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DIVISION: 03—CONCRETE**Section: 03151—Concrete Anchoring****DIVISION: 04—MASONRY****Section: 04081—Masonry Anchorage****DIVISION: 05—METALS****Section: 05090—Metal Fastenings****DIVISION: 06—WOOD AND PLASTICS****Section: 06090—Wood and Plastic Fastenings****REPORT HOLDER:****SIMPSON STRONG-TIE COMPANY, INC.****5956 WEST LAS POSITAS BOULEVARD****PLEASANTON, CALIFORNIA 94588****(800) 999-5099**www.simpsonanchors.com**EVALUATION SUBJECT:****POWER-DRIVEN FASTENERS****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2006 *International Building Code*® (2006 IBC)
- 2003 *International Building Code*® (2003 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2003 *International Residential Code*® (2003 IRC)
- 1997 *Uniform Building Code*™ (UBC)

Property evaluated:

Structural

2.0 USES**2.1 General:**

The Simpson Strong-Tie Company power-driven fasteners are used to fasten building components, such as wood and steel, to normal-weight concrete, steel decks with structural lightweight concrete fill, steel, and hollow concrete masonry units (CMUs).

2.2 Headed Fasteners:

2.2.1 PDP Headed Fasteners: PDP headed fasteners are used to fasten building components to normal-weight concrete, steel, and hollow CMUs, including fastening of steel channels and angle clips to normal-weight concrete.

2.2.2 PDPH Headed Fasteners: PDPH headed fasteners are used to fasten building components to normal-weight concrete and steel.

2.2.3 PHN Headed Fasteners: PHN headed fasteners are used to fasten building components to normal-weight concrete and steel, including connecting of wood sill plates to concrete foundations, and fastening of steel channels and angle clips to normal-weight concrete.

2.3 Headed Fasteners with Washers:

PDPW, PDPWL, PDPWLS and PHNW headed fasteners with washers are used to fasten wood sill plates to normal-weight concrete.

2.4 Headed Tophat Fasteners:

PDPT and PHNT headed tophat fasteners are used to fasten building components to steel decks with structural lightweight concrete fill, and to steel members.

2.5 Threaded Stud Fasteners:

2.5.1 PSLV3 Threaded Stud Fasteners: PSLV3 threaded stud fasteners are used to fasten building components to normal-weight concrete, steel, and steel decks with structural lightweight concrete fill.

2.5.2 PSLV4 Threaded Stud Fasteners: PSLV4 threaded stud fasteners are used to fasten building components to steel, and steel decks with structural lightweight concrete fill.

2.6 Preassembled Ceiling Clips:

PCLDP and PECLDP preassembled ceiling clips are used to fasten building components to steel decks with structural lightweight concrete fill.

2.7 Threaded Rod Hangers:

PTRH3 and PTRH4 threaded rod hangers are used to fasten building components to normal-weight concrete and steel decks with structural lightweight concrete fill.

3.0 DESCRIPTION**3.1 Fasteners:**

3.1.1 General: The power-driven fasteners are installed with a low-velocity powder-actuated fastening tool recommended by Simpson Strong-Tie. The fasteners are manufactured from steel complying with ASTM A 510, Grades 1060 to 1065, and austempered to a Rockwell "C" core hardness of 51 to 56. Unless otherwise noted in this report, the fasteners have a mechanically plated zinc finish complying with ASTM B 695, Type I, Class 5. When installed with the powder-actuated fastening tool recommended by Simpson Strong-Tie, the fasteners pierce the material being fastened and embed into the supporting concrete, steel or CMU substrate. See Figure 1 for fastener details.

3.1.2 Headed Fasteners:

3.1.2.1 PDP Headed Fasteners: PDP headed fasteners have a 0.145-inch-diameter (3.68 mm) smooth or knurled shank and a 0.30-inch-diameter (7.4 mm) head. They are available in lengths from 1/2 inch (13 mm) to 3 inches (76 mm).

3.1.2.2 PDPH Headed Fasteners: PDPH headed fasteners have a 0.177-inch-diameter (4.50 mm) smooth or knurled shank and a 0.30-inch-diameter (7.4 mm) head, and are available in lengths from $\frac{1}{2}$ inch (13 mm) to 3 inches (76 mm).

3.1.2.3 PHN Headed Fasteners: PHN headed fasteners have a 0.145-inch-diameter (3.68 mm) smooth or knurled shank and an 8-millimeter-diameter (0.315 inch) head, and are available in lengths from $\frac{1}{2}$ inch (13 mm) to $2\frac{7}{8}$ inches (72 mm).

3.1.3 Headed Fasteners with Washers:

3.1.3.1 PDPW-300 Headed Fasteners with Washers: PDPW-300 headed fasteners with washers consist of 0.145-inch-diameter (3.68 mm), 3-inch-long (76 mm), smooth shank PDP fasteners described in Section 3.1.2.1 of this report, with $\frac{3}{4}$ -inch-diameter (19 mm), 0.070-inch-thick (1.78 mm) washers premounted near the pointed end. The washer is manufactured from steel complying with ASTM A 1011, CS Type A, and has an electroplated zinc finish complying with ASTM B 633, SC1, Type I.

3.1.3.2 PDPWL-300, PDPWL-300MG and PDPWLS-300MG Headed Fasteners with Washers: PDPWL-300 headed fasteners with washers consist of 0.145-inch-diameter (3.68 mm), minimum 3-inch-long (76 mm), smooth shank PDP fasteners described in Section 3.1.2.1 of this report, with 1-inch-diameter (25 mm), 0.070-inch-thick (1.78 mm) washers premounted near the pointed end. The washer is manufactured from steel complying with ASTM A 1011, CS Type A, and has an electroplated zinc finish complying with ASTM B 633, SC1, Type I. The PDPWL-300MG is identical to the PDPWL-300, except that the PDPWL-300MG fasteners and washers have a mechanically plated zinc finish complying with ASTM B 695, Type I, minimum Class 55. The PDPWLS-300MG is identical to the PDPWL-300, except that the PDPWLS-300MG has a 1-inch (25 mm) square washer premounted near the pointed end.

3.1.3.3 PHNW-72 Headed Fasteners with Washers: PHNW-72 headed fasteners with washers consist of 0.145-inch-diameter (3.68 mm), $2\frac{7}{8}$ -inch-long (73 mm), smooth shank PHN fasteners described in Section 3.1.2.3 of this report, with 1-inch-diameter (25 mm), 0.070-inch-thick (1.78 mm) washers premounted near the pointed end. The washer is manufactured from steel complying with ASTM A 1011, CS Type A, and has an electroplated zinc finish complying with ASTM B 633, SC1, Type I.

3.1.4 Headed Tophat Fasteners:

3.1.4.1 PDPT Headed Tophat Fasteners: The PDPT headed tophat fasteners consist of the PDP headed fasteners described in Section 3.1.2.1 of this report, and a “tophat” that is manufactured from steel complying with ASTM A 1011, CS Type A, with an electroplated zinc finish complying with ASTM B 633, SC1, Type I. The fasteners are available in lengths from $\frac{1}{2}$ inch (13 mm) to 1 inch (25 mm).

3.1.4.2 PHNT Headed Tophat Fasteners: The PHNT headed tophat fastener consists of a PHN headed fastener described in Section 3.1.2.3 of this report, and a “tophat” that is manufactured from steel complying with ASTM A 1011, CS Type A, with an electroplated zinc finish complying with ASTM B 633, SC1, Type I. The fasteners are available in lengths from $\frac{5}{8}$ inch (16 mm) to 1 inch (25 mm).

3.1.5 Threaded Stud Fasteners:

3.1.5.1 PSLV3 Threaded Stud Fasteners: PSLV3 threaded stud fasteners consist of a 0.205-inch-diameter (5.2 mm), smooth or knurled shank portion, and a $1\frac{1}{4}$ -inch-long (32 mm), 3/8-16 (9.5 mm - 6.30 threads/cm) threaded portion. The fasteners are supplied as PSLV3-12575K, with a $\frac{3}{4}$ -inch-long

(19 mm) knurled shank portion; as PSLV3-125100, with a 1-inch-long (25 mm) smooth shank portion; and as PSLV3-125125, with a $1\frac{1}{4}$ -inch-long (32 mm) smooth shank portion.

3.1.5.2 PSLV4 Threaded Stud Fasteners: PSLV4 threaded stud fasteners consist of a 0.150-inch-diameter (3.81 mm) smooth shank portion and a $\frac{1}{4}$ -20 (6.4 mm - 7.87 threads/cm) threaded portion. The fasteners are supplied with various combinations of smooth shank and threaded portion lengths, each from $\frac{1}{2}$ to $1\frac{1}{4}$ inches (13 and 32 mm).

3.1.6 Preassembled Ceiling Clips:

3.1.6.1 PCLDP Preassembled Ceiling Clips: PCLDP preassembled ceiling clips consist of a 0.145-inch-diameter (3.68 mm), smooth-shank, PDPT headed tophat fastener described in Section 3.1.4.1 of this report, and a 0.075-inch-thick (1.91 mm), 90-degree angle clip that is premounted near the pointed end. The clip is manufactured from steel complying with ASTM A 1011, CS Type A, with an electroplated zinc finish complying with ASTM B 633, SC1, Type I. The PCLDP preassembled ceiling clips are supplied as PCLDP-100, with a 1-inch-long (25 mm) fastener, and as PCLDP-125, with a $1\frac{1}{4}$ -inch-long (32 mm) fastener.

3.1.6.2 PECLDP-125 Preassembled Ceiling Clips: PECLDP-125 preassembled ceiling clips consist of a 0.145-inch-diameter (3.68 mm), $1\frac{1}{4}$ -inch-long (32 mm), smooth-shank, PDP headed fastener described in Section 3.1.2.1 of this report, and a 0.075-inch-thick (1.91 mm), 45-degree angle clip that is premounted near the pointed end. The clip is manufactured from steel complying with ASTM A 1011, CS Type A, with an electroplated zinc finish complying with ASTM B 633, SC1, Type I.

3.1.7 Threaded Rod Hangers:

3.1.7.1 PTRH3-HN32 Threaded Rod Hangers: PTRH3 threaded rod hangers consist of a 0.145-inch-diameter (3.68 mm), $1\frac{1}{4}$ -inch-long (32 mm), smooth-shank, PHN headed fastener described in Section 3.1.2.3 of this report, and a premounted, embossed, 0.075-inch-thick (1.91 mm) clip that has two bends, one having a 45-degree angle and the other having a 30-degree angle. The 90-degree angle portion of the clip has a $\frac{3}{8}$ -16 (9.5 mm - 6.30 threads/cm) threaded eyelet. The clip is manufactured from steel complying with ASTM A 1011, CS Type A, with an electroplated zinc finish complying with ASTM B 633, SC1, Type I.

3.1.7.2 PTRH4-HN32 Threaded Rod Hangers: PTRH4 threaded rod hangers consist of a 0.145-inch-diameter (3.68 mm), $1\frac{1}{4}$ -inch-long (32 mm), smooth-shank, PHN headed fastener described in Section 3.1.2.3 of this report, and a premounted, embossed, 0.075-inch-thick (1.91 mm) clip that has one bend having a 30-degree angle and another bend having a 90-degree angle. The 90-degree angle portion of the clip has a $\frac{1}{4}$ -20 (6.4 mm - 7.87 threads/cm) threaded portion threaded eyelet. The clip is manufactured from steel complying with ASTM A 1011, CS Type A, with an electroplated zinc finish complying with ASTM B 633, SC1, Type I.

3.2 Materials:

3.2.1 Normal-weight Concrete: Normal-weight concrete must be stone-aggregate and comply with Section 1905 of the 2006 IBC or 2003 IBC, Section R402.2 of the 2006 IRC or 2003 IRC, or UBC Section 1905, as applicable.

3.2.2 Structural Lightweight Concrete: Structural lightweight concrete must be sand-lightweight and must comply with Section 1905 of the 2006 IBC or 2003 IBC, Section R402.2 of the 2006 IRC or 2003 IRC, or UBC Section 1903, as applicable.

3.2.3 Concrete Masonry Units: The minimum allowable nominal size of the CMU must be 8 inches (203 mm) high by 8 inches (203 mm) wide by 16 inches (406 mm) long, and comply with ASTM C 90.

3.2.4 Steel: Structural steel substrates must comply with ASTM A 36 and must have a minimum yield strength of 36 ksi (248 MPa) and a thickness as noted in Table 2 of this report.

3.2.5 Steel Deck: Where fasteners are placed through a steel deck into structural sand-lightweight concrete in accordance with Table 5 and Figure 2 of this report, the steel deck must comply with the applicable reference standard, have a minimum yield strength of 38 ksi (262 MPa), have a minimum No. 20 gage thickness [0.0359 inch (0.091 mm) base-steel thickness] and have a depth of 3 inches (76 mm).

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Allowable shear and tension (pullout) values in the tables of this report are for use in allowable stress design, and are for fasteners driven into the materials specified in the tables. The stress increases and load reductions described in Section 1605.3 of the 2006 IBC or 2003 IBC, and the stress increases described in UBC Section 1612.3, are not allowed for wind loads acting alone or combined with vertical loads. No adjustments are allowed for vertical loads acting alone.

Seismic load resistance is outside the scope of this report, except for fasteners used under the 2006 IBC and 2006 IRC for attachment of architectural, electrical and mechanical components as described in the exceptions to Section 13.1.4 of ASCE/SEI 7-05, Minimum Design Loads for Buildings and Other Structures (American Society of Civil Engineers/Structural Engineering Institute).

Seismic load resistance is outside the scope of this report, except for fasteners used under the 2003 IBC and 2003 IRC for attachment of architectural, electrical and mechanical components as described in the exceptions to Section 9.6.1 of ASCE/SEI 7-02, Minimum Design Loads for Buildings and Other Structures (American Society of Civil Engineers/Structural Engineering Institute)

Allowable loads for fasteners subjected to combined shear and tension loads may be calculated by the following equation:

$$\left(\frac{P_s}{P_t} \right) + \left(\frac{V_s}{V_t} \right) \leq 1.0$$

where:

P_s = Applied service tension load, lbf (N).

P_t = Allowable service tension load, lbf (N).

V_s = Applied service shear load, lbf (N).

V_t = Allowable service shear load, lbf (N).

Members fastened to the substrates specified in this report must be designed in accordance with the applicable code and design criteria.

4.1.2 Wood-to-Concrete Connections: Lateral design values for Simpson fasteners must be based on lateral design values determined for headed, equal-or-lesser-diameter fasteners and headed, equal-or-lesser-diameter fasteners with washers used in wood-to-steel connections in accordance with Part 11 of the ANSI/AF&PA NDS-05 (2006 IBC), Part 11 of the ANSI/AF&PA NDS-01 (2003 IBC) or Part 12 of the ANSI/NFoPA NDS-91 (UBC), as applicable. The wood element must be the side member. The fastener bending yield

strength must be the value noted for nails in the NDS-05, NDS-01 or NDS-91, as applicable, based on fastener shank diameter.

4.1.3 Sill Plate to Foundation Connections:

4.1.3.1 General: The PDPWL-300MG and PDPWLS-300MG fasteners and washers described in Section 3.1.3.2 of this report may be used to attach wood sill plates to the concrete foundation under the following conditions:

1. No cold joint exists, between the slab and foundation, below the sill plate.
2. The sill plate is not installed on slabs supported by masonry foundation walls.

4.1.3.2 Design: Table 4 of this report specifies the allowable fastener spacings for attachment of wood sill plates to concrete in structures located in areas classified as Seismic Design Category A or B (2006 or 2003 IBC or 2006 or 2003 IRC), or Seismic Zones 0, 1, 2 and 3 (UBC), and in areas assigned basic wind speeds up to 100 mph (161 km/h) (3-second-gust wind speed) or 85 mph (137 km/h) (fastest mile wind speed). For sill plate connections in 105 mph (169 km/h) (3-second-gust wind speed) or 90 mph (145 km/h) (fastest mile wind speed) areas, an engineered design using allowable loads described in Table 1 of this report must be provided to the code official for approval.

4.2 Installation:

The installation of fasteners requires a powder-actuated fastening tool, recommended by Simpson Strong-Tie, used in accordance with the manufacturer's published installation instructions. Installation is limited to dry, interior environments. The fastener size, minimum penetration, minimum spacing, and edge distances must comply with Tables 1 through 7 of this report, as applicable. For fasteners installed into concrete, the fasteners must not be driven until the concrete has reached the designated compressive strength. Unless otherwise noted, the concrete must have a thickness of at least three times the fastener penetration.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie power-driven fasteners 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** Fasteners must be installed in accordance with this report and Simpson Strong-Tie published installation instructions. In the event of a conflict between this report and the Simpson Strong-Tie published installation instructions, this report governs.
- 5.2** Fasteners must not be used in preservative-treated wood or fire-retardant-treated wood, except when the PDPWL-300MG and PDPWLS-300MG fasteners and washers, described in Section 3.1.3.2 of this report, are used to attach preservative-treated wood to concrete. Preservative-treated wood must be as described in IBC Section 2303.1.8.
- 5.3** Installation is limited to dry, interior environments.
- 5.4** Earthquake load resistance is outside the scope of this report, except as permitted in Sections 4.1.1 and 4.1.3.2.
- 5.5** Allowable loads must comply with Section 4.1. Calculations demonstrating that the applied loads are less than the maximum allowable loads described in 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.

- 5.6** For fasteners installed into concrete, the minimum concrete thickness must be three times the fastener embedment in concrete, except where noted otherwise in this report.
- 5.7** Use in concrete is limited to uncracked concrete. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements (AC70), dated October 2006.

7.0 IDENTIFICATION

Containers of the fasteners are labeled with the Simpson Strong-Tie Company, Inc., name and address; the fastener product size and type; the evaluation report number (ESR-2138); and the manufacturing date and lot number. In addition, the fastener heads are identified with the following marking:



TABLE 1—ALLOWABLE LOADS IN NORMAL-WEIGHT CONCRETE (lbf)^{1,2,3,4}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM PENETRATION (inches)	MINIMUM EDGE DISTANCE (inches)	MINIMUM SPACING (inches)	CONCRETE COMPRESSIVE STRENGTH							
					2,000 psi		3,000 psi		4,000 psi		6,000 psi	
					Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
PDP-XX ⁶	0.145	1	3	4	45	120	100	165	150	205	150	205
		1 ¹ / ₄	3	4	140	265	255	265	370	265	370	265
PHN-XX ⁵	0.145	1	3	4	45	120	100	165	150	205	150	205
		1 ¹ / ₄	3	4	140	265	255	265	370	265	370	265
PDPH-XX ⁶	0.177	³ / ₄	3.5	5	30	50	30	80	30	110	115	195
		1 ¹ / ₄	3.5	5	130	265	195	240	260	220	190	105

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength, or the minimum compressive strength specified in the applicable code, whichever is greater. Concrete aggregate must comply with ASTM C 33. Minimum concrete thickness must be three times the fastener embedment into the concrete.

²The allowable shear and tension values are only for the fasteners in the concrete. Members connected to the concrete must be investigated in accordance with accepted design criteria.

³The stress increases and load reductions described in 2006 or 2003 IBC Section 1605.3, and the stress increases described in UBC Section 1612.3, are not allowed for wind loads acting alone or when combined with vertical loads. No adjustment is allowed for vertical loads acting alone.

⁴Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1 and 4.1.3.2 of this report.

⁵The XX designation in the model number is replaced with the length of the fastener expressed in millimeters. The fastener must be long enough to provide for the minimum penetration.

⁶The XX designation in the model number is replaced with the length of the fastener expressed in inches. The fastener must be long enough to provide for the minimum penetration.

TABLE 2—ALLOWABLE LOADS IN STEEL (lbf)^{1,2,3,4,5}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EDGE DISTANCE (inch)	MINIMUM SPACING (inches)	STEEL THICKNESS (inches)			
				³ / ₁₆		¹ / ₄	
				Tension	Shear	Tension	Shear
FASTENERS							
PDP - XX ⁷	0.145	0.5	1.0	155	395	—	—
PHN - XX ⁶	0.145	0.5	1.0	155	395	—	—
PDPT - XX ⁷	0.145	0.5	1.0	290	660	340	700
PHNT - XX ⁶	0.145	0.5	1.0	50	620	250	620
PDPH - XX ⁷	0.177	0.5	1.0	340	790	520	870
THREADED STUDS ⁸							
PSLV3-XXYY ⁹	0.205	1.0	1.5	270	770	680	1120
PSLV3 -12575 K ¹⁰	0.205	1.0	1.5	270	930	870	1130
PSLV4 - XXYY ⁹	0.150	0.5	1.0	200	630	420	690

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

¹The entire pointed portion of the fastener must penetrate through the steel to obtain the tabulated values.

²The allowable tension and shear values are for the fastener only. Members connected to the steel must be investigated separately in accordance with accepted design criteria.

³Steel must conform to ASTM A 36 specifications, with $F_y = 36,000$ psi, minimum.

⁴The stress increases and load reductions described in 2006 or 2003 IBC Section 1605.3, and the stress increases described in UBC Section 1612.3, are not allowed for wind loads acting alone or combined with other loads. No adjustment is allowed for vertical loads acting alone.

⁵Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1 and 4.1.3.2 of this report.

⁶The XX designation in the model number is replaced with the length of the fastener expressed in millimeters. The fastener must be long enough to provide for the minimum penetration.

⁷The XX designation in the model number is replaced with the length of the fastener expressed in inches. The fastener must be long enough to provide for the minimum penetration.

⁸The shank diameters are of the smooth or knurled shank portion of the threaded fastener.

⁹The XX and YY designations in the model number are replaced with the lengths, expressed in inches, of the threaded shank and smooth shank portions, respectively. The smooth shank portion must be long enough to provide for the minimum penetration.

¹⁰The K designation in the model number denotes a knurled shank.

TABLE 3—ALLOWABLE LOADS WHEN ATTACHING STEEL ANGLES AND CHANNELS TO NORMAL-WEIGHT CONCRETE (lbf)^{1,2,3}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	PENETRATION (inches)	ATTACHED ITEM	CONCRETE COMPRESSIVE STRENGTH (psi)	TYPE OF LOAD	ALLOWABLE LOAD (pounds)
PDP-125	0.145	1 ¹ / ₈	Angle clip ⁴	2,000	Tension	25
PHN-32	0.145	1 ¹ / ₈	Angle clip ⁴	2,000	Tension	25
PDP-150	0.145	1 ¹ / ₄	Angle clip ⁴	2,000	Tension	85
PHN-32	0.145	1 ¹ / ₄	Angle clip ⁴	2,000	Tension	85
PDP-100	0.145	7 ⁷ / ₈	No. 20 gage ⁵ steel channel	2,000	Shear	160
PHN-22	0.145	7 ⁷ / ₈	No. 20 gage ⁵ steel channel	2,000	Shear	160
PDP-100	0.145	7 ⁷ / ₈	No. 18 gage ⁵ steel channel	2,000	Shear	135
PHN-22	0.145	7 ⁷ / ₈	No. 18 gage ⁵ steel channel	2,000	Shear	135

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength, or the minimum compressive strength specified in the applicable code, whichever is greater. Concrete aggregate must comply with ASTM C 33. Minimum concrete thickness must be three times the fastener embedment into the concrete.

²The stress increases and load reductions described in 2006 or 2003 IBC Section 1605.3, and the stress increases described in UBC Section 1612.3, are not allowed for wind loads acting alone or combined with other loads. No adjustment is allowed for vertical loads acting alone.

³Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1 and 4.1.3.2 of this report.

⁴The angle clip is formed from steel having a minimum base metal thickness of 0.080 inch.

⁵The Nos. 18 and 20 gage steel channels must have minimum base-metal thicknesses of 0.0478 and 0.0377 inch, respectively, and must be formed from steel having a minimum specified yield stress of 33 ksi.

TABLE 4—ALLOWABLE FASTENER SPACING FOR ATTACHMENT OF WOOD PLATE TO CONCRETE FOOTING OR SLAB^{1,2,3,4,5}

FASTENER MODEL NUMBER ^a	OVERALL LENGTH (inches)	HEAD DIAMETER (inch)	SHANK DIAMETER (inch)	MAXIMUM SPACING (feet)		
				Interior Shear Walls ⁶	Interior Nonshear Walls ⁷	Exterior Shear Walls ⁶
PHN-72 or PHNW-72	2 ⁷ / ₈	0.315	0.145	1.5	3.0	1.5
PDPW-300, PDPWL-300, PDPWL-300MG or PDPWLS-300MG ^{9,10}	3	0.300	0.145	1.0	2.0	1.0

For **SI**: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psi = 6.89 kPa, 1 plf = 0.0146 N/m.

¹Spacings are based upon the attachment through the center of nominally 2-inch-thick wood sill plates, with specific gravity of 0.50 or greater, to concrete floor slabs or footings in accordance with 2006 or 2003 IBC Section 2308.6, 2006 or 2003 IRC Section R403.1.6 (for maximum two-story buildings), or UBC Sections 1806.6 and 2320.6 (for maximum two-story buildings), as applicable. For other species of lumber, the required spacings of fasteners require special calculations complying with 2006 or 2003 IBC Section 2306 and UBC Chapter 23, as applicable.

²Fasteners must not be driven until the concrete has reached a minimum concrete compressive strength of 2,000 psi, or the minimum compressive strength specified in the applicable code, whichever is greater. Minimum edge distance is 1³/₄ inches.

³Wall panels must be braced in accordance with 2006 or 2003 IBC Section 2308.9.3, 2006 or 2003 IRC Section R602.10, or UBC Section 2320.11.3, as applicable. Interior and nonbearing wall panels are not assumed to be braced.

⁴Fasteners must not be used to attach shear walls having a unit shear exceeding 100 pounds per foot to the other building elements.

⁵See Section 4.1.3 of this report for additional design and installation requirements.

⁶Walls must have two fasteners placed 6 inches and 10 inches, respectively, from each end of sill plates, with maximum spacing as noted in this table.

⁷Walls must have fasteners placed at 6 inches from ends of sill plates, with maximum spacing as noted in this table.

⁸All fasteners must be installed with minimum ³/₄-inch-diameter, No. 16 gage (0.06-inch-thick) steel washers.

⁹Fasteners indicated must have four fasteners placed at each end of sill plates with a length greater than 30 inches. The fasteners must be placed 3, 6, 9 and 12 inches, respectively, from the interior face of the end of studs. The spacing may be adjusted to avoid interference with intervening studs.

¹⁰Only the PDPWL-300MG or PDPWLS-300MG fasteners and washers shall be used to attach preservative-treated wood to concrete. Preservative-treated wood must be as described in IBC Section 2303.1.8.

TABLE 5—ALLOWABLE LOADS IN MINIMUM 3,000 psi STRUCTURAL LIGHTWEIGHT CONCRETE FILLED STEEL DECK ^{1,2,3,4,5}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inches)	INSTALLED DIRECTLY INTO CONCRETE		INSTALLED THROUGH LOWER FLUTE OF STEEL DECK INTO CONCRETE		
			Tension (lbf)	Shear (lbf)	Tension (lbf)	Shear (lbf)	Oblique (lbf)
PDPT-XX ⁶	0.145	$\frac{7}{8}$	85	250	40	275	—
PHNT-XX ⁷	0.145	$\frac{7}{8}$	185	275	165	400	—
PTRH3 - HN32	0.145	1	—	—	140	—	—
PTRH4 - HN32	0.145	1	—	—	140	—	—
PCLDP -100; PCLDP-125	0.145	$\frac{7}{8}$	—	—	55	—	85
PCLDP -125	0.145	1	—	—	55	—	85
PECLDP -125	0.145	1	—	—	55	—	85
PSLV4 - XXYY ⁸	0.150	1	—	—	80	—	—
PSLV3 -125125	0.205	$1\frac{1}{4}$	—	—	225	—	—

For **SI**: 1 lbf = 4.448 N, 1 inch = 25.4 mm, 1 psi = 6.89 kPa.

¹The tabulated allowable load values are for the fasteners only. Members connected to the concrete receiving elements must be designed in accordance with the applicable code and accepted design criteria.

²The steel deck must be 3 inches deep, and have a minimum thicknesses of 20 gage (0.0359-inch-thick base-steel thickness) and a minimum yield strength of 38,000 psi.

³The fasteners must be installed through the steel deck and into the concrete at the upper or lower flute as designated in the table. The fastener must be a minimum of $1\frac{1}{8}$ inches from the edge of the deck web and 4 inches from the end of the deck. The minimum fastener spacing is 4 inches.

⁴Structural sand-lightweight concrete fill above top of steel deck profiles must be a minimum of $3\frac{1}{4}$ inches thick. Figure 2 shows nominal flute dimensions, fastener locations, and load orientations for both floor deck profiles.

⁵The stress increases and load reductions described in 2006 or 2003 IBC Section 1605.3, and the stress increases described in UBC Section 1612.3, are not allowed for wind loads acting alone or combined with other loads. No adjustment is allowed for vertical loads acting alone.

⁶The XX designation in the model number is replaced with the length of the fastener expressed in inches. The fastener must be long enough to provide for the minimum embedment.

⁷The XX designation in the model number is replaced with the length of the fastener expressed in millimeters. The fastener must be long enough to provide for the minimum embedment.

⁸The XX and YY designations in the model number are replaced with the lengths, expressed in inches, of the threaded shank and smooth shank portions, respectively. The smooth shank portion must be long enough to provide for the minimum embedment.

TABLE 6—ALLOWABLE LOADS IN HOLLOW CONCRETE MASONRY UNITS (CMUs) ^{1,2,3,4,5}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM CMU FACE SHELL THICKNESS (inches)	HOLLOW CMU	
			Face Shell	
			Tension (lbf)	Shear (lbf)
PDP - XX ⁶	0.145	$1\frac{1}{4}$	110	200

For **SI**: 1 lbf = 4.448 N, 1 inch = 25.4 mm.

¹The tabulated allowable load values are for the fasteners only. Members connected to the CMU receiving elements shall be designed in accordance with the applicable code and accepted design criteria.

²The tabulated allowable load values are for fasteners installed in hollow CMUs conforming to ASTM C 90. The minimum allowable nominal size of the CMU must be 8 inches high by 8 inches wide by 16 inches long, with a minimum, $1\frac{1}{4}$ -inch-thick face shell thickness.

³The tabulated allowable load values are for fasteners installed in the center of a hollow CMU face shell. Allowable loads for fasteners installed in mortar head and bed joints, or into the web of the CMU, are outside the scope of this report.

⁴The entire pointed portion of the fastener must penetrate through the thickness of the face shell to obtain the tabulated values.

⁵No more than one fastener may be installed in an individual hollow CMU cell.

⁶The XX designation in the model number is replaced with the length of the fastener expressed in inches. The fastener must be long enough to provide for the minimum penetration.

TABLE 7—ALLOWABLE LOADS IN MINIMUM 2500 psi NORMAL-WEIGHT CONCRETE (pounds) ^{1,2,3}

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM PENETRATION (inches)	MINIMUM EDGE DISTANCE (inches)	MINIMUM SPACING (inches)	ALLOWABLE TENSION LOAD (pounds)
PTRH3 - HN32	0.145	1	3.0	4.0	155
PTRH4 - HN32	0.145	1	3.0	4.0	150
PSLV3 -125125	0.205	$1\frac{1}{4}$	4.0	6.0	260

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

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength, or the minimum compressive strength specified in the applicable code, whichever is greater. Concrete aggregate must comply with ASTM C 33. Minimum concrete thickness must be three times the fastener embedment into the concrete.

²The stress increases and load reductions described in 2006 or 2003 IBC Section 1605.3, and the stress increases described in UBC Section 1612.3, are not allowed for wind loads acting alone or combined with other loads. No adjustment is allowed for vertical loads acting alone.

³Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1 and 4.1.3.2 of this report.

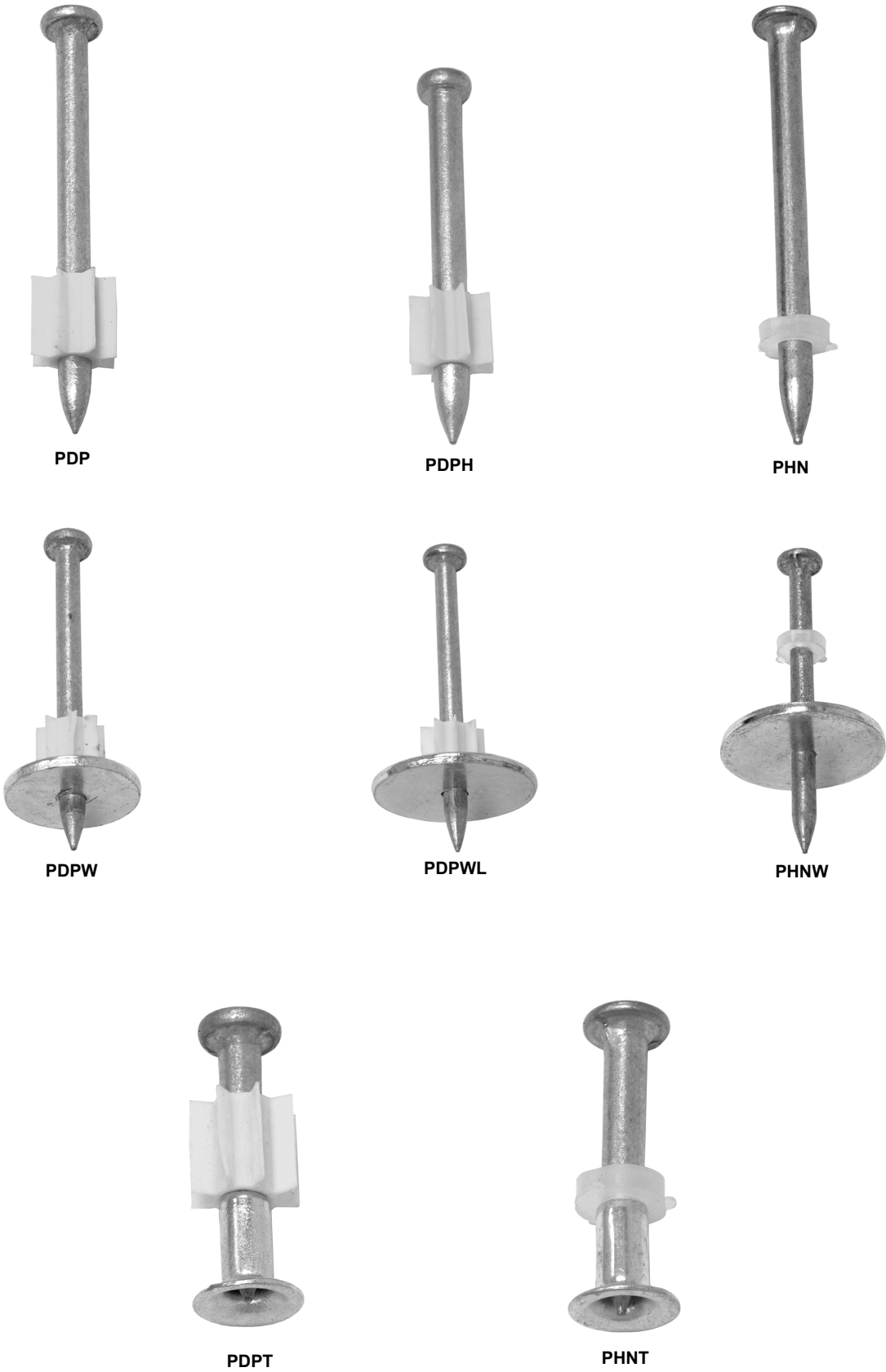


FIGURE 1—FASTENERS

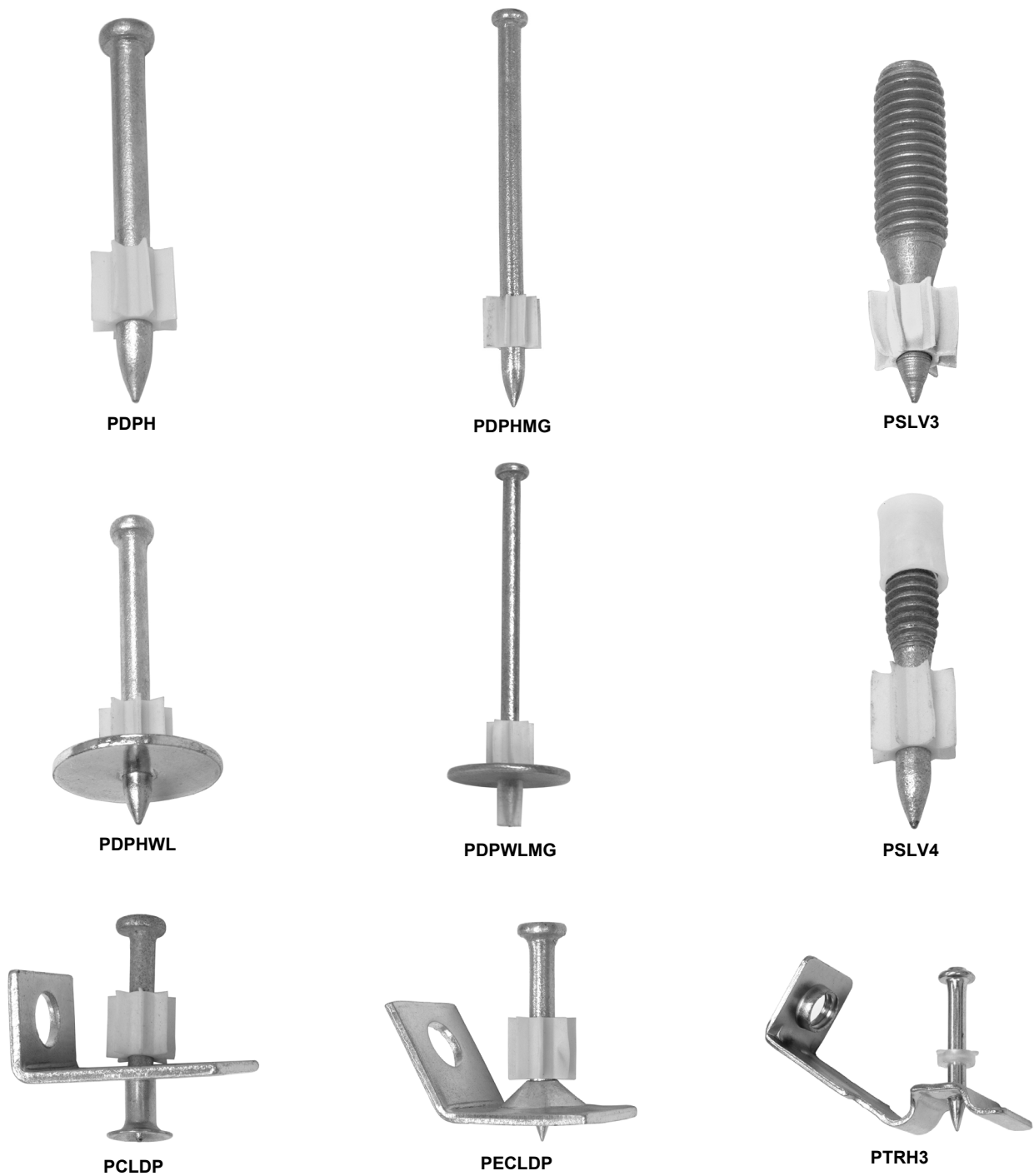


FIGURE 1—FASTENERS (Continued)

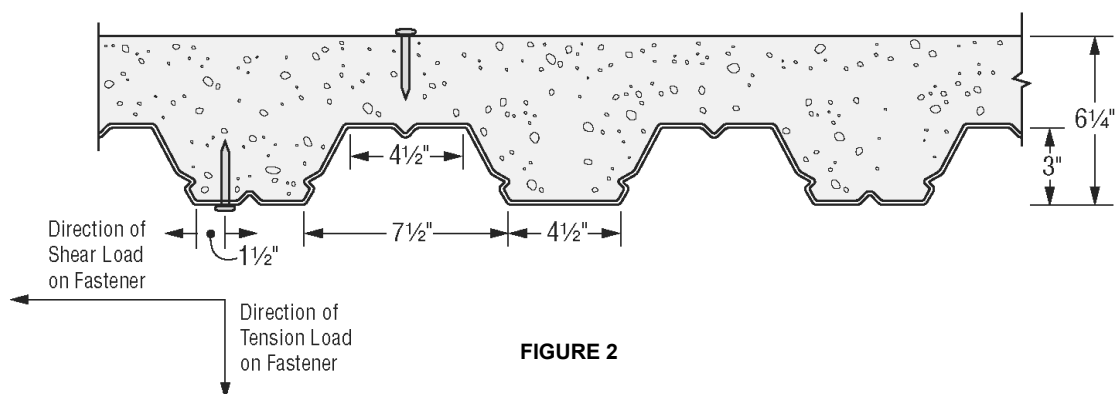


FIGURE 2