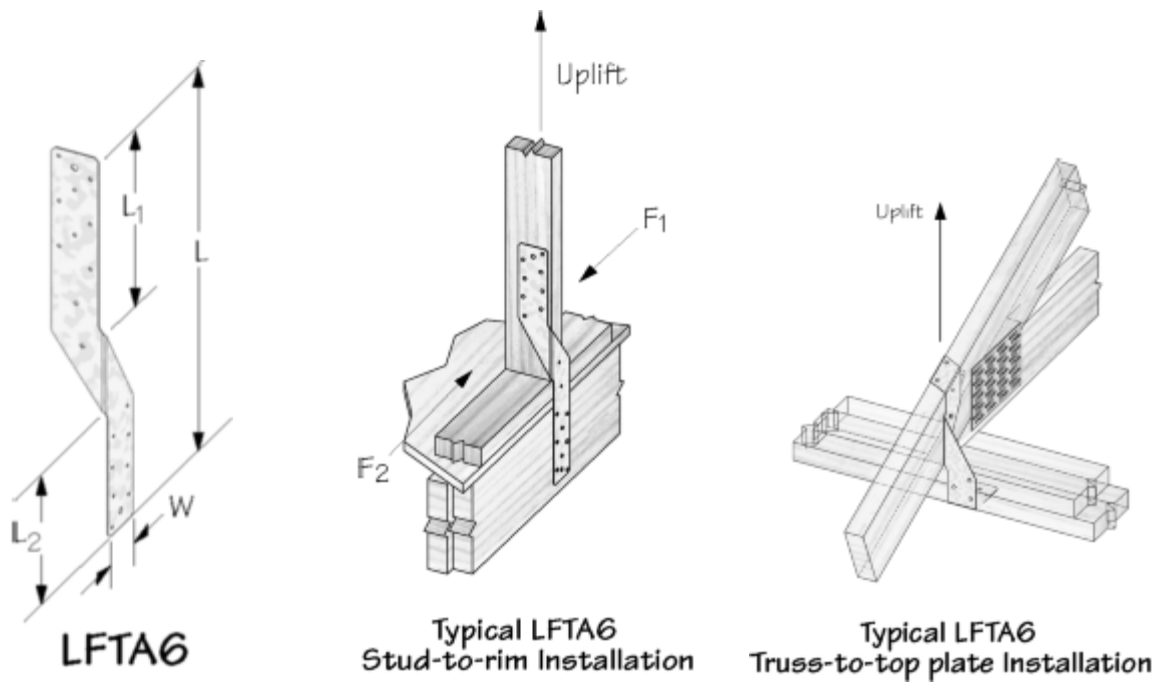


FIGURE 5—DIMENSIONS AND INSTALLATION OF LFTA6 STRAP TIE

TABLE 6—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR PHXU SERIES HANGERS

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)					FASTENER SCHEDULE				ALLOWABLE LOADS (lbs.) ^{1,3}			
							Header		Joist		Download			Uplift
		W	H	D	L	TF	Qty	Type ²	Qty	Type ²	C _D = 1.00	C _D = 1.15	C _D = 1.25	C _D = 1.60
PHXU17xxx	7	1 ¹³ / ₁₆	7 ¹ / ₄ - 20	3 ¹ / ₄	10	2 ¹ / ₂	8	16d common	6	10d x 1 ¹ / ₂ "	4420	4550	4635	1035
PHXU23xxx	7	2 ³ / ₈	9 ¹ / ₄ - 30	3 ¹ / ₄	10	2 ¹ / ₂	8	16d common	6	10d x 1 ¹ / ₂ "	5560	5690	5775	970
PHXU25xxx	7	2 ⁹ / ₁₆	9 ¹ / ₄ - 30	3 ¹ / ₄	10	2 ¹ / ₂	8	16d common	6	10d x 1 ¹ / ₂ "	5940	6020	6020	970
PHXU26xxx	7	2 ¹¹ / ₁₆	9 ¹ / ₄ - 30	3 ¹ / ₄	10	2 ¹ / ₂	8	16d common	6	10d x 1 ¹ / ₂ "	6020	6020	6020	970
PHXU27xxx	7	2 ³ / ₄	9 ¹ / ₄ - 30	3 ¹ / ₄	10	2 ¹ / ₂	8	16d common	6	10d x 1 ¹ / ₂ "	6020	6020	6020	970
PHXU35xxx	7	3 ⁹ / ₁₆	9 ¹ / ₄ - 30	3 ¹ / ₄	10	2 ¹ / ₂	8	16d common	6	10d common	6650	6650	6650	1290
PHXU23xxx - 2	7	4 ³ / ₄	9 ¹ / ₄ - 30	3 ¹ / ₄	10 ³ / ₄	2 ¹ / ₂	8	16d common	6	10d common	6650	6650	6650	1290
PHXU25xxx - 2	7	5 ¹ / ₈	9 ¹ / ₄ - 30	3 ¹ / ₄	11 ¹ / ₈	2 ¹ / ₂	8	16d common	6	10d common	6650	6650	6650	1290
PHXU52xxx	7	5 ³ / ₈	9 ¹ / ₄ - 30	3 ¹ / ₄	11 ³ / ₈	2 ¹ / ₂	8	16d common	6	10d common	6650	6650	6650	1290
PHXU55xxx	7	5 ¹ / ₂	9 ¹ / ₄ - 30	3 ¹ / ₄	11 ¹ / ₂	2 ¹ / ₂	8	16d common	6	10d common	6650	6650	6650	1290
PHXU71xxx	7	7 ¹ / ₈	9 ¹ / ₄ - 30	3 ¹ / ₄	13 ¹ / ₈	2 ¹ / ₂	8	16d common	6	10d common	6650	6650	6650	1290

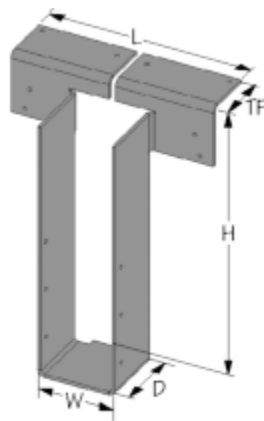
For S1: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Allowable loads have been adjusted for load duration factors, C_D, as shown, in accordance with the NDS, and are not permitted to be adjusted for other load durations. See Section 4.1 for additional design requirements.

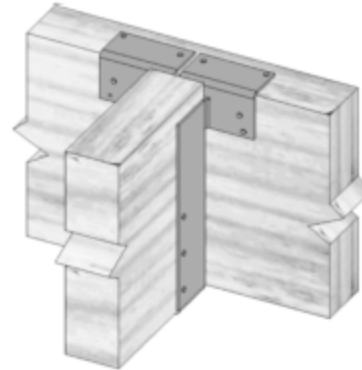
²See Section 3.9.3 for required nail dimensions and mechanical properties.

³Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.

⁴The hangers provide torsional resistance, which is defined as a moment of not less than 75 pounds (334 N) times the depth of the joist at which the lateral movement of the top and bottom of the joist with respect to the vertical position of the joist is 0.125 inch (3.2 mm). The height, H, of the joist hanger must be equal to the height of the joist to ensure proper attachment of the sheathing to the joist and supporting member.



PHXU



Typical PHXU Installation

FIGURE 6—DIMENSIONS AND INSTALLATION OF PHXU SERIES HANGERS

TABLE 7—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR SNP SKEWABLE NAILER PLATE

STOCK NUMBER	STEEL GAGE	HANGER DIMENSIONS (inches)			FASTENER SCHEDULE ²				ALLOWABLE LOADS (lbs.) ^{1,3,5}			
					Supporting Member		Supported Member		Download			Uplift
		W1	W2	H	Qty ⁴	Type ²	Qty ⁴	Type ²	C _D = 1.00	C _D = 1.15	C _D = 1.25	C _D = 1.60
SNP3	16	3 1/2	3 1/2	3 3/8	6	8d x 1 1/2	6	8d x 1 1/2	530	530	530	530

For S1: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Allowable loads have been adjusted for load duration factors, C_D, as shown, in accordance with the NDS, and are not permitted to be adjusted for other load durations. See Section 4.1 for additional design requirements.

²See Section 3.9.3 for required nail dimensions and mechanical properties.

³Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2.

⁴Install specified fasteners into the wide faces of the members, from the bend line out from each end. Not all nail holes will be filled.

⁵The SNP was tested for use with a bend angle of 45 to 90 degrees.

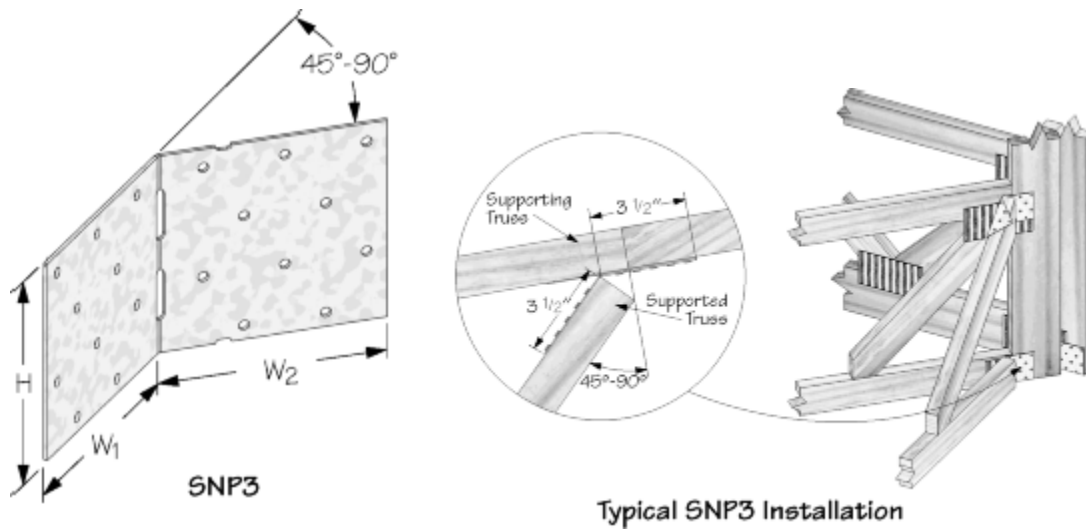


FIGURE 7—DIMENSIONS AND INSTALLATION OF SNP SKEWABLE NAILER PLATE

TABLE 8—NAILING SCHEDULES, DIMENSIONS AND ALLOWABLE LOADS FOR SW, SWH AND KHW TOP MOUNT HANGERS

STOCK NUMBER	STEEL GAGE		DIMENSIONS (inches)					FASTENER SCHEDULE				ALLOWABLE LOADS (lbs.) ¹		
	Top Flange	U-Strap	L	W	H	D	TF	Header ³		Joist		Download		
								Qty	Type ²	Qty	Type ²	C _D = 1.00	C _D = 1.15	C _D = 1.25
SW26	12	12	6 1/2	1 9/16	5 3/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW28	12	12	6 1/2	1 9/16	7 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW210	12	12	6 1/2	1 9/16	9 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW212	12	12	6 1/2	1 9/16	11 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW214	12	12	6 1/2	1 9/16	13 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW216	12	12	6 1/2	1 9/16	15 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW36	12	12	6 1/2	2 9/16	5 3/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW38	12	12	6 1/2	2 9/16	7 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW310	12	12	6 1/2	2 9/16	9 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	2315	2315	2315
SW46	12	12	6 1/2	3 9/16	5 3/8	2 1/2	2 1/2	2	10d common	2	10d common	2520	2520	2520
SW48	12	12	6 1/2	3 9/16	7 1/8	2 1/2	2 1/2	2	10d common	2	10d common	2520	2520	2520
SW410	12	12	6 1/2	3 9/16	9 1/8	2 1/2	2 1/2	2	10d common	2	10d common	2520	2520	2520
SWH26-2	7	12	7	3 1/8	5 3/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH28-2	7	12	7	3 1/8	7 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH210-2	7	12	7	3 1/8	9 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH212-2	7	12	7	3 1/8	11 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH214-2	7	12	7	3 1/8	13 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH216-2	7	12	7	3 1/8	15 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH312	7	12	7	2 9/16	11 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	3305	3305	3305
SWH314	7	12	7	2 9/16	13 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	3305	3305	3305
SWH316	7	12	7	2 9/16	15 1/8	2 1/2	2 1/2	2	10d common	2	10d x 1 1/2"	3305	3305	3305
SWH410	7	12	7	3 9/16	9 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH412	7	12	7	3 9/16	11 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH414	7	12	7	3 9/16	13 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH416	7	12	7	3 9/16	15 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH66	7	12	7	5 1/2	5 3/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH68	7	12	7	5 1/2	7 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
SWH610	7	12	7	5 1/2	9 1/8	2 1/2	2 1/2	2	10d common	2	10d common	3305	3305	3305
KHW46	3	10	10	3 9/16	5 3/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW48	3	10	10	3 9/16	7 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW410	3	10	10	3 9/16	9 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW412	3	10	10	3 9/16	11 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW414	3	10	10	3 9/16	13 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW416	3	10	10	3 9/16	15 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW66	3	10	10	5 1/2	5 3/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW68	3	10	10	5 1/2	7 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW610	3	10	10	5 1/2	9 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW612	3	10	10	5 1/2	11 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW614	3	10	10	5 1/2	13 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW616	3	10	10	5 1/2	15 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW86	3	10	10	7 1/2	5 3/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW88	3	10	10	7 1/2	7 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW810	3	10	10	7 1/2	9 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW812	3	10	10	7 1/2	11 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW814	3	10	10	7 1/2	13 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW816	3	10	10	7 1/2	15 1/8	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5335	5335	5335
KHW26	3	10	10	2 11/16	Spec.	4	2 1/2	4	20d x 2 1/2"	2	10d x 1 1/2"	5295	5295	5295
KHW3	3	10	10	3 1/4	Spec.	3	2 1/2	4	20d x 2 1/2"	2	10d common	5295	5295	5295
KHW5	3	10	10	5 1/4	Spec.	2 1/2	2 1/2	4	20d x 2 1/2"	2	10d common	5295	5295	5295

For S1: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Allowable loads have been adjusted for load duration factors, C_D, as shown, in accordance with the NDS, and are not permitted to be adjusted for other load durations. See Section 4.1 for additional design requirements.

²See Section 3.9.3 for required nail dimensions and mechanical properties.

³Allowable loads shown are for installations in sawn lumber or structural composite lumber complying with Section 3.9.2. Headers must have a minimum thickness of 2 inches (51 mm).

⁴The hangers provide torsional resistance, which is defined as a moment of not less than 75 pounds (334 N) times the depth of the joist at which the lateral movement of the top and bottom of the joist with respect to the vertical position of the joist is 0.125 inch (3.2 mm). The height, H, of the joist hanger must be equal to the height of the joist to ensure proper attachment of the sheathing to the joist and supporting member.

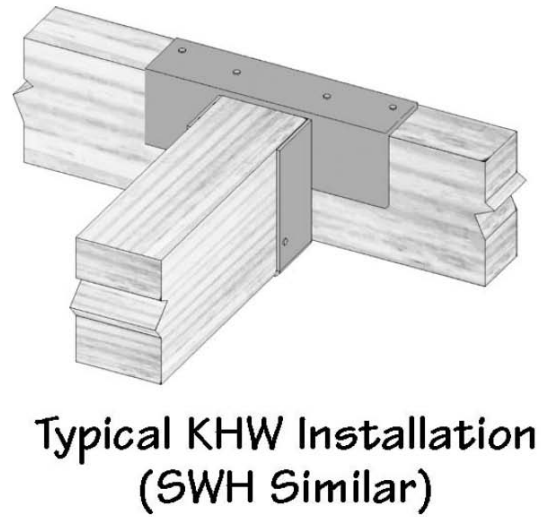
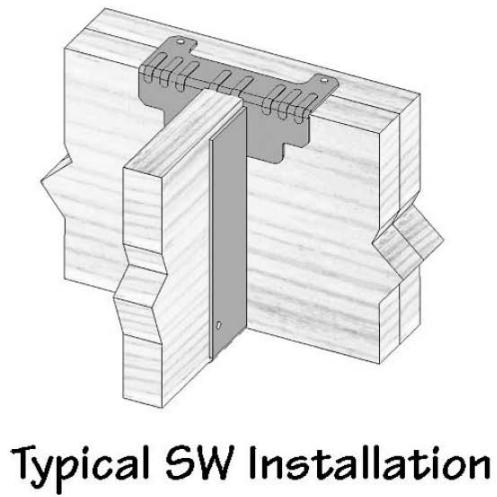
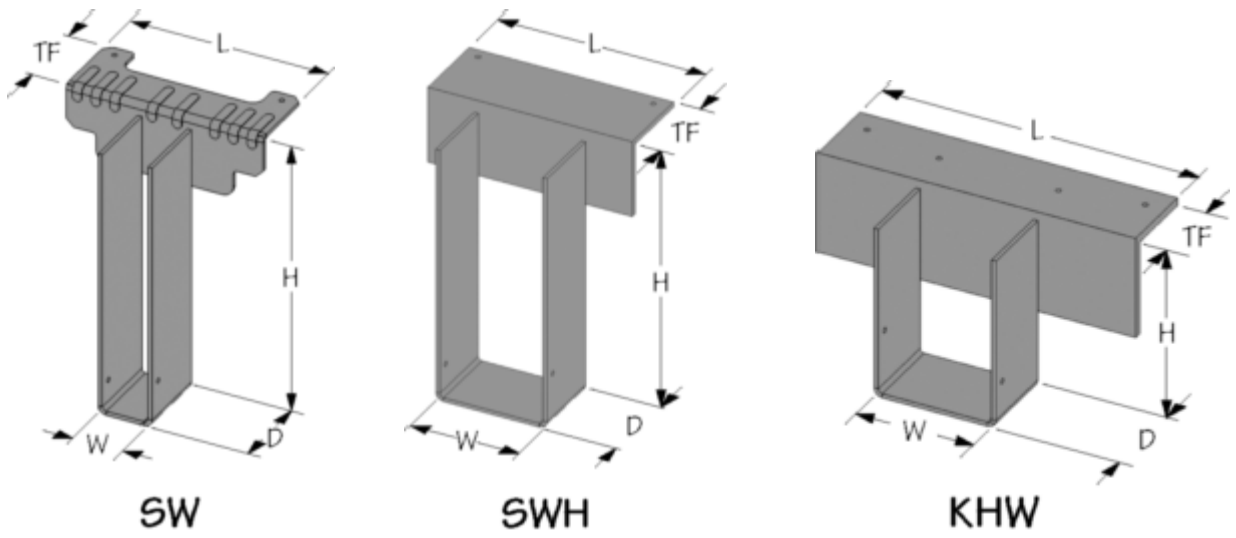


FIGURE 8—DIMENSIONS AND INSTALLATION OF SW, SWH AND KHW TOP MOUNT HANGERS