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DIVISION: 03 00 00—CONCRETE
SECTION: 03 16 00—CONCRETE ANCHORS
DIVISION: 04 00 00—MASONRY
SECTION: 04 05 19.16—MASONRY ANCHORS
DIVISION: 05 00 00—METALS
SECTION: 05 05 23—METAL FASTENINGS
DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
SECTION: 06 05 23—WOOD, PLASTIC, AND COMPOSITE FASTENINGS

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

5956 W LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® POWDER-ACTUATED FASTENERS, THREADED STUDS AND ASSEMBLIES

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DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Fastenings

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

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(925) 560-9000
www.strongtie.com

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® POWDER-ACTUATED FASTENERS, THREADED STUDS AND ASSEMBLIES

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Structural

2.0 USES

The Simpson Strong-Tie® Powder-Actuated Fasteners and Threaded Studs are used to fasten building components, such as wood and steel, to base materials of normal-weight concrete, sand-lightweight concrete, steel deck filled with sand-lightweight concrete, structural steel, and hollow concrete masonry units (CMUs). The fasteners are alternatives to the cast-in-place anchors described in 2015 IBC Section 1901.3 (2012 IBC Section 1908; 2009 and 2006 IBC Section 1911); the embedded anchors described in Section 8.1.3 of TMS 402-13, referenced in Section 2107 of the 2015 IBC (Section 2.1.4 of TMS 402-11, -08 and -05, referenced in Section 2107 of the 2012, 2009 and 2006 IBC, respectively) for placement in masonry; and the welds and bolts used to attach materials to structural steel, described in IBC Sections 2204.1 and 2204.2, respectively.

The Simpson Strong-Tie Ceiling Clip Assemblies are used to attach steel wire to concrete and concrete-filled steel deck panels; the Simpson Strong-Tie Threaded Rod Hanger Assemblies are used to attach threaded steel rod to concrete and concrete-filled steel deck panels.

For structures regulated under the IRC, the fasteners and assemblies may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Powder-Actuated Fasteners and Threaded Studs:

3.1.1 Materials: The fasteners and threaded studs are power-actuated fasteners (PAFs) manufactured from steel complying with ASTM A510, Grades 1060 to 1065 or 10B60 to 10B65 and austempered to a Rockwell "C" core hardness of 51 to 56, except for PDPA headed fasteners, which are manufactured from steel complying with ASTM A510, Grade 1060, and austempered to a Rockwell "C" core hardness of 53 to 56.

3.1.2 Finish: Unless otherwise noted in Table 1 of this report, the fasteners have a mechanically plated zinc finish complying with ASTM B695, Class 5, Type I.

3.1.3 Shank Type and Dimensions: The fasteners have straight shanks which are either smooth or knurled. See Table 1 for shank type and fastener dimensions. Maximum point length is the maximum specified length from the tip of the fastener to the location where the diameter of the shank becomes constant. Minimum effective shank length is the minimum specified length from the underside of the fastener head to the tip of the fastener, except for fasteners with premounted washers, where the minimum effective shank length is the minimum specified length from the underside of the washer, in its installed condition, to the tip of the fastener.

3.2 Powder-Actuated Assemblies:

Ceiling clip assemblies consist of a powder-actuated fastener and a steel angle (clip) which is premounted on the fastener at the manufacturing facility. The clip has a hole in the outstanding leg for attachment of ceiling wire.

Threaded rod hanger assemblies consist of a powder-actuated fastener and a steel bracket which is premounted

on the fastener at the manufacturing facility. The bracket has a threaded hole in the outstanding leg for attachment of threaded rod.

See Table 1 for additional descriptions of the assemblies.

3.3 Substrate Materials:

3.3.1 Concrete: Normal weight and sand-lightweight concrete must comply with Chapter 19 of the IBC or Section R402.2 of the IRC, as applicable. The minimum concrete compressive strength at the time of fastener installation must be as noted in the applicable allowable load table.

3.3.2 Concrete Masonry Units: Concrete masonry units (CMUs) must be minimum 8-inch-thick (203 mm) lightweight blocks complying with ASTM C90.

3.3.3 Structural Steel: Structural steel substrates must comply with the minimum requirements of ASTM A36, ASTM A572, Grade 50, or ASTM A992, and have a thickness as noted in Table 3 .

3.3.4 Steel Deck: Steel deck panels must conform to ASTM A653 SS Grade 33 (minimum) with a minimum yield strength of 38,000 psi and a minimum tensile strength of 45,000 psi. Steel deck configurations must be as described in Table 7 and Figures 7, 8 and 9.

3.3.5 Sill Plates: Sill plates must be nominal 2-inch-thick naturally durable wood complying with the definition in 2015 and 2012 IBC Section 202 (2009 and 2006 IBC Section 2302) or IRC Section R202, as applicable, or wood that has been preservative-treated in accordance with 2015 IBC Section 2303.1.9 (2012, 2009 and 2006 IBC Section 2303.1.8) or 2015, 2012 and 2009 IRC Section R317.1 (2006 IRC Section R319.1), as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Selection of fasteners must take into consideration the applicable base material and the length of the fastener. The minimum fastener length must be determined as follows:

- For installation into concrete, concrete-filled steel deck panels, and steel base materials, the minimum effective shank length shown in Table 1 must equal or exceed the sum of the thickness of the attached material and the minimum embedment depth (penetration) shown in applicable the tables in this report.
- For installation through steel or CMU base materials, the minimum effective shank length shown in Table 1 must equal or exceed the sum of the following: the thickness of the attached material, the thickness of the base material and the required point penetration shown in the applicable tables in this report.

4.1.2 Allowable Loads: The applicable allowable load tables for Simpson Strong-Tie® Powder-Actuated Fasteners and assemblies driven into different base materials may be determined by referencing Table 1.

The most critical applied loads, excluding seismic load effects, resulting from the load combinations in IBC Section 1605.3.1 or 1605.3.2 must not exceed the allowable loads. For fasteners which are subjected to seismic loads, see Section 4.1.6 for additional information. The stress increases and load reductions described in IBC Section 1605.3 are not allowed.

Allowable shear loads, tension (pullout) loads and oblique loads (applied at a 45-degree angle with respect to the fastener axis) listed in this report apply only to the connection of the fasteners to the base materials and to the connection of premounted accessories to the fastener. Other limit states applicable to the design of a connection, such as fastener pull-through (pull-over) and lateral bearing on the attached material, which are governed by the properties of the attached material, are outside the scope of this report. Design of the connection to the attached material must comply with the applicable requirements of the IBC. When designing the connection of wood members to the base material, the bending yield strength of the PAFs can be assumed to be the same as that of a nail with the same shank diameter.

4.1.3 Combined Loading: For fasteners subjected to both tension and shear loads, compliance with the following interaction equation must be verified:

$$(p/P_a) + (v/V_a) \leq 1.0$$

Where:

p = Actual applied tension load on fastener, lbf (N).

P_a = Allowable tension load on fastener, lbf (N).

v = Actual applied shear load on fastener, lbf (N).

V_a = Allowable shear load on fastener, lbf (N).

4.1.4 Sill Plate Connections:

The fasteners listed in Table 5 may be used to attach wood sill plates to concrete for structural walls in areas classified as Seismic Design Category A or B. Table 5 specifies the allowable fastener shear and tension loads for attachment of wood sill plates to concrete. Bearing area and thickness of the washers, are also given in Table 5. For shear loads, spacing of fasteners must be determined considering the lesser of allowable shear load from Table 5 and allowable load on the wood sill plate, determined in accordance with the NDS, with a fastener bending yield strength, F_{yb} = 90,000 psi (621 MPa) and a concrete dowel bearing strength, F_e = 7,500 psi (52 MPa). For tension loads, spacing of fasteners must be determined considering the lesser of allowable tension load from Table 5 and pull through capacity of the wood sill plate, based on Section 3.10 of the NDS, using the washer bearing area from Table 5.

The fasteners listed in Table 6 may be used to attach wood sill plates to concrete for interior, nonstructural walls [maximum horizontal transverse load on the wall must not exceed 5 psf (0.24 kN/m^2)] in Seismic Design Categories A through F, when installed as described in Table 6.

4.1.5 Steel-to-steel Connections: When the Simpson Strong-Tie® fasteners listed in Table 3 are used in connections of two steel elements in accordance with Section E5 of AISI S100-12, connection capacity must be determined in accordance with Sections 4.1.5.1 and 4.1.5.2, as applicable.

4.1.5.1 Connection Strength - Tension: To determine tensile connection strength in accordance with Section E5.2 of AISI S100-12, the fastener tension strength, pull-out strength and pull-over strength must be known. These characteristics must be determined as follows:

- **PAF Tensile Strength:** The available tension strengths must be calculated in accordance with Section E5.2.1 of AISI S100-12 using a value of 260,000 psi for F_{uh}.
- **Pull-out Strength:** See Table 3 for available pull-out strength.
- **Pull-over Strength:** The available pull-over strengths must be calculated in accordance with Section E5.2.3 of AISI S100-12.

4.1.5.2 Connection Strength - Shear: To determine shear connection strength in accordance with Section E5.3 of AISI S100-12, the fastener shear strength, bearing and tilting strength, pull-out strength in shear, net section rupture strength and shear strength limited by edge distance must be known. These characteristics must be determined as follows:

- **PAF Shear Strength:** The available shear strengths must be calculated in accordance with Section E5.3.1 of AISI S100-12 using a value of 260,000 psi for F_{uh}.
- **Bearing and Tilting Strength:** The available bearing and tilting strengths must be calculated in accordance with Section E5.3.2 of AISI S100-12.
- **Pull-out Strength in Shear:** The available pull-out strength in shear must be the applicable allowable shear strength from Table 3, or must be calculated in accordance with Section E5.3.3 of AISI S100-12.
- **Net Section Rupture Strength and Shear Strength Limited by Edge Distance:** The net section rupture strength must be determined in accordance with Section E5.3.4 of AISI S100-12 and the shear strength limited by edge distance must be determined in accordance with Section E5.3.5 of AISI S100-12.

4.1.6 Seismic Considerations: The Simpson Strong-Tie fasteners and assemblies are recognized for use when subjected to seismic loads as follows:

1. The fasteners and assemblies may be used for attachment of nonstructural components listed in Section 13.1.4 of ASCE 7, which are exempt from the requirements of ASCE 7.
2. Concrete base materials: The fasteners and assemblies installed in concrete may be used to support acoustical tile or lay-in panel suspended ceiling systems, distributed systems and distribution systems where the service load on any individual fastener does not exceed the lesser of 90 lbf (400 N) or the published allowable load in Tables 2, 4 and 7, as applicable.
3. Steel base materials: The fasteners and assemblies installed in steel may be used where the service load on any individual fastener does not exceed the lesser of 250 lbf (1112 N) or the published allowable load shown in Table 3.
4. The fasteners listed in Table 5 may be used to attach wood sills to concrete, subject to the limitations described in Section 4.1.4.
5. For interior, nonstructural walls that are not subject to sustained tension loads and are not a bracing application, the fasteners may be used to attach steel track to concrete or steel in all Seismic Design Categories. In Seismic Design Categories D, E, and F, the allowable shear load due to transverse pressure must be no more than 90 pounds (400 N) when attaching to concrete; or 250 pounds (1,112 N) when attaching to steel. Substantiating calculations must be submitted addressing the fastener-to-base-material capacity and the fastener-to-attached-material capacity. Interior nonstructural walls are limited to locations where bearing walls, shear walls or braced walls are not required by the approved plans. The design load on the fastener must not exceed the allowable load established in this report for the concrete or steel base material.

4.2 Installation:

The installation of fasteners and assemblies requires a powder-actuated fastening tool, in accordance with the Simpson Strong-Tie recommendations. The fasteners must be installed in accordance with Simpson Strong-Tie published installation instructions. A copy of these instructions must be available on the jobsite at all times during fastener installation.

The fastener size, minimum embedment depth or penetration, minimum spacing, and edge distances must comply with Tables 2 through 8, as applicable. For fasteners installed into concrete, the fasteners must not be driven until the concrete has reached the designated compressive strength.

5.0 CONDITIONS OF USE

The Simpson Strong-Tie® Powder-Actuated Fasteners, Threaded Studs and Assemblies 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 fasteners and assemblies must be manufactured and identified in accordance with this report.

5.2 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, the more restrictive requirements govern.

5.3 Fasteners must not be used in preservative-treated wood or fire-retardant-treated wood, except for the mechanically galvanized fasteners (with MG in the designation), which may be used to attach preservative-treated wood to concrete.

5.4 Installation is limited to dry, interior environments, which include exterior walls which are protected by an exterior wall envelope.

5.5 See Section 4.1.6 for seismic considerations.

5.6 Calculations demonstrating that the applied loads are less than the 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.

5.7 For steel-to-steel connections that meet the applicability requirements of Section E5 of AISI S100-12, calculations demonstrating that the available connection strength has been determined in accordance with Section E5 of AISI S100-12 and Section 4.1.5 of this report, and equals to or exceeds the applied load, 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.

5.8 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.

5.9 Use of fasteners in concrete or masonry is limited to installation in uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.10 The Simpson Strong-Tie products addressed in this report are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements (AC70), dated February 2016.

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 one of the following markings:

TABLE 1—SIMPSON STRONG-TIE® POWDER-ACTUATED FASTENERS AND ASSEMBLIES

FASTENERS (see Figure 1)								
FASTENER MODEL NUMBER[1]	**SHANK TYPE**	**SHANK DIAMETER (inch)**	**NOMINAL HEAD DIAMETER (inch, u.o.n.)[2]**	**MAXIMUM POINT LENGTH (inch)**	**MINIMUM EFFECTIVE SHANK LENGTH (inch)**	**FASTENER GALVANIZATION**	**APPLICABLE BASE MATERIAL**	**APPLICABLE LOAD TABLES**
PDP-XX(X)	Smooth	0.145	0.300	0.354	XX(X)/100 - 0.04	ASTM B695 Class 5, Type 1	Concrete Steel Conc.-filled deck Masonry	2, 3, 4, 7, 8
PDP-XXK	Knurled	0.145	0.300	0.354	XX/100 - 0.04	ASTM B695 Class 5, Type 1	Steel	3
PDP-XXXMG	Smooth	0.145	0.300	0.354	XXX/100 - 0.04	ASTM B695 Class 65, Type 1	Concrete Steel Conc.-filled deck Masonry	2, 3, 7, 8
PDPA-XX(X)	Smooth	0.157	0.300	0.354	XX(X)/100 - 0.04	ASTM B695 Class 5, Type 1	Concrete Steel Conc.-filled deck Masonry	2, 3, 7, 8
PDPA-XXK	Knurled	0.157	0.300	0.354	XX/100 - 0.04	ASTM B695 Class 5, Type 1	Steel	3
PDPA-XXXMG	Smooth	0.157	0.300	0.354	XXX/100 - 0.04	ASTM B695 Class 65, Type 1	Concrete Steel Conc.-filled deck Masonry	2, 3, 7, 8
PDPH-XX(X)	Smooth	0.177	0.300	0.354	XX(X)/100 - 0.04	ASTM B695 Class 5, Type 1	Concrete Steel	2, 3
PDPH-XXK	Knurled	0.177	0.300	0.354	XX/100 - 0.04	ASTM B695 Class 5, Type 1	Steel	3
PHN-YY	Smooth	0.145	8 mm	0.354	YY/25.4 - 0.04	ASTM B695 Class 5, Type 1	Concrete Steel Conc.-filled deck	2, 3, 4, 7
PHN-YYK	Knurled	0.145	8 mm	0.354	YY/25.4 - 0.04	ASTM B695 Class 5, Type 1	Steel	3

FASTENERS WITH PREMOUNTED FLAT WASHERS (see Figure 2)							
ASSEMBLY MODEL NUMBER[1]	**FASTENER**	**WASHER DESCRIPTION**	**MAXIMUM POINT LENGTH (inch)**	**MINIMUM EFFECTIVE SHANK LENGTH (inch)**	**WASHER MATERIAL & GALVANIZATION**	**APPLICABLE BASE MATERIAL**	**APPLICATION TABLES**
PDPW-XXX	PDP-XXX	$^3/_4$ inch diameter, 0.070 inch thick	See PDP fastener	XXX/100 - 0.110	Carbon steel w/ electroplated zinc coating	Concrete Steel Conc.-filled deck Masonry	2, 3, 5, 6, 7, 8
PDPWL-XXX	PDP-XXX	1 inch diameter, 0.070 inch thick		XXX/100 - 0.110	Carbon steel w/ electroplated zinc coating	Concrete Steel Conc.-filled deck Masonry	2, 3, 5, 6, 7, 8
PDPWL-XXXMG	PDP-XXXMG	1 inch diameter, 0.055 inch thick		XXX/100 - 0.095	Carbon steel, ASTM B695 Class 65, Type 1	Concrete Steel Conc.-filled deck Masonry	2, 3, 5, 6, 7, 8
PDPWLS-300MG	PDP-300MG	1 inch square, 0.055 inch thick		2.905	Carbon steel, ASTM B695 Class 65, Type 1	Concrete	5, 6
PINW-XXX	PDP-XXX	$1^7/_{16}$ inch diameter, 0.078 inch thick		XXX/100 - 0.118	Carbon steel w/ electroplated zinc coating	Concrete Steel Conc.-filled deck Masonry	2, 3, 7, 8
PINWP-XXX		$1^3/_8$ inch diameter, 0.125 inch thick		XXX/100 - 0.165	Gray plastic		
PINWP-XXXW					White plastic		

TABLE 1—SIMPSON STRONG-TIE® POWDER-ACTUATED FASTENERS AND ASSEMBLIES[1] (Continued)

FASTENERS WITH PREMOUNTED FLAT WASHERS (see Figure 2)							
PDPAW-XX(X)	PDPA-XX(X)	3/4 inch diameter, 0.070 inch thick	See PDPA fastener	XXX/100 - 0.110	Carbon steel w/ electroplated zinc coating	Concrete Steel Conc.-filled deck Masonry	2, 3, 5, 6, 7, 8
PDPAWL-XX(X)		1 inch diameter, 0.070 inch thick					
PDPAWL-XXXMG	PDPA-XXXMG	1 inch diameter, 0.070 inch thick		XXX/100 - 0.110	Carbon steel, ASTM B695 Class 65, Type 1	Concrete	5, 6
PDPAWLS-287	PDPA-287	1 inch square, 0.055 inch thick		2.785	Carbon steel w/ electroplated zinc coating	Concrete	5, 6
PDPAWLS-287MG	PDPA-287MG	1 inch square, 0.055 inch thick		2.785	Carbon steel, ASTM B695 Class 65, Type 1	Concrete	5, 6
PHNW-YY	PHN-YY	1 inch diameter, 0.070 inch thick	See PHN fastener	YY/25.4 - 0.110	Carbon steel w/ electroplated zinc coating	Concrete Steel Conc.-filled deck	2, 3, 5, 6, 7

ASSEMBLY MODEL NUMBER[1]	**FASTENER**	**WASHER DESCRIPTION**	**MAXIMUM POINT LENGTH (inch)**	**MINIMUM EFFECTIVE SHANK LENGTH (inch)**	**WASHER MATERIAL & GALVANIZATION**	**APPLICABLE BASE MATERIAL**	**APPLICATION TABLES**
FASTENERS WITH PREMOUNTED TOPHAT WASHERS (see Figure 3)							
PDPT-XX(X)	PDP-XX(X)	Tophat	See PDP fastener	XXX/100 - 0.077	Aluminum	Concrete Steel Conc.-filled deck Masonry	2, 3, 7, 8
PDPT-XXK	PDP-XXK	Tophat		XX/100 - 0.077	Aluminum	Steel	3
PDPAT-XX(X)	PDPA-XX(X)	Tophat	See PDPA fastener	XXX/100 - 0.055	Carbon steel w/ electroplated zinc coating	Concrete Steel Conc.-filled deck Masonry	2, 3, 7, 8
PDPAT-XXK	PDPA-XXK	Tophat		XX/100 - 0.055	Carbon steel w/ electroplated zinc coating	Steel	3
PHNT-YY	PHN-YY	Tophat	See PHN fastener	YY/25.4 - 0.077	Aluminum	Concrete Steel Conc.-filled deck	2, 3, 7
PHNT-YYK	PHN-YYK	Tophat		YY/25.4 - 0.077	Aluminum	Steel	3

FASTENER MODEL NUMBER[1]	**SHANK TYPE**	**SHANK DIAMETER (inch) / THREADS**	**MAXIMUM POINT LENGTH (inch)**	**MINIMUM EFFECTIVE SHANK LENGTH (inch)**	**FASTENER GALVANIZATION**	**APPLICABLE BASE MATERIAL**	**APPLICATION TABLES**
THREADED STUDS (see Figure 4)							
PSLV3-XX(X)ZZ(Z)	Smooth / Threaded	0.205 / 3/8-16	0.433	ZZ(Z)/100 - 0.0156	ASTM B695 Class 5, Type 1	Concrete Steel Conc.-filled deck	2, 3, 7
PSLV3-XXZZK	Knurled / Threaded	0.205 / 3/8-16	0.433	ZZ/100 - 0.0156	ASTM B695 Class 5, Type 1	Steel	3
PSLV4-XX(X)ZZ(Z)	Smooth / Threaded	0.150 / 1/4-20	0.354	ZZ(Z)/100 - 0.0156	ASTM B695 Class 5, Type 1	Steel Conc.-filled deck	3, 7

ASSEMBLY MODEL NUMBER[1]	**FASTENER**	**CLIP DESCRIPTION**	**CLIP MATERIAL& GALVANIZATION**	**APPLICABLE BASE MATERIAL**	**APPLICATION TABLES**
CEILING CLIP ASSEMBLIES (see Figure 5)					
PCLDP-XXX	PDPT-XXX	0.075 inch thick, 90° clip angle, 5/16" dia. hole	Carbon steel w/ electroplated zinc coating	Conc.-filled deck	7
PECLDP-125	PDP-125	0.075 inch thick, 120° clip angle, 5/16" dia. hole	Carbon steel w/ electroplated zinc coating	Conc.-filled deck	7
PCLDPA-XXX	PDPAT-XXX	0.075 inch thick, 90° clip angle, 5/16" dia. hole	Carbon steel w/ electroplated zinc coating	Concrete Conc.-filled deck	2, 7
PECLDPA-XXX	PDPA-XXX	0.075 inch thick, 120° clip angle, 5/16" dia. hole	Carbon steel w/ electroplated zinc coating	Concrete Conc.-filled deck	2, 7
THREADED ROD HANGER ASSEMBLIES (see Figure 6)					

ASSEMBLY MODEL NUMBER[1]	FASTENER	BRACKET DESCRIPTION	BRACKET MATERIAL & GALVANIZATION	APPLICABLE BASE MATERIAL	APPLICATION TABLES
PTRH3-HN32	PHN-32	0.075 inch thick with $^3/_8$-16 threaded eyelet	Carbon steel w/ electroplated zinc coating	Concrete Conc.-filled deck	2, 7
PTRH4-HN32	PHN-32	0.075 inch thick with $^1/_4$-20 threaded eyelet	Carbon steel w/ electroplated zinc coating	Concrete Conc.-filled deck	2, 7
PTRHA3-XXX	PDPA-XXX	0.075 inch thick with $^3/_8$-16 threaded eyelet	Carbon steel w/ electroplated zinc coating	Concrete Conc.-filled deck	2, 7
PTRHA4-XXX	PDPA-XXX	0.075 inch thick with $^1/_4$-20 threaded eyelet	Carbon steel w/ electroplated zinc coating	Concrete Conc.-filled deck	2, 7

For **SI:** 1 inch = 25.4 mm.

[1]For fastener designations:

- The XX(X) designation in the model number represents the fastener length expressed in inches multiplied by 100.
- The YY designation in the model number represents the fastener length expressed in mm.
- For threaded studs, the XX and ZZ designations represent the length of the threaded portion of the fastener and the length of the unthreaded portion of the fastener, expressed in inches multiplied by 100, respectively.
- The K at the end of the designation denotes a knurled fastener.
- MG in the designation denotes a mechanically galvanized zinc coating complying with ASTM B695, Class 65, Type 1.

[2]u.o.n. = unless otherwise noted

TABLE 2—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMAL-WEIGHT CONCRETE[1,2]

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	MINIMUM EDGE DISTANCE (inches)	MINIMUM SPACING (inches)	ALLOWABLE LOADS (lbf)									
Concrete Compressive Strength:					**2,000 psi**		**2,500 psi**		**3,000 psi**		**4,000 psi**		**6,000 psi**	
Load Direction for Fasteners and Threaded Rod Hanger Assemblies and Threaded Studs:					**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**	**Tension**	**Shear**
FASTENERS														
PDP-XXX PDP-XXXMG PDPW-XXX PDPWL-XXX PDPWL-XXXMG PINW-XXX PINWP-XXX(W) PDPT-XXX	0.145	1	3	4	45	120	70	140	100	165	150	205	150	205
		$1^1/_4$	3	4	140	265	195	265	255	265	370	265	370	265
PHN-YY PHNT-YY PHNW-YY	0.145	$^3/_4$	3	4	-	-	-	-	-	-	60	95	-	-
		1	3	4	45	120	70	140	100	165	150	205	150	205
		$1^1/_4$	3	4	140	265	195	265	255	265	370	265	370	265
PDPA-XX(X) PDPA-XXXMG PDPAT-XX PDPAW-XX(X) PDPAWL-XX(X)	0.157	$^3/_4$	3.5	5	-	-	110	120	110	125	110	135	110	130
		1	3.5	5	-	-	210	285	240	290	310	310	160	350
		$1^1/_4$	3.5	5	-	-	320	360	340	380	380	420	365	390
		$1^1/_2$	3.5	5	-	-	375	405	400	430	450	485	465	495
PDPH-XX(X)	0.177	$^3/_4$	3.5	5	30	50	30	65	30	80	30	110	115	195
		$1^1/_4$	3.5	5	130	265	160	250	195	240	260	220	190	105
THREADED ROD HANGER ASSEMBLIES														
PTRH3-HN32	0.145	1	3	4	-	-	155	-	-	-	-	-	-	-
PTRH4-HN32	0.145	1	3	4	-	-	150	-	-	-	-	-	-	-
PTRHA3-106 PTRHA4-106	0.157	1	3.5	5	180	-	-	-	-	-	190	-	180	-
PTRHA3-131 PTRHA4-131		$1^1/_4$	3.5	5	185	-	-	-	-	-	220	-	190	-
THREADED STUDS														
PSLV3-125125	0.205	$1^1/_4$	4	6	-	-	260	-	-	-	-	-	-	-
CEILING CLIP ASSEMBLIES														
Load Direction for Ceiling Clip Assemblies:					**Tension**	**Oblique**	**Tension**	**Oblique**	**Tension**	**Oblique**	**Tension**	**Oblique**	**Tension**	**Oblique**
PCLDPA-106	0.157	1	3.5	5	175	255	-	-	-	-	180	240	190	245
PCLDPA-131		$1^1/_4$	3.5	5	210	250	-	-	-	-	210	265	190	265
PECLDPA-131	0.157	1	3.5	5	180	225	-	-	-	-	155	230	180	255

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

[1]The fasteners must not be driven until the concrete has reached the designated minimum compressive strength.
[2]The fasteners and assemblies listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.6, Items 2 and 5, as applicable.

TABLE 3—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO STEEL[1,2]

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EDGE DISTANCE (inch)	MINIMUM SPACING (inches)	ALLOWABLE LOADS (lbf)									
Steel Thickness (inch):				3/16		1/4		3/8		1/2		3/4	
Load Direction for Fasteners and Threaded Studs:				Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
FASTENERS IN A36 STEEL													
PDP-XX(X) PDP-XXK PDPW-XXX PDPWL-XXX PDPWL-XXXMG PDP-XXXMG PINW-XXX PINWP-XXX(W)	0.145	0.5	1.0	155[7]	395	-	-	-	-	-	-	-	-
PHN-YY PHN-YYK PHNW-YY	0.145	0.5	1.0	155[7]	395	-	-	-	-	-	-	-	-
PDPT-XX(X) PDPT-XXK	0.145	0.5	1.0	290[7]	660	340[7]	700	-	-	-	-	-	-
PHNT-YY PHNT-YYK	0.145	0.5	1.0	50[7]	620	250[7]	620	-	-	-	-	-	-
PDPA-XX(X)PDPA-XXK PDPA-XXXMG PDPAT-XX(X) PDPAT-XXK PDPAW-XX(X) PDPAWL-XX(X)	0.157	0.5	1.0	260[7]	410	370[7]	365	380[6]	385[6]	530[6]	385[6]	195[3]	325[3]
PDPH-XX(X) PDPH-XXK	0.177	0.5	1.0	340[7]	790	520[7]	870	-	-	-	-	-	-
FASTENERS IN A572 OR A992 STEEL													
PDPA-XX(X) PDPA-XXK PDPA-XXXMG PDPAT-XX(X) PDPAT-XXK PDPAW-XX(X) PDPAWL-XX(X)	0.157	0.5	1.0	305[7]	420	335[7]	365	355[6]	290[6]	485[4]	275[4]	170[5]	275[5]
THREADED STUDS IN A36 STEEL[2]													
PSLV3-XX(X)ZZ(Z)	0.205	1.0	1.5	270[7]	770	680[7]	1120	-	-	-	-	-	-
PSLV3-12575K	0.205	1.0	1.5	270[7]	930	870[7]	1130	-	-	-	-	-	-
PSLV4-XX(X)ZZ(Z)	0.150	0.5	1.0	200[7]	630	420[7]	690	-	-	-	-	-	-

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

[1]The entire pointed portion of the fastener must penetrate through the steel to obtain the tabulated values, unless otherwise noted.
[2]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.6, Items 3 and 5, as applicable.[3]Based upon a minimum penetration depth of 0.46 inch (11.7 mm).
[4]Based upon a minimum penetration depth of 0.58 inch (14.7 mm), which can be achieved due to deformation of the steel base material.
[5]Based upon a minimum penetration depth of 0.36 inch (9.1 mm).
[6]The fastener must be driven to where at least some of the point of the fastener penetrates through the steel.
[7]For steel-to-steel connections designed in accordance with Section 4.1.5, the tabulated allowable load may be increased by a factor of 1.25, and the design strength may be taken as the tabulated allowable load multiplied by a factor of 2.0.

TABLE 4—ALLOWABLE LOADS WHEN ATTACHING STEEL ANGLES AND CHANNELS TO NORMAL-WEIGHT CONCRETE[1,4]

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	ATTACHED ITEM	CONCRETE COMPRESSIVE STRENGTH (psi)	TYPE OF LOAD	ALLOWABLE LOAD (lbf)
PDP-125	0.145	$1^1/_8$	Angle clip[2]	2,000	Tension	25
PHN-32	0.145	$1^1/_8$	Angle clip[2]	2,000	Tension	25
PDP-150	0.145	$1^1/_4$	Angle clip[2]	2,000	Tension	85
PHN-32	0.145	$1^1/_4$	Angle clip[2]	2,000	Tension	85
PDP-100	0.145	$^7/_8$	No. 20 gage[3] steel channel	2,000	Shear	160
PHN-22	0.145	$^7/_8$	No. 20 gage[3] steel channel	2,000	Shear	160
PDP-100	0.145	$^7/_8$	No. 18 gage[3] steel channel	2,000	Shear	135
PHN-22	0.145	$^7/_8$	No. 18 gage[3] steel channel	2,000	Shear	135

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

[1]The fasteners must not be driven until the concrete has reached the designated minimum compressive strength.
[2]The angle clip is used to attach wire to the supporting concrete. The angle clip must be formed from steel having a minimum base metal thickness of 0.080 inch, and must have a dimension from the center of the hole through which the fastener is installed to the outstanding leg of the angle of 1 inch or less. Values in the table are for the fastener only. Capacity of the angle clip is outside the scope of this report.
[3]The Nos. 18 and 20 gage steel channels (drywall tracks) 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. Values in the table are for the fastener installed in concrete only. Capacity of the channels is outside the scope of this report.
[4]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.6, Items 2 and 5, as applicable.

TABLE 5—ALLOWABLE LOADS ON FASTENERS USED TO ATTACH WOOD SILL PLATES TO NORMAL-WEIGHT CONCRETE[3,4,5,6]

FASTENER MODEL NUMBER[4]	OVERALL LENGTH (inches)	NOMINAL HEAD DIAMETER (inch)	SHANK DIAMETER (inch)	WASHER THICKNESS (inch)	WASHER BEARING AREA (in^2)	ALLOWABLE LOADS (lbf)	
						Tension	Shear
PHNW-72[1]	$2^7/_8$	0.315	0.145	0.070	0.770	125	150
PDPW-300[1]	3	0.300	0.145	0.070	0.426	100	100
PDPWL-300[1], PDPWL-300MG[1]	3	0.300	0.145	0.070	0.770	100	100
PDPWLS-300MG[1]	3	0.300	0.145	0.055	0.970	100	100
PDPAW-287[2]	$2^7/_8$	0.300	0.157	0.070	0.424	200	205
PDPAWL-287[2] PDPAWL-287MG[2]	$2^7/_8$	0.300	0.157	0.070	0.767	200	205
PDPAWLS-287[2] PDPAWLS-287MG[2]	$2^7/_8$	0.300	0.157	0.055	0.970	200	205

For **SI:** 1 inch = 25.4 mm, 1 foot = 305 mm, 1 lbf = 445 N, 1 psi = 6.89 kPa.

[1]The fasteners must not be driven until the concrete has reached a minimum compressive strength of 2,000 psi.
[2]The fasteners must not be driven until the concrete has reached a minimum compressive strength of 2,500 psi.
[3]Minimum edge distance is $1^3/_4$ inches (44 mm).
[4]Wood members connected to the substrate must be investigated for compliance with the applicable code in accordance with referenced design criteria, for both lateral resistance and fastener pull-through.
[5]Only mechanically galvanized fasteners (with 'MG' in the designation) are suitable for use with preservative-treated wood, in accordance with 2015 IBC Section 2304.10.5.1 (2012, 2009 and 2006 IBC Section 2304.9.5.1) and IRC Section R317.3.1 (2006 IRC Section R319.3).
[6]Minimum spacings must be 4 inches on center or must comply with the NDS to prevent splitting of the wood.
[7]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6, as applicable. The tabulated allowable loads apply to static and seismic load conditions.

TABLE 6—LOAD AND SPACING REQUIREMENTS FOR WOOD SILL PLATE ANCHORAGE OF INTERIOR NONSTRUCTURAL WALLS[3,4,6,7,9,10]

FASTENER TYPE	NOMINAL FASTENER SHANK LENGTH (inches)	NOMINAL FASTENER SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH	CONCRETE EDGE DISTANCE (inches)	FASTENER SPACING[5,8] (ft.)	MAXIMUM WALL HEIGHT (ft.)
PDPW-300[1] PDPWL-300[1] PDPWL-300MG[1]PDPWLS-300MG[1]	3	0.145	Washer bearing on sill plate	$1^3/_4$	2	14
PHNW-72[1]	$2^7/_8$	0.145		$1^3/_4$	3	14
PDPAW-287[2] PDPAWL-287[2] PDPAWL-287MG[2] PDPAWLS-287[2] PDPAWLS-287MG[2]	$2^7/_8$	0.157		$1^3/_4$	4	14

For **SI:** 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psi = 6.89 kPa.

[1]The fasteners must not be driven until the concrete has reached a minimum compressive strength of 2,000 psi.
[2]The fasteners must not be driven until the concrete has reached a minimum compressive strength of 2,500 psi.
[3]Interior nonstructural walls are limited to locations where bearing walls, shear walls or braced walls are not required by the approved plans.
[4]Fasteners must be driven into the center of the nominally 2-inch-thick wood sill plate and must be at least $1^3/_4$ inch from the concrete edge.
[5]Walls must have fasteners placed at 6 inches from ends of sill plates with maximum spacing between, as shown in this table.
[6]Walls must be laterally supported at the top and the bottom.
[7]Sill or bottom plates must comply with IBC Section 2304 and be of lumber with a specific gravity of 0.50 or greater.
[8]Minimum spacings must be 4 inches on center or as required by the NDS to prevent splitting of the wood.
[9]Only mechanically galvanized fasteners (with 'MG' in the designation) are suitable for use in contact with preservative-treated wood in accordance with 2015 IBC Section 2304.10.5.1 (2012, 2009 and 2006 IBC Section 2304.9.5.1) and IRC Section R317.3.1 (2006 IRC Section R319.3).
[10]The maximum horizontal transverse load on the wall, in accordance with IBC Section 1607.14, must be 5 psf (0.24 kN/m^2).

TABLE 7—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO MINIMUM 3,000 psi SAND-LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK[1,6]

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENTDEPTH (inches)	ALLOWABLE LOADS (lbf)							
Fastener Location:			Fasteners Installed Directly into Concrete[5]		Fasteners Installed through Lower Flute of Steel Deck into Concrete					
					3" Deep Deck with $3^1/_4$"Concrete Fill[2]		3" Deep Deck with $2^1/_2$" Concrete Fill[3]		$1^1/_2$" Deep Deck with 2" Concrete Fill[4]	
Load Direction for Fasteners and Threaded Studs:			Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
FASTENERS										
PDPA-XX(X) PDPA-XXXMG PDPAT-XX(X) PDPAW-XX(X) PDPAWL-XX(X)	0.157	$^3/_4$	85	105	105	280	-	-	160	275
		1	150	225	145	280	-	-	210	370
		$1^1/_4$	320	420	170	320	-	-	265	460
		$1^1/_2$	385	455	325	520	-	-	-	-
PDP-XX(X) PDP-XXXMG PDPW-XXX PDPWL-XXX PDPWL-XXXMG PINW-XXX PINWP-XXX(W) PDPT-XX(X)	0.145	$^7/_8$	85	250	40	275	-	-	-	-
PHN-YY PHNT-YY PHNW-YY	0.145	$^7/_8$	185	275	165	400	-	-	-	-
THREADED STUDS										
PSLV4 - XX(X)ZZ(Z)	0.150	1	-	-	80	-	-	-	-	-
PSLV3 -125125	0.205	$1^1/_4$	-	-	225	-	-	-	-	-
CEILING CLIP ASSEMBLIES										
Load Direction for Ceiling Clip Assemblies:			Tension	Oblique	Tension	Oblique	Tension	Oblique	Tension	Oblique
PCLDP -100 PCLDP-125	0.145	$^7/_8$	-	-	55	85	-	-	-	-
PCLDP -125	0.145	1	-	-	55	85	-	-	-	-
PECLDP -125	0.145	1	-	-	55	85	-	-	-	-
PCLDPA-106	0.157	1	-	-	140	175	140	175	160	240
PCLDPA-131		$1^1/_4$	-	-	160	185	160	185	180	280
PECLDPA-131	0.157	1	-	-	120	145	120	145	135	175
THREADED ROD HANGER ASSEMBLIES										
Load Direction for Threaded Rod Hanger Assemblies:			Tension		Tension		Tension		Tension	
PTRH3 - HN32	0.145	1	-		140		-		-	
PTRH4 - HN32	0.145	1	-		140		-		-	
PTRHA3-106 PTRHA4-106	0.157	1	-		-		160		175	
PTRHA3-131 PTRHA4-131		$1^1/_4$	-		-		160		175	

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

[1]Fasteners must not be driven until the concrete has reached a minimum concrete compressive strength of 3,000 psi.
[2]The steel deck must have a minimum thickness of 20 gage (0.0359-inch-thick base-steel thickness). Figure 7 shows nominal flute dimensions, fastener locations, and tension and shear load orientations. Oblique loads are applied at a 45-degree angle to the fastener. The fastener must be a minimum of $1^1/_2$ inches from the edge of the deck web and 4 inches from the end of the deck. The minimum fastener spacing is 4 inches.
[3]The steel deck must have a minimum thickness of 20 gage (0.0359-inch-thick base-steel thickness). Figure 8 shows nominal flute dimensions, fastener locations, and tension and shear load orientations. Oblique loads are applied at a 45-degree angle to the fastener. The fastener must be a minimum of $1^1/_2$ inches from the edge of the deck web and 4 inches from the end of the deck. The minimum fastener spacing is 4 inches.
[4]The steel deck must have a minimum thickness of 20 gage (0.0359-inch-thick base-steel thickness). Figure 9 shows nominal flute dimensions, fastener locations, and tension and shear load orientations. Oblique loads are applied at a 45 degree angle to the fastener. The fastener must be a minimum of $^7/_8$ inches from the edge of the deck web and 4 inches from the end of the deck. The minimum fastener spacing is 4 inches.
[5]Minimum edge distance must be $3^1/_2$ inches and minimum spacing must be 4 inches.
[6]The fasteners and assemblies listed in the table above may be used for static load conditions and for the seismic load conditions described in Section 4.1.6, as applicable. The tabulated allowable loads apply to static load conditions. For seismic load conditions, the allowable loads must be limited in accordance with Section 4.1.6, Items 2 and 5, as applicable.

TABLE 8—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO THE FACE SHELL OF HOLLOW CONCRETE MASONRY UNITS (CMUs)[1,2,3,4]

FASTENER MODEL NUMBER	SHANK DIAMETER (inch)	MINIMUM CMU FACE SHELL THICKNESS (inches)	ALLOWABLE LOADS (lbf)	
			Tension	Shear
PDP-XXX PDP-XXXMG PDPW-XXX PDPWL-XXX PDPWL-XXXMG PDPT-XXX PINW-XXX PINWP-XXX(W)	0.145	$1^1/_4$	110	200
PDPA-XXX PDPA-XXXMG PDPAW-XXX PDPAWL-XXX PDPAT-XXX	0.157	$1^1/_4$	125	210

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

[1]The tabulated allowable load values are for fasteners installed in hollow lightweight CMUs conforming to ASTM C90. The minimum allowable nominal size of the CMU must be 8 inches high by 8 inches wide by 16 inches long, with a minimum,$1^1/_4$-inch-thick face shell thickness.
[2]The tabulated allowable load values are for fasteners installed in the center of a hollow CMU face shell. See Figure 10 for the applicable placement zone. Only one PAF may be installed at each cell. 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.
[3]The entire pointed portion of the fastener must penetrate through the thickness of the face shell to obtain the tabulated values.
[4]The fasteners listed in the table above may be used for static load conditions and for the seismic load conditions described in Item 1 of Section 4.1.6.

PDP **PDPA** **PDPH** **PHN**

FIGURE 1—FASTENERS

PDPW / PDPWL **PHNW** **PDPAW / PDPAWL**

PINW **PINWP**

FIGURE 2—FASTENERS WITH PREMOUNTED FLAT WASHERS

PDPT

PHNT

PDPAT

FIGURE 3—FASTENERS WITH PREMOUNTED TOPHAT WASHERS

PSLV3

PSLV4

FIGURE 4—THREADED STUDS

PCLDP

PECLDP

PTRH

PCLDPA

PECLDPA

FIGURE 5—CEILING CLIP ASSEMBLIES

PTRHA

FIGURE 6—THREADED ROD HANGER ASSEMBLIES

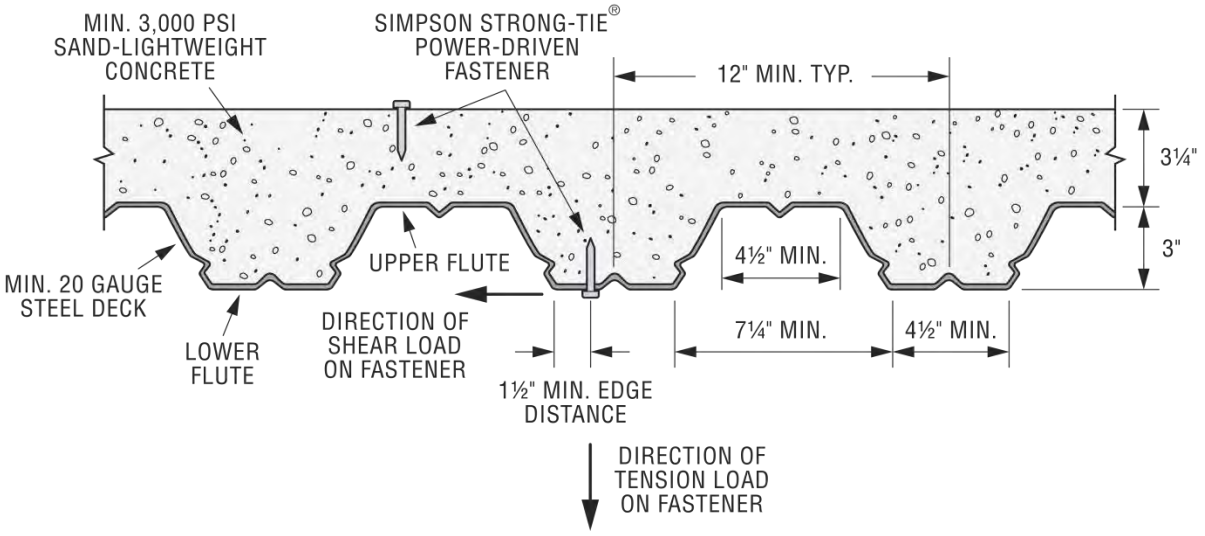

FIGURE 7—INSTALLATION IN $3^1/_4$-INCH CONCRETE FILL OVER 3-INCH-DEEP STEEL DECK

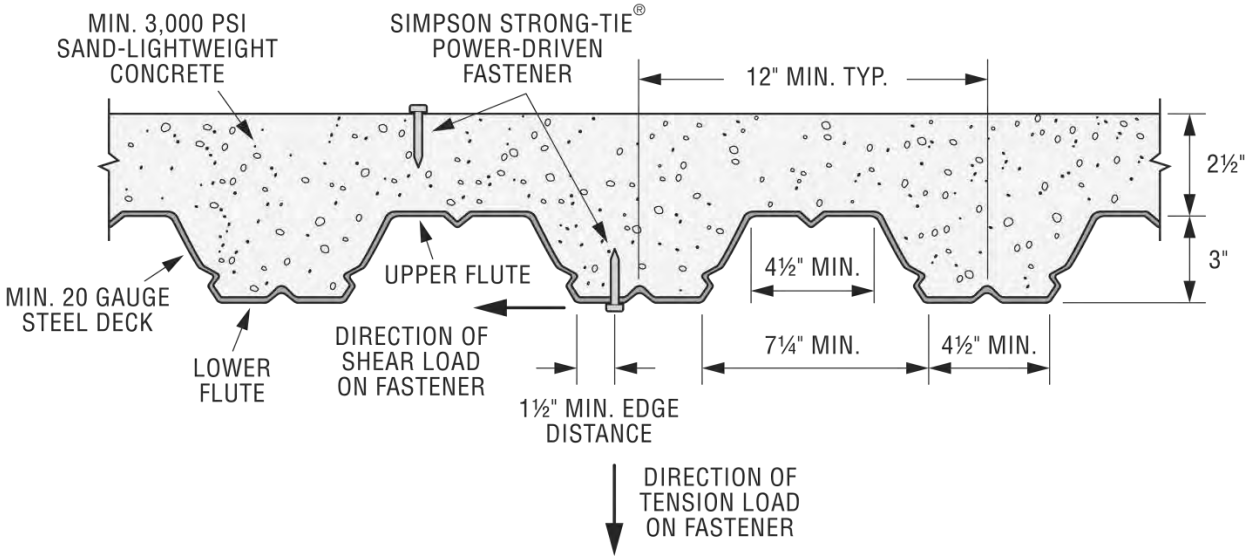

FIGURE 8—INSTALLATION IN $2^1/_2$-INCH CONCRETE FILL OVER 3-INCH-DEEP STEEL DECK

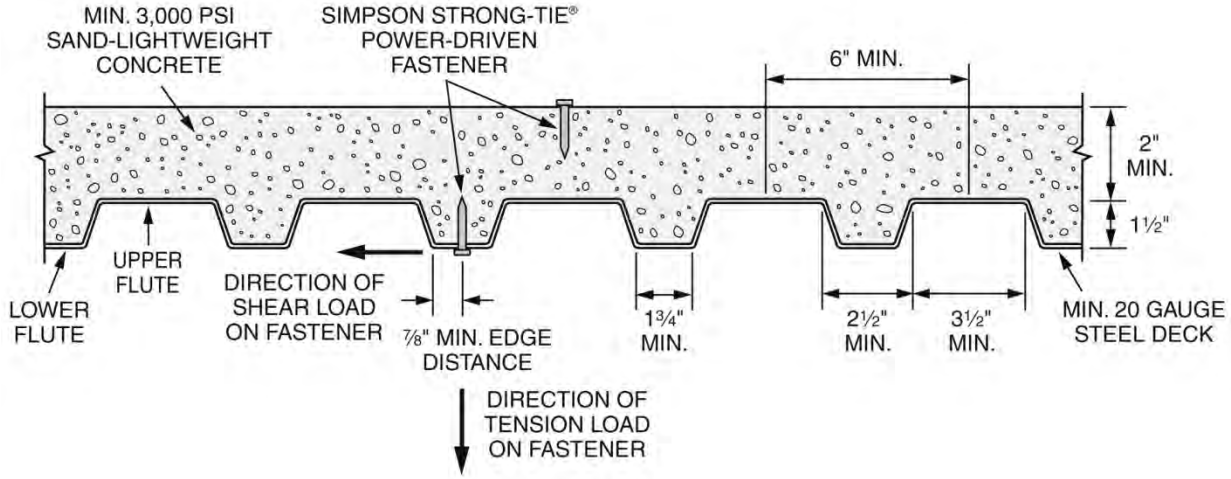

FIGURE 9—INSTALLATION IN 2-INCH CONCRETE FILL OVER $1^1/_2$-INCH-DEEP STEEL DECK

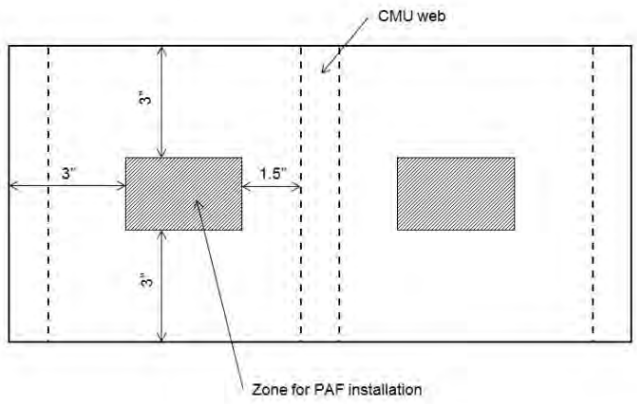

FIGURE 10—ZONE FOR FASTENER INSTALLATION IN FACE SHELL OF CMU