

ICBO-ES ER-5938

Used for Florida State Wide Product Approval #

FL1463

Products on this Report which are approved:

Product	Florida #
HDC10/22-SDS2.5	FL1463.21
HDC10/4-SDS2.5	FL1463.22
HDC5/22-SDS2.5	FL1463.23
HDC5/4-SDS2.5	FL1463.24
HDQ8-SDS3	FL1463.25
PCT18	FL1463.41
PCT23	FL1463.42
PCT27	FL1463.43
PCT38	FL1463.44

SIMPSON

Strong-Tie

SIMPSON STRONG-TIE COMPANY, INCTM

Filing Category: FASTENERS—Wood Hangers and Framing Anchors

SIMPSON STRONG-TIE PCT PURLIN CROSSTIES, HDC CONCENTRIC HOLDOWNS, AND HDQ8 HOLDOWNS

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1.0 SUBJECT

Simpson Strong-Tie PCT Purlin Crossties, HDC Concentric Holdowns, and HDQ8 Holdowns.

2.0 DESCRIPTION

2.1 PCT Purlin Crossties:

PCT Purlin Crossties connect intervening wood purlins to each other at the intersection of the supporting beam and transmit compression and tension forces from one purlin to the other. The crossties must be installed in pairs. The crossties are manufactured from cold-formed, square-shaped, seamless, structural carbon-steel tubing, measuring 1½ inches by 1½ inches by 1/8 inch (38 by 38 by 3.2 mm) thick or 1½ inches by 1½ inches by 3/16 inch (38 by 38 by 5.2 mm) thick. The steel tubing conforms to ASTM A 500, Grade B, and has minimum yield and tensile strengths of 46 ksi (317 MPa) and 58 ksi (400 MPa), respectively. The crossties are hot-dipped galvanized in accordance with ASTM A 153-00, Class B-1. Each crosstie has an offset angle to permit drilling access through the supporting beam. The offset portion is either 6½ inches (165 mm) or 9½ inches (241 mm) long. Refer to Table 1 for dimensions, required numbers of fasteners, and allowable loads for PCT Purlin Crossties.

2.2 HDC Concentric Holdowns:

HDC Concentric Holdowns are two-part connectors with a 3-inch-wide (76 mm), die-formed, U-shaped steel strap and a 2½-inch-high (63.5 mm) aluminum support base. The U-shaped steel strap is No. 10 gage [0.1342 inch (3.4 mm) design base-metal thickness], and is die-formed from galvanized steel complying with ASTM A 653 SS, Grade 33, having minimum yield and tensile strengths of 33 ksi (193 MPa) and 45 ksi (262 MPa), respectively. The galvanized coating has a G90 designation. The support base is manufactured from 6061-T6 aluminum, having minimum yield and tensile strengths of 40 ksi (275 MPa) and 45 ksi (262 MPa), respectively. The base support includes a hole for a 5/8-inch-diameter (15.9 mm) or 7/8-inch-diameter (22 mm) anchor bolt. The post bases are manufactured to fit a nominal 4-inch-by-4-inch wood post or doubled 2-inch-thick (51 mm) wood studs. See Table 2

for dimensions, required numbers of fasteners, and allowable loads for HDC Concentric Holdowns.

2.3 HDQ8 Holdown:

The HDQ8 Holdown is designed to anchor vertical wood members to foundations, or to another vertical wood member, or to act as a horizontal tension tie. The HDQ8 Holdown is fabricated from No. 7 gage [0.1784 inch (4.5 mm) design base-metal thickness] steel complying with ASTM A 653, SS, Grade 33. It also has a square steel block where the anchor attaches to the hold-down device. The steel block measures 1.030 inch (26 mm) square and 0.415 inch (10.5 mm) thick, and has a hole to accommodate a 7/8-inch-diameter (22 mm) anchor bolt or all-thread rod. Overall, the hold-down is 14 inches (356 mm) high, by 2 7/8 inches (73 mm) wide, by 2 1/2 inches (63.5 mm) deep. Refer to Table 3 for dimensions, required fastener schedule, and allowable tension load.

2.4 Design Criteria:

Load capacities in this evaluation report are based on lumber having a specific gravity of 0.50 or greater. Load capacities in this report also apply to structural composite lumber that is made primarily from veneers or strands with an oven-dry specific gravity of 0.49 or greater, or that has an overall oven-dry specific gravity of 0.60 or greater, and that has both a dowel bearing strength and compression strength perpendicular-to-grain equivalent to a solid-sawn wood listed in the NDS¹ with a specific gravity of 0.50 or greater. Tabulated allowable design loads are for normal duration, unless noted otherwise. Adjustments to these values, using C_d factors for other durations of loading, are permitted. Values in this report are for connections in solid-sawn lumber and structural composite lumber with a moisture content of 19 percent or less, and where sustained temperatures are 100°F (37.8°C) or less. When connectors are installed in solid-sawn lumber having a moisture content greater than 19 percent in service or at time of installation, the allowable design values in this evaluation report must be adjusted by multiplying by the wet-service factor, C_m , specified in the NDS.

Unless noted otherwise, the tabulated allowable loads are based on the lowest load obtained from comparing the following:

- The static test load on a steel jig under which 1/8-inch (3.2 mm) deflection occurs.
- The lowest ultimate test load on a steel jig, divided by 3.0.
- Loads based on calculations of allowable capacities of steel and fasteners in wood.

¹NDS refers to the revised edition of, and the supplement to, the National Design Specification for Wood Construction. The NDS-97 is as adopted by reference in Section 2306 of the 2000 *International Building Code*® (IBC), and applicable sections of the 2000 *International Residential Code*®, the NDS-91 is adopted by reference in Division III, Part I, Chapter 23 of the 1997 *Uniform Building Code*™.

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Structural wood members must be checked for load-carrying capacity at connections in accordance with the NDS.

In designing the wood members, the following must be considered for single- and double-shear applications of the HDC and HDQ8 Holdowns:

- Single shear: The wood member must be checked for its design capacity at the critical net section, for combined bending due to eccentricity, and for tensile stresses in accordance with the NDS, where applicable.
- Double shear: The wood member must be checked for its design capacity at the critical net section, for tensile stresses in accordance with the NDS, where applicable.

In addition to considering combined bending and tension in the wood member connected to the HDQ8 Holdown, the engineer shall also address axial buckling and perpendicular-to-grain stress beneath shearwall endposts when the use is to restrain overturning in a shearwall system.

Anchor bolts used to connect HDC and HDQ8 Holdowns to a concrete structural member must be designed. The grade of anchor bolt and anchor bolt embedment must be specified by the engineer of record. Additionally, the concrete foundation must be designed for the loads transferred from the Simpson connectors.

2.5 Materials:

2.5.1 Steel: The specifications and design steel thicknesses of steel connectors are described in Sections 2.1 through 2.3. The uncoated minimum steel thicknesses of the cold-formed steel products described in this report are not permitted, at any location except at bends and corners, to be less than 95 percent of the listed design thicknesses.

2.5.2 Wood: The wood elements must be structural composite lumber or solid-sawn lumber having dimensions consistent with the connector dimensions shown in Tables 1, 2, and 3. Allowable loads in this report are based on lumber with specific gravities as described in Section 2.4 of this report. Allowable loads for use with solid-sawn lumber with a specific gravity of less than 0.50 shall be adjusted in accordance with the NDS. Solid-sawn wood members must have a moisture content not exceeding 19 percent unless the connection has been designed with the appropriate wet-use factor. Structural composite lumber members must have a moisture content not exceeding 16 percent. Use of connectors is limited to lumber that has not been treated with fire-retardant chemicals.

2.5.3 Fasteners:

2.5.3.1 Screws: Screws used with the HDC Concentric Holdown and the HDQ8 Holdown must be Simpson SDS-Series Wood Screws, and must have the sizes and lengths shown in Tables 2 and 3. The Simpson SDS screws are recognized in ICBO ES evaluation report ER-5268.

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

2.5.3.3 Anchor Bolts: The HDQ8 Holdown must be attached to the foundation or wall with a minimum $7/8$ -inch-

diameter (22 mm) anchor bolt at the base of the connector. The HDC10/4-SDS2 and the HDC10/22-SDS2 Concentric Holdowns must be attached to a concrete foundation with a minimum $7/8$ -inch-diameter (22 mm) anchor bolt at the base of the connectors. The HDC5/4-SDS2 and the HDC5/22-SDS2 Concentric Holdowns must be attached to a concrete foundation with a minimum $5/8$ -inch-diameter (15.9 mm) anchor bolt. All anchor bolts must comply with ASTM A 307, Grade A.

2.5.3.4 All-thread Rods: The HDC and HDQ8 holdowns may be installed with an all-threaded rod of the same diameter specified for the anchor bolt as per Section 2.5.3.3 of this report. The threaded rod must comply with ASTM A 36.

2.6 Installation:

Connectors must be installed in accordance with this report and the manufacturer's published installation instructions.

2.7 Identification:

For field identification, each of the connectors described in this report must be stamped with the words "Simpson Strong-Tie," the model number, and the evaluation report number (ICBO ES ER-5938).

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICBO ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated January 2002; and a quality control manual.

4.0 FINDINGS

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

- 4.1 The connectors are manufactured, identified and installed in accordance with this report and the manufacturer's installation procedures.**
- 4.2 Connectors are installed in lumber that has not been treated with fire-retardant chemicals.**
- 4.3 Plans specifying Simpson Strong-Tie Company crossties and holdowns are accompanied by engineering calculations showing that the allowable loads shown in this report for the connectors or hangers are not exceeded. These calculations must be submitted to the building official.**
- 4.4 Fasteners for pressure-preservative-treated wood are of hot-dipped zinc-coated galvanized steel.**
- 4.5 The uncoated minimum steel thicknesses of the cold-formed steel products described in this report are not permitted, at any location except at bends and corners, to be less than 95 percent of the listed design base-metal thicknesses.**
- 4.6 The connectors are manufactured by the Simpson Strong-Tie Company at their facilities located in San Leandro and Brea, California.**

This report is subject to re-examination in one year.

TABLE 1—PCT PURLIN CROSSTIES^{1,2,3,4}

MODEL NO.	TUBE THICKNESS (inch)	TOTAL LENGTH, L (inches)	L1 (inches)	L2 (inches)	NUMBER AND DIAMETER OF FASTENERS (MACHINE BOLTS)	ALLOWABLE LOADS PER PAIR OF PCTs INSTALLED ON DOUGLAS FIR–LARCH OR SOUTHERN PINE PURLINS (lbs)							
						Based on Steel Capacity		Based on Bolt Capacity (Double Shear)					
						Steel Tension	Steel Compression	Length of Bolt in Purlin					
								C _p	3 1/8"	3 1/2"	5 1/8"	5 1/2"	6 3/4"
PCT18	1/8	44 3/4	14	17 3/4	8—5/8" MB	24,665	19,165	1.33	14,365	15,925	15,925	15,905	15,875
								1.6	17,235	19,110	19,110	19,090	190,50
PCT23	1/8	52 3/4	14	17 3/4	10—5/8" MB	24,665	19,165	1.33	17,720	19,705	19,705	19,685	19,600
								1.6	2,13901	23,645	23,645	23,620	23,525
PCT27	3/16	66 5/8	19 1/2	23 1/2	12—5/8" MB	39,665	28,665	1.33	20,715	23,085	23,670	23,690	23,545
								1.6	24,855	27,705	28,400	28,430	2,8255
PCT38	3/16	71 5/8	19 1/2	23 1/2	12—5/8" MB	39,665	28,665	1.33	24,255	27,520	33,735	33,805	33,490
								1.6	29,105	33,020	40,485	40,570	40,190

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

¹The allowable load for a pair of PCT crosstie connectors must be the lower of the steel capacity or the bolt capacity. The tabulated loads are based on the lowest of the following criteria: 1/8-inch deflection static test on a steel jig, ultimate load from a static test on a steel jig divided by 3, or the fastener in wood value.

²Allowable loads have been increased by 33% or 60% for wind or earthquake loading. Increases are limited to a maximum of 33% under the UBC. No further increase is allowed.

³The PCT purlin crossties must be installed in pairs.

⁴Allowable loads for bolts assume a purlin with a minimum depth of 10 1/2 inches.

TABLE 2—HDC CONCENTRIC HOLDDOWNS^{1,2,3}

MODEL NO.	DIMENSIONS (inches)			ANCHOR BOLT DIAMETER (inch)	NUMBER OF SDS $1/4 \times 2 1/2$ SCREWS	ALLOWABLE LOAD (pounds)			
	Width, <i>W</i>	Height, <i>H</i>	Depth, <i>B</i>			TENSION		COMPRESSION	
						133%	160%	133%	160%
HDC5/22-SDS2.5	$3 \frac{1}{8}$	$9 \frac{3}{8}$	3	$\frac{5}{8}$	12	4,870	5,875	15,820	18,970
HDC5/4-SDS2.5	$3 \frac{9}{16}$	$9 \frac{1}{8}$	3	$\frac{5}{8}$	12	4,870	5,875	16,995	20,395
HDC10/22-SDS2.5	$3 \frac{1}{8}$	$14 \frac{3}{8}$	3	$\frac{7}{8}$	24	9,790	11,750	15,820	18,970
HDC10/4-SDS2.5	$3 \frac{9}{16}$	$14 \frac{1}{8}$	3	$\frac{7}{8}$	24	9,790	11,750	16,995	20,395

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

¹Allowable loads have been increased by 33% or 60% for wind or earthquake loading. Increases are limited to a maximum of 33% under the UBC. No further increase allowed.

²The anchor bolt and concrete foundation must be designed. The anchor bolt type, length and embedment must comply with code requirements.

³Loads are based on the lowest of the following criteria: $1/8$ -inch deflection static test on a steel jig, ultimate load from a static test on a steel jig divided by 3, or the fastener in wood value.

TABLE 3—HDQ8 HOLDOWN^{1,2,3,4}

MODEL NO.	DIMENSIONS					ANCHOR BOLT DIAMETER (inch)	NUMBER OF SDS $\frac{1}{4}$ x 3 SCREWS	ALLOWABLE LOAD (pounds)			
	Gage	Width (inches)	Height (inches)	Depth (inches)	CL (inches)			TENSION		COMPRESSION ^{5,6,7}	
								133%	160%	133%	160%
HDQ8-SDS3	7	$2\frac{7}{8}$	14	$2\frac{1}{2}$	$1\frac{1}{2}$	$\frac{7}{8}$	20	8,345	8,635	7,175	7,175

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

¹Allowable loads have been increased by 33% or 60% for wind or earthquake loading. No further increase is allowed.

²Allowable loads are for single HDQ8 Holdown installation. Allowable loads may be doubled for installations where HDQ8 Holdowns are installed on both sides of the post, provided the hold-downs are offset to eliminate screw interference.

³The anchor bolt and concrete foundation must be designed. The anchor bolt type, length and embedment must comply with code requirements.

⁴Loads are based on the lowest of the following criteria: $\frac{1}{8}$ -inch deflection static test on a wood jig, ultimate load from a static test on a wood jig divided by 3, or the fastener in wood value.

⁵Allowable compression forces are based on a maximum unbraced anchor bolt/rod length of 6 inches, measured from the concrete surface to the base plate of the HDQ8 Holdown device. Allowable compression rod capacity for lengths longer than 6 inches must be calculated.

⁶A nut must be installed on the anchor rod on both sides of the base plate of the hold-down for anchors in compression.

⁷ The tabulated allowable compression load does not consider the end bearing capacity of the wood member.