ICC EVALUATION SERVICE

ICC-ES Evaluation Report

ESR-2024

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DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories
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

DIVISION: 09 00 00—FINISHES
Section: 09 22 16.23—Fasteners

REPORT HOLDER:

DEWALT

ADDITIONAL LISTEE:

MAX CO., LTD.

EVALUATION SUBJECT:

POWER-DRIVEN FASTENERS, CEILING CLIP ASSEMBLIES AND SILL PLATE ANCHORAGE (DEWALT)

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012 and 2009 *International Building Code*® (IBC)
- 2018, 2015, 2012 and 2009 *International Residential Code*® (IRC)

For evaluation for compliance with codes adopted by California Office of Statewide Health Planning and Development (OSHPD) and Division of the State Architect (DSA), see ESR-2024 CBC and CRC Supplement.

Property evaluated:

Structural

2.0 USES

The power-driven fasteners are used to attach building elements such as wood and cold-formed steel to base materials of: uncracked, normalweight and sand-lightweight concrete; cold-formed steel decks with sand-lightweight concrete fill; concrete masonry and structural steel.

The fasteners, which include pins (with and without washers) and threaded studs, are alternatives to the cast-in-place anchors described in IBC Section 1901.3 (2012 IBC Section 1908; 2009 IBC Section 1911) for placement in concrete; the embedded anchors described in Section 8.1.3 of TMS 402-16 and TMS 402-13, referenced in Section 2107 of the 2018 and 2015 IBC, respectively (Section 2.1.4 of TMS 402-11 and -08, referenced in Section 2107 of the 2012 and 2009 IBC) for placement in masonry; and the welds and bolts used to attach materials to steel described in IBC Sections 2204.1 and 2204.2, respectively.

Select fasteners are alternatives to the cast-in-place anchors described in IBC Section 2308.3.1 (2012 and 2009 IBC Section 2308.6) and IRC Section R403.1.6 for anchorage of wood sills to concrete. The fasteners are also used as components of the ceiling clip assemblies, which are used to fasten suspended ceiling systems to the supporting structure. For structures regulated under the IRC, the fasteners may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Power-driven Fasteners:

The power-driven fasteners are low-velocity power-driven fasteners manufactured from hardened steel complying with the manufacturer's quality documentation; and are zinc-plated in accordance with ASTM B695, Class 5, Type 1 unless otherwise noted. Product names for the report holder and additional listee are presented in the table below:

COMPANY NAME	PRODUCT NAME
DEWALT	Power-driven Fasteners and Ceiling Clips
Max Co., Ltd.	Powerlite Fasteners

See Figure 3 for representative images of the fasteners and Table A for dimensional properties.

3.1.1 0.300-inch Head Drive Pins: These fasteners have a head diameter of 0.300-inch (7.62 mm) and either a smooth or knurled shank with a diameter of 0.145 inch (3.7 mm). The single fasteners have premounted plastic guide washers. These fasteners are also available with premounted top hat washers. The mechanically galvanized

(MG) version of these fasteners have premounted plastic guide washers and are zinc-plated in accordance with ASTM B695, Class 55.

3.1.2 8 mm Head Drive Pins: These fasteners have a head diameter of 8 mm (0.315 inch), a smooth or knurled shank with a diameter of 0.145 inch (3.7 mm). The single fasteners have premounted plastic guide washers. These fasteners are also available with premounted top hat washers or in collated strips.

3.1.3 CSI Spiral Pins: These fasteners have a head diameter of 8 mm (0.32 inch) and a spiral shank with a diameter of 0.157 inch (4.0 mm). The single fasteners have premounted plastic guide washers. These fasteners are also available in collated strips.

3.1.4 CSI Spiral Taper Shank Pins: These fasteners have a head diameter of 8 mm (0.32 inch) and a spiral taper shank with a diameter of 0.145 inch (3.7 mm) at the largest portion of the shank. The single fasteners have premounted plastic guide washers. These fasteners are also available in collated strips.

3.1.5 CSI Spiral Step Shank Pin: These fasteners have a head diameter of 8 mm (0.32 inch); and a stepped, spiral shank with diameters of 0.145 and 0.125 inch (3.7 and 3.2 mm). The single fasteners have premounted plastic guide washers. These fasteners are also available in collated strips.

3.1.6 Ballistic Point Drive Pins: These fasteners have a head diameter of 0.300 inch (7.62 mm) and a smooth shank with a diameter of 0.150 inch (3.8 mm). Single fasteners have a premounted plastic guide washer. The fasteners are coated with a black polymer.

3.1.7 Threaded Studs: These fasteners have a straight shank at the end of the fastener that is power-driven into the substrate and threads at the other end. The threaded studs are available with $^1/_4$-inch-20 or $^3/_8$-inch-16 thread diameters with a variety of thread and shank lengths. The $^1/_4$-inch-20 threaded studs have a smooth or knurled shank diameter of 0.145 inch (3.7 mm), while the $^3/_8$-inch-16 threaded studs have a smooth shank diameter of 0.205 inch (5.2 mm). The single fasteners have a premounted plastic guide washer.

3.2 Ceiling Clip Assemblies:

The power-driven ceiling clip assemblies are comprised of a power-driven fastener with a premounted steel angle clip for attachment of ceiling wire or a premounted steel clip with a post-nut accessory for attachment of threaded rod. The assemblies may also include premounted washers. The clips are manufactured from carbon steel and are zinc-plated in accordance with ASTM B695, Class 5, Type 1. See Figure 3 for images of the ceiling clip assemblies.

3.2.1 0.300-inch Head Drive Pin Ceiling Clip Assemblies: Both standard and economy ceiling clip assemblies are available and are comprised of the smooth shank head drive pins, described in Section 3.1.1 and a standard or economy clip, respectively. The standard ceiling clip assemblies are available with a regular length clip or an extended length (XL) clip, which have a 90 degree angle and are manufactured from 0.080-inch-thick (2.0 mm) steel. The economy clips have a 60-degree angle and are manufactured from 0.075-inch-thick (1.9 mm) steel.

3.2.2 8 mm Head Drive Pin Ceiling Clip Assemblies: The assemblies are comprised of the smooth shank head drive pins described in Section 3.1.2 and the standard ceiling clip described in Section 3.2.1.

3.2.3 CSI Spiral Pin Ceiling Clip Assemblies: The assemblies are comprised of the spiral shank pin described in Section 3.1.3 and a 90-degree angle clip manufactured from 0.079-inch-thick (2.0 mm) steel.

3.2.4 Post Nut Hanger Ceiling Clip Assemblies: The Post Nut Hanger Ceiling Clip Assembly is a 0.300-inch head standard ceiling clip assembly, described in Section 3.2.1, with a factory- assembled post-nut (threaded eye coupling nut) attachment that accepts $^1/_4$-20 threaded rod or bolts. The post nut is zinc-plated in accordance with ASTM B695 Class 5, Type 1. The post-nut hanger ceiling clip assemblies are available with a regular length clip or clip with an extended length (XL).

3.2.5 Ballistic Point Drive Pin Ceiling Clip Assembly: The Ballistic Point Drive Pin Ceiling Clip Assembly is comprised of a Ballistic Point Drive Pin described in Section 3.1.5 and a steel clip. The clips have a 90-degree angle and are manufactured from 0.080-inch-thick (2.0 mm) steel.

3.3 Washered Pin Assemblies:

The Washered Pin Assemblies are comprised of a head drive pin described in Section 3.1.1, 3.1.2 or 3.1.3 and a premounted washer manufactured from low-carbon steel. A number of different washers are available. The washered pin assemblies are zinc-plated in accordance with ASTM B695, Class 5, Type 1, except for mechanically galvanized (MG) washered pin assemblies which are zinc plated in accordance with ASTM B695, Class 55. See Figure 3 for typical washered pin assemblies.

3.4 Substrate Material:

3.4.1 Concrete: Normalweight and sand-lightweight concrete must conform to IBC Chapter 19 or IRC Section R402.2, as applicable. The minimum concrete compressive strength at the time of fastener installation is noted in Tables 1A, 1B, 1C, 2A and 2B.

3.4.2 Concrete Masonry: Concrete masonry units (CMUs) must be minimum 8-inch-thick (203 mm) normalweight or lightweight blocks conforming to ASTM C90, as noted in Table 5. Mortar must be Type N, M or S complying with ASTM C270. Grout must be coarse grout complying with ASTM C476. Concrete masonry walls must have a minimum compressive strength, f'_m, of 2,000 psi (13.8 MPa), as applicable.

3.4.3 Steel Substrates: Structural steel must comply with the minimum requirements of ASTM A36, ASTM A572 Grade 50, or ASTM A992, and have a minimum thickness as shown in Tables 6A, 6B, 7A and 7B.

3.4.4 Steel Deck Panels: The steel deck properties and configurations must be as described in the footnotes of Tables 3A, 3B, 4A and 4B and in Figures 1A or 1B, as applicable.

3.4.5 Sill Plates: The sill plates must be nominally 2-inch-thick lumber that is naturally durable wood complying with the definition in IBC Section 202 (2009 IBC Section 2302) or IRC Section R202, as applicable, or wood that has been preservative-treated in accordance with IBC Section 2303.1.9 (2012 and 2009 IBC Section 2303.1.8) or IRC Section R317.1, 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 cold-formed steel deck panels, concrete masonry and steel base materials, the minimum effective shank length shown in Table A must equal or exceed the sum of the thickness of the attached material and the minimum embedment depth (penetration) shown in the applicable tables in this report.
- For installation through steel base materials, the minimum effective shank length shown in Table A 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 fasteners driven into different base materials may be determined by referencing Table A.

The tabulated allowable loads are applicable to the fastener in the base material and the capacity of premounted ceiling clips only. The connection capacity of the materials attached to the base materials, and of the wire or rod connected to the ceiling clip assemblies, must be determined in accordance with accepted design criteria and the applicable requirements of the IBC.

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 these 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.

The allowable tension (pull-out) and shear loads listed in this report apply only to the connection of the fastener to the base materials. 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 attached materials, 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 base materials, the bending yield strength of the power-driven fasteners 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 tension and shear loads, compliance with the following interaction equation must be verified:

$$(p/P_a) + (v/V_a) \leq 1$$

where:

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

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

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

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

4.1.4 Steel-to-steel Connections: When the fasteners listed in Table 6A and Table 6B are used in connections of two steel elements in accordance with Section J5 of AISI S100-16 (Section E5 of AISI S100-12), connection capacity must be determined in accordance with Sections 4.1.4.1 and 4.1.4.2, as applicable.

4.1.4.1 Connection Strength - Tension: To determine tensile connection strength in accordance with Section J5.2 of AISI S100-16 (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:

- **Tensile Strength:** The available tension strengths must be calculated in accordance with Section J5.2.1 of AISI S100-16 (Section E5.2.1 of AISI S100-12) using a value of 260,000 psi for F_{uh}.
- **Pull-out Strength:** See Table 5A and Table 5B for available pull-out strength, as applicable.
- **Pull-over Strength:** The available pull-over strengths must be calculated in accordance with Section J5.2.3 of AISI S100-16 (Section E5.2.3 of AISI S100-12).

4.1.4.2 Connection Strength - Shear: To determine shear connection strength in accordance with Section J5.3 of AISI S100-16 (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:

- **Shear Strength:** The available shear strengths must be calculated in accordance with Section J5.3.1 of AISI S100-16 (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 J5.3.2 of AISI S100-16 (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 Tables 5A and 5B, or must be calculated in accordance with Section J5.3.3 of AISI S100-16 (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 J5.3.4 of AISI S100-16 (Section E5.3.4 of AISI S100-12) and the shear strength limited by edge distance must be determined in accordance with Section J5.3.5 of AISI S100-16 (Section E5.3.5 of AISI S100-12).

4.1.5 Sill Plate to Foundation Connections:

Allowable shear and tension loads for fasteners used to attach wood sill plates to concrete are provided in Table 8A. The bearing area and thickness of the washers are also given in Table 8A. For shear loads, spacing of fasteners must be determined based on the lesser of the allowable shear load from Table 8A and the allowable load on the fastener/wood sill plate/concrete foundation interaction, determined in accordance with the ANSI/AWC National Design Specification (NDS) for Wood Construction, 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 based on the lesser of allowable tension load from Table 8A and pull through capacity of the wood sill plate, based on Section 3.10 of the NDS, using the washer bearing area from Table 8A. For fasteners subject to combined tension and shear loads, compliance with Section 4.1.3 must be verified.

4.1.6 Seismic Considerations: The fasteners and ceiling clip assemblies are recognized for use when subjected to seismic loads as follows:

1. The fasteners 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 1A, 1B, 1C, 2A, 2B, 3A, 3B, 4A or 4B 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 Tables 6A, 6B, 7A or 7B, as applicable.
4. 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 (1,112N) 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.
5. The fasteners listed in Table 8A may be used to attach wood sill plates to concrete for structural walls in Seismic Design Categories A and B. The fasteners listed in Table 8B 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 8B.

4.2 Installation:

4.2.1 General: Fasteners must be installed with a power-actuated fastening tool in accordance with the manufacturer's published installation instructions. A copy of these instructions must be available on the jobsite at all times during fastener installation. Installers using a low-velocity powder-actuated tool during fastener installation must have a current operator's license for projects under the IBC.

The fastener size, minimum embedment depth or penetration, minimum spacing, and edge distances must comply with Tables 1A through 7B 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.

4.2.2 Use with Treated Lumber:

The mechanically galvanized 0.300-inch Head Drive pins described in Section 3.1.1 and the mechanically galvanized washered pin assemblies described in Section 3.3, which have a ASTM B695, Class 55 mechanically galvanized coating, may be used in contact with preservative-treated wood in dry, interior locations only in accordance with IBC Section 2304.10.5.1 (2012 and 2009 IBC Section 2304.9.5.1). These products may also be used in contact with fire-retardant-treated wood in dry, interior locations only, in accordance with IBC Section 2304.10.5.4 (2012 and 2009 IBC Section 2304.9.5.4) and the report holder's recommendations.

Any power-driven fasteners described in this report may be used in contact with wood treated with SBX/DOT and zinc borate preservatives in dry, interior locations only, in accordance with the exception to IBC Section 2304.10.5.1 (2012 and 2009 IBC Section 2304.9.5.1).

5.0 CONDITIONS OF USE

The power-driven fasteners, ceiling clip assemblies and sill plate anchorage 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 must be manufactured and identified in accordance with this report.

5.2 The fasteners must be installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, the more restrictive requirements govern.

5.3 Calculations demonstrating that the applied loads are less than the allowable loads described in this report must be submitted to the code official for approval. 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.

5.4 For steel-to-steel connections that meet the applicability requirements of Section J5 of AISI S100-16 (Section E5 of AISI S100-12), calculations demonstrating that the available connection strength has been determined in accordance with Section J5 of AISI S100-16 (Section E5 of AISI S100-12) and Section 4.1.4 of this report, and equals 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.

5.5 The use of the fasteners in this report is limited to installation in dry, interior environments, which include exterior walls which are protected by an exterior wall envelope.

5.6 The use of fasteners is limited to installation in uncracked concrete or masonry. Cracking occurs when $f_t > f_r$, due to service loads or deformations.

5.7 Installation must comply with Section 4.2.2 regarding fasteners in contact with preservative-treated or fire-retardant-treated wood.

5.8 See Section 4.1.6 of this report for seismic considerations.

5.9 The 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 (editorially revised November 2017).

7.0 IDENTIFICATION

7.1 The power-driven fasteners are identified by a "D" or a "P" stamped onto the head of the drive pin. Packages bear one of the company names set forth in Section 3.1, the fastener catalog number, the fastener length and diameter, and the evaluation report number (ESR-2024).

7.2 The report holder's contact information is the following:

DEWALT
701 EAST JOPPA ROAD
TOWSON, MARYLAND 21286
(800) 524-3244
www.DEWALT.com
anchors@DEWALT.com

7.3 The additional listee's contact information is the following:

MAX CO., LTD.
6-6 NIHONBASHI-HAKAZAKI-CHO
CHUO-KU, TOKYO
JAPAN
+ (03) 3669-8131

TABLE A—FASTENERS, THREADED STUDS AND CEILING CLIP ASSEMBLIES INDEX[1,2]

FASTENERS (INCLUDING WASHERED PIN ASSEMBLIES)							
FASTENER DESCRIPTION	**SHANK TYPE**	**SHANK DIAMETER (inch)**	**MAX. POINT LENGTH (inch)**	**AVAILABLE LENGTHS (L) (inch)**	**MIN. EFFECTIVE SHANK LENGTH (inch)**	**APPLICABLE BASE MATERIAL**	**APPLICABLE LOAD TABLE**
0.300-inch Head Drive Pins	Smooth	0.145	0.300	0.50 to 3.00	L - 0.032	Normalweight Concrete	1A, 8A, 8B
						Lt. Wt. Concrete Concrete-filled Steel Deck	3A
						Masonry	5
						Steel	6A
	Knurled			0.50 to 0.625		Steel	6A
8 mm Head Drive Pins	Smooth	0.145	0.210	0.625 to 2.875	L - 0.032	Normalweight Concrete	1B, 8A, 8B
	Knurled			0.625 to 0.75		Steel	6A
CSI Spiral Pins	Spiral	0.157	0.310	0.625 to 2.875	L - 0.032	Normalweight Concrete	1C
						Lt. Wt. Concrete Concrete-filled Steel Deck	3B
						Masonry	5
						Steel	6A, 6B
CSI Spiral Taper Shank Pins	Spiral, Taper	0.145	0.120	0.50 to 0.625	L - 0.032	Steel	6A, 6B
CSI Spiral Step Shank Pin	Spiral, Step	0.145 / 0.125	0.180	0.50	L - 0.032	Steel	6A, 6B
Ballistic Point Drive Pins	Smooth	0.150	0.310	0.50 to 0.75	L - 0.032	Steel	6A

THREADED STUDS								
FASTENER DESCRIPTION	**SHANK TYPE**	**SHANK DIAMETER (inch)**	**MAX. POINT LENGTH (inch)**	**LENGTH OF THREADS (inch)**	**AVAILABLE SHANK LENGTHS BELOW THREADS (L) (inch)**	**MIN. EFFECTIVE SHANK LENGTH[3] (inch)**	**APPLICABLE BASE MATERIAL**	**ALLOWABLE LOAD TABLE**
$^3/_8$-inch-16 Threaded Studs	Smooth	0.205	0.310	1.25	1.04 or 1.30 (1.00 or 1.25 nominal, respectively)	L - 0.032	Normalweight Concrete	1B
							Lt. Wt. Concrete, Concrete-filled Steel Deck	3A
$^1/_4$-inch-20 Threaded Studs	Smooth	0.145	0.180	0.50	0.83 (0.75 nominal)	L - 0.032	Normalweight Concrete	1B
				0.75	0.69, 0.83 or 1.06 (0.625, 0.75 or 1.00 nominal, respectively)		Lt. Wt. Concrete, Concrete-filled Steel Deck	3A
				1.25	1.06 (1.00 nominal)		Masonry	5
	Knurled	0.145	0.180	0.50 to 0.75	0.58 (0.50 nominal)	L - 0.032	Steel	6A, 6B

CEILING CLIP ASSEMBLIES						
ASSEMBLY DESCRIPTION	**MAX. PIN POINT LENGTH (inch)**	**AVAILABLE PIN LENGTHS (L) (inch)**	**MAX. CLIP THICKNESS (inch)**	**MIN. EFFECTIVE SHANK LENGTH (inch)**	**APPLICABLE BASE MATERIAL**	**ALLOWABLE LOAD TABLE**
0.300-inch Head Standard Ceiling Clip Assemblies (regular and extended length clips)	0.300	1.00 to 1.25	0.080	L - 0.112	Normalweight Concrete	2A
					Lt. Wt. Concrete, Concrete-filled Steel Deck	4A
					Steel	7A
8 mm Head Ceiling Clip Assemblies	0.210	1.00 to 1.25	0.080	L – 0.112	Normalweight Concrete	2A
					Lt. Wt. Concrete, Concrete-filled Steel Deck	4A
CSI Spiral Pin Ceiling Clip Assemblies	0.310	0.875 to 1.25	0.079	L – 0.111	Normalweight Concrete	2B
					Lt. Wt. Concrete, Concrete-filled Steel Deck	4B
					Steel	7B
0.300-inch Head Economy Ceiling Clip Assemblies	0.300	1.000 to 1.25	0.075	L – 0.106	Normalweight Concrete	2A
					Lt. Wt. Concrete, Concrete-filled Steel Deck	4A
Ballistic Point Drive Pin Ceiling Clip Assemblies	0.300	0.875 to 1.25	0.079	L – 0.111	Steel	7A
Post Nut Hanger Ceiling Clip Assemblies (regular and extended length clips)	0.300	1.125 to 1.25	0.080	L – 0.112	Normalweight Concrete	2A
					Lt. Wt. Concrete, Concrete-filled Steel Deck	4A
					Steel	7A

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

[1]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.
[2]Unless otherwise noted, minimum effective shank length is the minimum specified length from the underside of the fastener head to the tip of the fastener.
[3]Minimum effective shank length for threaded studs is the minimum specified length from the bottom of the threads to the tip of the fastener.

TABLE 1A—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMALWEIGHT CONCRETE (lbf)[1,2,3]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	f'c = 2,500 psi		f'c = 3,000 psi		f'c = 4,000 psi	
					Tension	Shear	Tension	Shear	Tension	Shear
0.300-inch Head Drive Pins	0.145	5/8	3	3 1/4	80	150	85	150	85	150
		3/4			85	195	90	195	90	195
		1			145	400	145	400	145	400
		1 1/4			305	495	305	495	305	495
		1 1/2			305	495	465	505	465	505

TABLE 1B—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMALWEIGHT CONCRETE (lbf)[1,2,3]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)		EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	f'c = 2,500 psi		f'c = 3,000 psi		f'c = 4,000 psi		f'c = 5,000 psi	
						Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
8 mm Head Drive Pins	0.145		5/8	3	3	30	50	60	95	45	95	25	95
			3/4			70	105	95	125	95	125	100	125
			1			110	140	130	155	155	155	180	200
			1 1/4			125	155	155	165	195	165	235	200
			1 1/2			130	175	180	175	235	175	290	200
3/8-inch-16 Threaded Studs	0.205		1	3	3	80	135	80	135	160	110	160	110
			1 1/4			165	220	165	220	200	320	200	320
1/4-inch-20 Threaded Studs	0.145		5/8	3	3	30	50	60	95	45	95	25	95
			3/4			70	105	95	125	95	125	100	125
			1			110	140	130	155	155	155	180	200

TABLE 1C—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO NORMALWEIGHT CONCRETE (lbf)[1,2,3]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	f'c = 2,500 psi		f'c = 3,000 psi		f'c = 4,000 psi		f'c = 6,000 psi	
					Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
CSI Spiral Pins	0.157	3/4	4	3 1/2	120	170	130	190	270	380	-	-
		1			195	245	225	280	270	520	205	300
		1 1/4			310	385	340	420	475	575	205	380

For **SI:** 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

Notes for Tables 1A, 1B and 1C:

[1]Fasteners must not be driven until the concrete has reached the designated compressive strength.

[2]Concrete thickness must be a minimum of three times the embedment depth of the fastener.

[3]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 of this report, 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 4, as applicable.

TABLE 2A—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES DRIVEN INTO NORMALWEIGHT CONCRETE (lbf)[1,2,3]

ASSEMBLY DESCRIPTION		SHANK DIAMETER (inch)	EMBEDMENT DEPTH (inches)	MIN. REQUIRED NOMINAL FASTENER LENGTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	f'c = 2,500 psi		f'c = 3,000 psi			f'c = 4,000 psi	
							Tension	Shear	Tension	45°	Shear	Tension	Shear
0.300-inch Head Ceiling Clip Assemblies	Regular Length Clips	0.145	3/4	7/8	3	3	45	75	125	-	105	190	170
			7/8	1			45	75	140	145	160	200	250
			1	1 1/8			130	125	140	145	160	200	245
			1 1/8	1 1/4			140	125	150	190	160	225	275
	Extended Length (XL)	0.145	3/4	1	3	3 1/4	115	195	115	-	195	115	195
			1	1 1/4			150	280	165	-	280	245	280
8 mm Head Ceiling Clip Assemblies		0.145	3/4	7/8	3	3	45	75	65	-	105	70	145
			7/8	1			45	75	75	125	145	70	145
			1	1 1/8			45	125	75	125	160	100	160
0.300-inch Head Economy Ceiling Clip Assemblies		0.145	3/4	7/8	3	3	40	75	40	-	75	70	145
			1	1 1/8			40	135	40	-	150	100	150
Post Nut Hanger Ceiling Clip Assemblies	Regular Length Clips	0.145	1	1 1/8	3	3	120	220	160	150	240	185	245
			1 1/8	1 1/4			125	240	165	245	255	205	275
	Extended Length (XL)	0.145	3/4	1	3	3 1/4	115	195	115	-	195	115	195
			1	1 1/4			150	280	165	-	280	245	280

TABLE 2B—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES DRIVEN INTO NORMALWEIGHT CONCRETE (lbf)[1,2,3]

ASSEMBLY DESCRIPTION	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MIN. REQUIRED NOMINAL FASTENER LENGTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	f'c = 3,000 psi		
						Tension	45°	Shear
CSI Spiral Pin Ceiling Clip Assemblies	0.157	3/4	3/4	4	3 1/2	100	130	175
		1	1			170	215	230

For **SI:** 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

Notes for Tables 2A and 2B:

[1]Fasteners must not be driven until the concrete has reached the minimum tabulated compressive strength.

[2]Concrete thickness must be a minimum of three times the embedment depth of the fastener.

[3]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 of this report, 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, Item 2.

TABLE 3A—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK PANELS (lbf)[1,5]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	f'c = 3,000 psi						f'c = 3,500 psi					
				Directly Into Concrete		Through 3-inch Deep Steel Deck Panel[3]				Directly Into Concrete		Through 3-inch Deep Steel Deck Panel[3]			
						Tension		Shear				Tension		Shear	
				Tension	Shear	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Tension	Shear	Upper Flute	Lower Flute	Upper Flute	Lower Flute
0.300-inch Head Drive Pins	0.145	3/4	3	70	70	165(6)	95(6)	280(6)	290(6)	75	75	-	-	-	-
		7/8		70	70	165(6)	165(6)	290(6)	290(6)	75	75	165	185	290	290
		1		200	215	175	165	-	290	220	235	190	185	-	315
		1 1/4		250	305	280	190	-	340	270	330	305	205	-	365
		1 1/2		340	375	280	235	-	380	365	405	305	255	-	410
1/4-inch-20 Threaded Studs	0.145	3/4	3	70	35	-	35	-	160	75	40	-	40	-	175
		1		70	125	-	65	-	170	75	135	-	70	-	185
3/8-inch-16 Threaded Studs	0.205	1	6	70	130	-	45	-	165	75	140	-	50	-	180
		1 1/4		170	265	-	85	-	225	185	285	-	90	-	245
Minimum Edge Distance (inches):				3		N/A	1 1/8	N/A	1 1/8	3		N/A	1 1/8	N/A	1 1/8
Minimum Concrete Topping Thickness:				See Footnote 2		3 1/4	2 1/4	3 1/4	2 1/4	See Footnote 2		3 1/4	2 1/4	3 1/4	2 1/4
Installation must comply with Figure:						1A						1A			

TABLE 3B—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK PANELS (lbf)[1,5]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inches)	MINIMUM SPACING (inches)	f'c = 3,000 psi											
				Directly Into Concrete		Through 3-inch Deep Steel Deck Panel[4]						Through 1 1/2-inch Deep Steel Deck Panel[4]			
						Upper Flute[6]			Lower Flute[6]			Upper Flute	Lower Flute	Upper Flute	Lower Flute
				Tension[6]	Shear[6]	Tension	45°	Shear	Tension	45°	Shear	Tension		Shear	
CSI Spiral Pins	0.157	3/4	4	185	270	185	-	430	130	-	355	120	120	410	410
		1		260	375	250	335	510	190	150	355	-	200	-	410
		1 1/8		350	425	250	430	560	200	150	425	-	200	-	410
		1 1/4		350	440	350	455	610	200	160	450	-	210	-	415
		1 1/2		460	520	475	530	610	205	220	450	-		-	
Minimum Edge Distance (inches):				3 1/2		N/A			1 1/8			7/8			
Minimum Concrete Topping Thickness:				See Footnote 2		3 1/4			2 1/4			2 1/4			
Installation must comply with Figure:						1A			1A			1B			

For **SI:** 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa, 1 ksi = 1,000 psi.

N/A = Not applicable.

Notes for Tables 3A and 3B:

[1]Fasteners must not be driven until the concrete has reached the minimum designated compressive strength.

[2]For fasteners installed directly into concrete, the concrete thickness must be a minimum of three times the embedment depth but not greater than 3 1/4 inches.

[3]The steel deck profile for the 3-inch deep composite floor deck panel have a minimum base metal thickness of 0.036 inch and minimum yield and tensile strengths (F_y and F_u) equal to 33 ksi and 45 ksi, respectively.

[4]The steel deck profile for the 3-inch deep composite floor deck panel have a minimum base metal thickness of 0.034 inch and minimum yield and tensile strengths (F_y and F_u) equal to 40 ksi and 55 ksi, respectively.

[5]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 of this report, 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 4, as applicable.

[6]Fasteners may be installed in 2,500 psi sand-lightweight concrete provided the allowable loads are multiplied by a factor of 0.87.

TABLE 4A—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES INSTALLED IN LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK PANELS (lbf)[1,5]

ASSEMBLY DESCRIPTION	SHANK DIAMETER (inch)	EMBEDMENT DEPTH (inches)	MINIMUM REQUIRED NOMINAL FASTENER LENGTH (inches)	MINIMUM SPACING (inches)	f'c = 3,000 psi													
					Directly Into Concrete[2]			Through 3-inch Deep Steel Deck Panel[3]						Through 1 1/2-inch Deep Steel Deck Panel[3]					
								Tension		45°		Shear		Tension		45°		Shear	
					Tension	45°	Shear	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute
0.300-inch Head Ceiling Clip Assemblies (regular length clip)	0.145	3/4	7/8	3	50	40	25	-	50	-	40	-	120	-	-	-	-	-	-
		7/8	1		50	40	25	-	55	-	120	-	325	-	80	-	120	-	310
		1	1 1/8		60	40	80	135	120	180	145	350	325	-	-	-	-	-	-
		1 1/8	1 1/4		60	40	80	135	120	180	145	350	325	-	-	-	-	-	-
8 mm Head Ceiling Clip Assemblies	0.145	3/4	7/8	3	50	40	25	-	35	-	40	-	120	-	-	-	-	-	-
		7/8	1		50	40	25	-	55	-	100	-	285	-	-	-	-	-	-
		1	1 1/8		60	40	80	-	55	-	100	-	285	-	-	-	-	-	-
0.300-inch Head Economy Ceiling Clip Assemblies	0.145	3/4	7/8	3	35	45	30	-	30	-	40	-	135	-	-	-	-	-	-
		1	1 1/8		55	90	115	-	55	-	45	-	135	-	-	-	-	-	-
Post Nut Hanger Ceiling Clip Assemblies (regular length clip)	0.145	1	1 1/8	3	60	-	-	135	120	-	-	-	-	-	-	-	-	-	-
		1 1/8	1 1/4		60	-	-	135	120	-	-	-	-	-	-	-	-	-	-
Minimum Edge Distance (inches):					3			N/A	1 1/8	N/A	1 1/8	N/A	1 1/8	N/A	7/8	N/A	7/8	N/A	7/8
Minimum Concrete Topping Thickness:					N/A			3 1/4	2 1/4	3 1/4	2 1/4	3 1/4	2 1/4	N/A	2 1/4	N/A	2 1/4	N/A	2 1/4
Installation must comply with Figure:								1A							1B		1B		1B

TABLE 4B—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES INSTALLED IN SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK PANELS (lbf)[1,5]

ASSEMBLY DESCRIPTION	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inches)	MINIMUM REQUIRED NOMINAL FASTENER LENGTH (inches)	MINIMUM SPACING (inches)	f'c = 3,000 psi											
					Through 3-inch Deep Steel Deck Panel[4]						Through 1 1/2-inch Deep Steel Deck Panel[4]					
					Tension		45°		Shear		Tension		45°		Shear	
					Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute	Upper Flute	Lower Flute
CSI Spiral Pin Ceiling Clip Assemblies	0.157	3/4	7/8	4	-	-	-	-	-	-	-	80	-	135	-	335
		7/8	1		110	-	205	-	340	-	-	-	-	-	-	-
		1	1		-	75	-	105	-	295	-	-	-	-	-	-
Minimum Edge Distance (inches):					N/A	1	N/A	1	N/A	1	N/A	7/8	N/A	7/8	N/A	7/8
Minimum Concrete Topping Thickness:					2							2 1/4		2 1/4		2 1/4
Installation must comply with Figure:					1A							1B		1B		1B

For **SI:** 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa, 1 ksi = 1,000 psi.

N/A = Not applicable.

Notes for Tables 4A and 4B:

[1]Fasteners must not be driven until the concrete has reached the minimum designated compressive strength.

[2]For fasteners installed directly into concrete, the concrete thickness must be a minimum of three times the embedment depth of the fastener but not greater than 3 1/4 inches

[3]The steel deck profile for the composite floor deck panels have a minimum thickness of 0.036 inch and minimum yield and tensile strengths (F_y and F_u) equal to 33 ksi and 45 ksi, respectively.

[4]The steel deck profile for the composite floor deck panels have a minimum thickness of 0.034 inch and minimum yield and tensile strengths (F_y and F_u) equal to 40 ksi and 55 ksi, respectively.

[5]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 of this report, 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 4, as applicable.

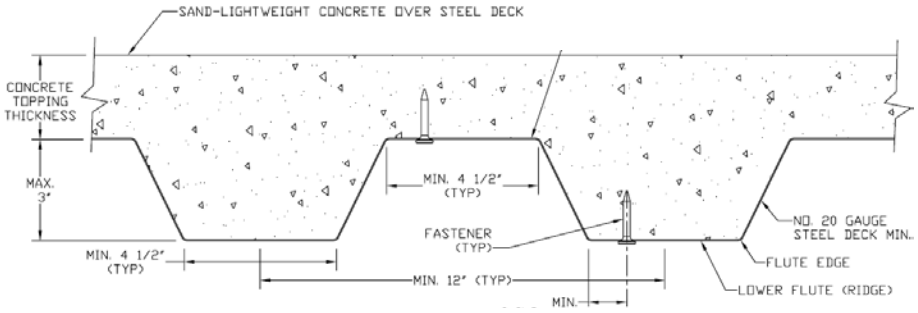

FIGURE 1A—FASTENER OR CEILING CLIP ASSEMBLY INSTALLATION LOCATION THROUGH THE SOFFIT OF 3-INCH-DEEP CONCRETE-FILLED COMPOSITE STEEL DECK FLOOR AND ROOF PANEL ASSEMBLIES

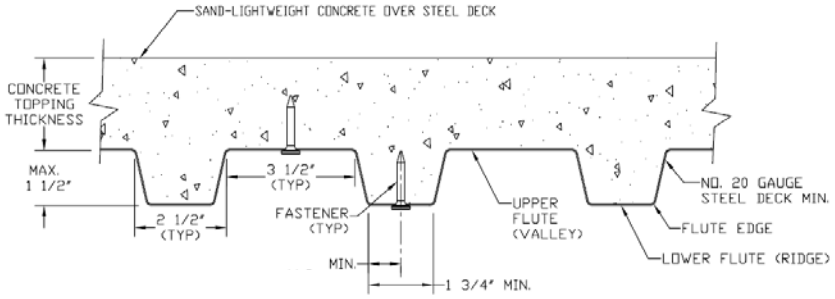

FIGURE 1B—FASTENER OR CEILING CLIP ASSEMBLY INSTALLATION LOCATION THROUGH THE SOFFIT OF $1^1/_2$-INCH-DEEP CONCRETE-FILLED COMPOSITE STEEL DECK FLOOR AND ROOF PANEL ASSEMBLIES (INVERTED DECK PROFILE SUITABLE)

TABLE 5—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO CONCRETE MASONRY UNITS[1,6,7,8]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	EMBEDMENT DEPTH (inch)	MIN. END AND EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)									
Masonry Type:				HOLLOW CMU				GROUTED CMU					
Fastener Location:				Face Shell[2]		Horizontal Mortar Joint[5]		Face Shell[2]		Horizontal Mortar Joint[5]		Top and Center of Grouted Wall	
Load Direction:				Tension	Shear[3]	Tension	Shear[4]	Tension	Shear[3]	Tension	Shear[4]	Tension	Shear[3]
0.300-inch Head Drive Pins	0.145	1	$3^3/_4$	-	-	-	-	150	155	140	170	45	115
CSI Spiral Pins	0.157	1	$3^3/_4$	185	210	70	115	140	165	120	185	120	145
$^1/_4$-inch-20 Threaded Studs	0.145	1	$3^3/_4$	185	180	60	120	175	220	135	220	-	-

For **SI:** 1 lbf = 4.4 N, 1 inch = 25.4 mm.

[1]Concrete masonry units (CMU) must be normalweight units for hollow CMU walls and lightweight units for grouted CMU walls and must conform to ASTM C90. The minimum 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]Only one fastener may be installed in each cell.
[3]Shear loads for fasteners installed in the face shell or in the top of grouted cells may be applied in any direction.
[4]Shear loads for fasteners installed into the horizontal mortar joint may be applied in any direction along the CMU wall plane.
[5]Mortar must be Type N, M or S complying with ASTM C270. Allowable loads may be increased by 50 percent for joint installations into Type M or S mortar.
[6]Allowable loads for fasteners installed into vertical mortar joints, including the intersection of the head joint and bed joint, are outside the scope of this report. [7]Fasteners must be installed a minimum of $1^3/_4$ inches from the vertical mortar joints.
[8]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 of this report.

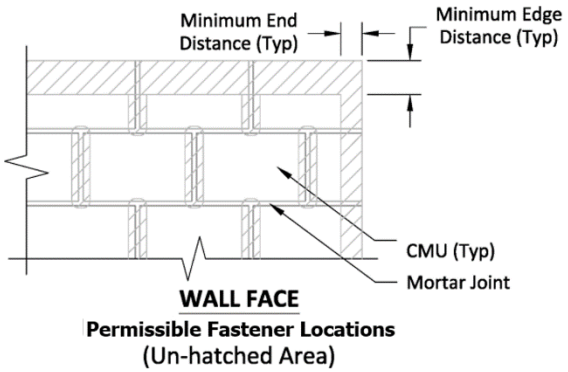

FIGURE 2—FASTENERS INSTALLED INTO CONCRETE MASONRY

TABLE 6A—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO ASTM A36 STEEL (lbf)[1,2,6,8,10]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	SHANK TYPE	STEEL THICKNESS (inch)									
			1/8		3/16		1/4		3/8		1/2	
			Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
0.300-inch Head Drive Pins[3]	0.145	Smooth	-	-	355[9]	565	410[9]	560	465[9]	390	390	520
		Knurled	170	265	150[9]	275	150[9]	210	300[9]	275	-	-
8 mm Head Drive Pins[3]	0.145	Knurled	-	-	340[9]	610	445[9]	560	520[7]	605	490	575
CSI Spiral Pins[3]	0.157	Spiral	280	540	515[9]	585	735[9]	535	615[9]	495	535[4]	565[4]
CSI Spiral Taper Shank Pins 1/2-inch	0.145	Spiral, Taper	-	-	-	-	195[9]	360	225[9]	360	230[5]	445[5]
CSI Spiral Taper Shank Pins 5/8-inch			-	-	-	-	245[9]	430	265[9]	430	295[6]	445[6]
CSI Spiral Step Shank Pin[3]	0.145 / 0.125	Spiral, Step	45	200	240	385	250[9]	415	295[9]	385	275[7]	380[7]
Ballistic Point Pins[3]	0.150	Smooth	-	-	-	-	310[9]	545	450[9	525	-	-
1/4-inch-20 Threaded Studs	0.145	Knurled	-	-	465	495	565	545	-	-	-	-

TABLE 6B—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO ASTM A572 GRADE 50 / A992 STEEL (lbf)[1,2,8,11]

FASTENER DESCRIPTION	SHANK DIAMETER (inch)	SHANK TYPE	STEEL THICKNESS (inch)									
			1/8		3/16		1/4		3/8		≥ 1/2	
			Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
0.300-inch Head Drive Pins	0.145	Knurled	-	-	160[9]	285	160[9]	220	325[9]	290	-	-
CSI Spiral Pins	0.157	Spiral	325	510	550[9]	630	795[9]	580	660[9]	535	580[4]	610[4]
CSI Spiral Taper Shank Pins 1/2-inch	0.145	Spiral, Taper	-	-	-	-	210[9]	390	240[9]	390	245[5]	480[5]
CSI Spiral Taper Shank Pins 5/8-inch			-	-	-	-	265[9]	465	290[9]	465	320[6]	480[6]
CSI Spiral Step Shank Pin	0.145 / 0.125	Spiral, Step	45	200	260	415	275[9]	450	320[9]	415	300[7]	405[7]
1/4-inch-20 Threaded Studs	0.145	Knurled	-	-	500	535	615	590	-	-	-	-

For **SI:** 1 lbf = 4.48 N, 1 inch = 25.4 mm.

Notes for Table 6A and 6B:

[1]To obtain the tabulated values, the entire pointed portion of the fastener must penetrate the steel, unless otherwise noted.

[2]The minimum spacing is 1 inch center-to-center, and minimum edge and end distances are 1/2 inch, unless otherwise noted.

[3]Fasteners must have a minimum spacing of 1 1/2 inches center-to-center, and minimum edge and end distances are 1/2 inch.

[4]The fasteners must be embedded a minimum of 0.50 inch into the steel. Fastener point penetration through the steel is not necessary provided the minimum embedment is achieved.

[5]The fasteners must be embedded a minimum of 0.43 inch into the steel. Fastener point penetration through the steel is not necessary provided the minimum embedment is achieved.

[6]The fasteners must be embedded a minimum of 0.45 inch into the steel. Fastener point penetration through the steel is not necessary provided the minimum embedment is achieved.

[7]The fasteners must be embedded a minimum of 0.41 inch into the steel. Fastener point penetration through the steel is not necessary provided the minimum embedment is achieved.

[8]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 of this report, 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 4, as applicable.

[9]For steel-to-steel connections designed in accordance with Section 4.1.4, the tabulated allowable load (ASD) may be increased by a factor of 1.25, and the design strength (LRFD) may be taken as the tabulated allowable load multiplied by a factor of 2.0 when the pointed portion penetration protrude past the steel.

[10]Steel base material must have minimum yield and tensile strengths (F_y and F_u) equal to 36 ksi and 58 ksi, respectively for A36 steel.

[11]Steel base material must have minimum yield and tensile strengths (F_y and F_u) equal to 50 ksi and 65 ksi, respectively for A572 Grade 50 or A992 steel.

TABLE 7A—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES DRIVEN INTO STEEL (lbf)[1,2,4,5]

ASSEMBLY DESCRIPTION	SHANK DIAMETER (inch)	SHANK TYPE	ASTM A36						ASTM A572 GRADE 50 / A992			
			1/8-INCH THICK		1/4-INCH THICK		3/8-INCH THICK		1/4-INCH THICK		3/8-INCH THICK	
			Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
0.300-inch Head Standard Ceiling Clip Assemblies	0.145	Smooth	140	350	345	385	190	255	375	415	205	275
Ballistic Point Pin Ceiling Clip Assemblies	0.150	Smooth	-	-	350	510	190	240	380	550	205	255
Post Nut Hanger Ceiling Clip Assemblies (regular length clip)	0.145	Smooth	140	-	345	-	190	-	375	-	205	-

TABLE 7B—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES INSTALLED INTO STEEL (lbf)[1,3,4,5]

ASSEMBLY DESCRIPTION	SHANK DIAMETER (inch)	SHANK TYPE	ASTM A36 OR ASTM A572 GRADE 50 / A992		
			1/4-INCH THICK		
			Tension	45°	Shear
CSI Spiral Pin Ceiling Clip Assemblies	0.157	Spiral	350	390	420

For **SI:** 1 lbf = 4.48 N, 1 inch = 25.4 mm.

Notes for Table 7A and 7B:
[1]To obtain the tabulated values, the entire pointed portion of the fastener must penetrate the steel.
[2]The minimum fastener spacing is 1 inch center-to-center, and minimum edge and end distances are 1/2 inch.
[3]The minimum fastener spacing is 1 1/2 inches center-to-center, and minimum edge and end distances are 1/2 inch.
[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 of this report, 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 4, as applicable.
[5]Steel base material must have minimum yield and tensile strengths (F_y and F_u) equal to 36 ksi and 58 ksi, respectively, for A36 steel and equal to 50 ksi and 65 ksi, respectively, for A572 Grade 50 or A992 steel.

TABLE 8A—ALLOWABLE LOADS ON FASTENERS USED TO ATTACH WOOD SILL PLATES TO NORMALWEIGHT CONCRETE FOR STRUCTURAL WALLS[1,2,3,6]

WASHERED PIN ASSEMBLY DESCRIPTION[7]	FASTENER SHANK LENGTH (inches)	FASTENER SHANK DIAMETER (inch)	APPLICABLE SILL PLATE MATERIAL	WASHER THICKNESS (inch)	WASHER BEARING AREA (in^2)	ALLOWABLE LOAD (lbf)	
						Tension	Shear
0.300-inch Head Drive Pins with 7/8" Diameter Washer	3	0.145	See Note 4	0.075	0.557	125	150
0.300-inch Head Drive Pins with 1" Diameter Washer	3	0.145	See Note 4	0.075	0.770	125	150
0.300-inch Head Drive Pins with 1" Square Washer	3	0.145	See Note 4	0.055	1.147	125	150
0.300-inch Head MG Pins with 1" Diameter Washer	3	0.145	See Note 5	0.060	0.753	125	150
0.300-inch Head MG Pins with 1" Square Washer	3	0.145	See Note 5	0.060	1.164	125	150
8 mm Head Drive Pins with 1" Diameter Washer	2 7/8	0.145	See Note 4	0.075	0.770	125	150

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.48 N, 1 psi = 6.89 kPa.

MG = Mechanically Galvanized

[1]The fasteners must not be driven until the concrete has reached a minimum compressive strength of 2,500 psi.
[2]Minimum fastener edge distance in concrete is 1 3/4 inches.
[3]Wood sill plate 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. See Section 4.1.5 of this report.
[4]Naturally durable lumber; see Section 3.4.5 of this report.
[5]Naturally durable lumber or preservative treated lumber. See Sections 3.1.1, 3.4.5, and 4.2.2 for applicable wood material and compatible fastener coatings.
[6]The fasteners listed in the table may be used to attach wood sill plates to concrete for structural walls in Seismic Design Categories A and B in accordance with Section 4.1.6, Item 5.

TABLE 8B—FASTENER SPACING REQUIREMENTS FOR WOOD SILL PLATE ANCHORAGE OF INTERIOR NONSTRUCTURAL WALLS[1,2,3,4,5,6,7,8]

WASHERED PIN ASSEMBLY DESCRIPTION[8]	FASTENER SHANK DIAMETER (inch)	FASTENER SHANK LENGTH (inches)	CONCRETE EDGE DISTANCE (inches)	MAXIMUM SPACING (feet)	MAXIMUM WALL HEIGHT (feet)
0.300-inch Head Drive Pins with $^7/_8$" Diameter Washer 0.300-inch Head Drive Pins with 1" Diameter Washer 0.300-inch Head Drive Pins with 1" Square Washer 0.300-inch Head MG Pins with 1" Diameter Washer 0.300-inch Head MG Pins with 1" Square Washer	0.145	3	$1^3/_4$	3	14
8 mm Head Drive Pin with 1" Diameter Washer	0.145	$2^7/_8$	$1^3/_4$	3	14

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

MG = Mechanically Galvanized

[1]Fasteners must not be driven until the concrete has reached a minimum concrete compressive strength of 2,500 psi.
[2]Interior nonstructural walls are limited to locations where bearing walls, shear walls or braced walls are not required by the approved plans.
[3]Fasteners must be driven into the center of the sill plate and be at least $1^3/_4$ inches from the concrete edge. Washer must bear on sill plate.
[4]Walls must have fasteners placed at 6 inches from ends of sill plates with maximum spacing between, as shown in this table.
[5]Walls must be laterally supported at the top and the bottom.
[6]Sill or bottom plates must comply with IBC Section 2304.1 and be of lumber with a specific gravity of 0.50 or greater. See Sections 3.1.1, 3.4.5 and 4.2.2 for applicable wood material and compatible fastener coatings.
[7]Minimum fastener spacing must be 4 inches center-to-center or must comply with Section 12.1.6 of the NDS (Section 11.1.5 for the 2012 IBC, Section 11.1.5 for the 2009) to prevent splitting of the wood.
[8]The fasteners listed in the table may be used to attach wood sill plates to concrete for interior, nonstructural walls in Seismic Design Categories A through F in accordance with Section 4.1.6, Item 5.

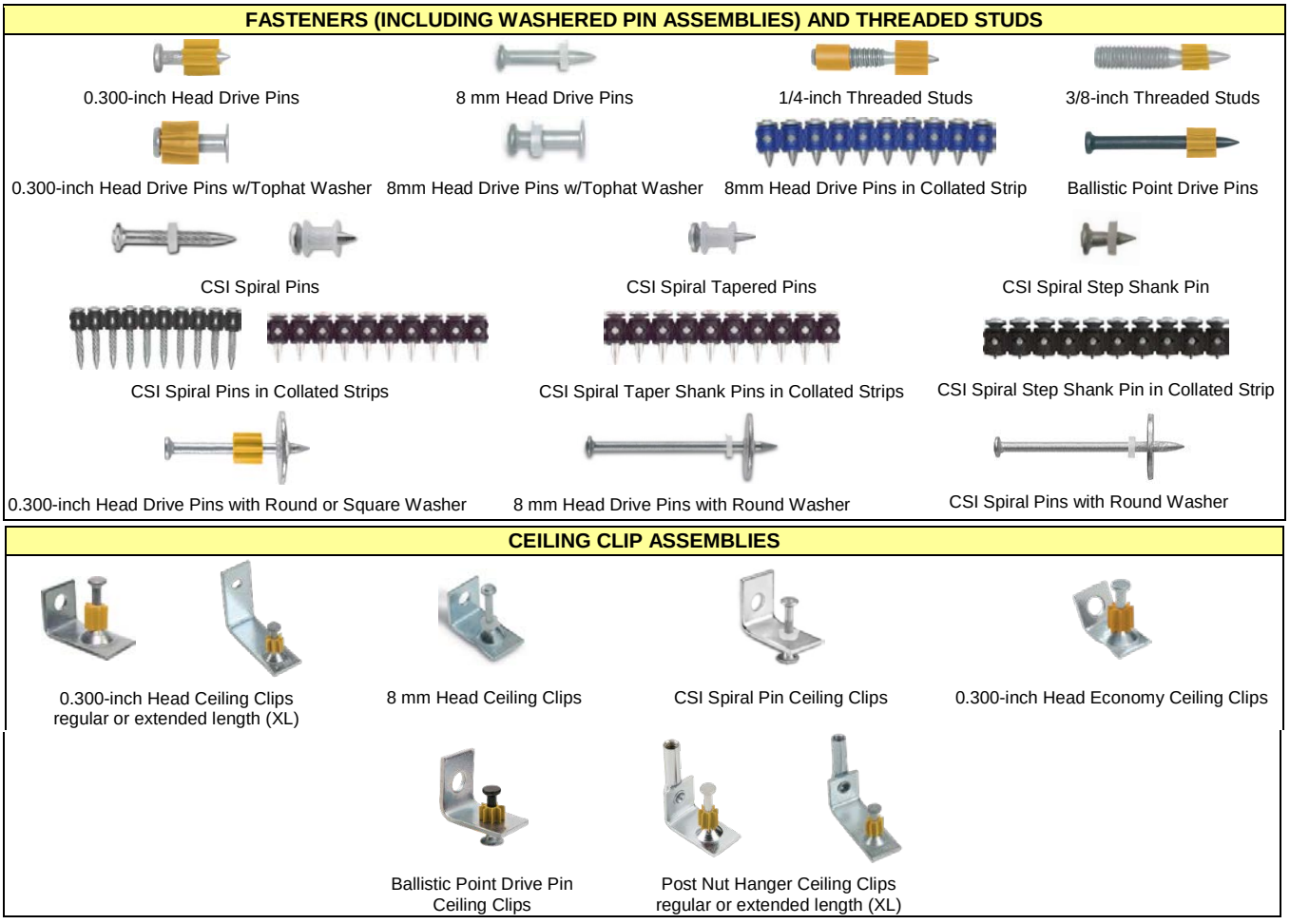

FIGURE 3—POWER-DRIVEN FASTENERS, THREADED STUDS AND CEILING CLIP ASSEMBLIES[1]

[1]Fasteners, threaded studs and assemblies illustrated with a premounted plastic guide washer and may be colored yellow, black or opaque (previously yellow guide washers were red in color). Plastic collations may be colored yellow, black, blue or opaque.

DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories
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

DIVISION: 09 00 00—FINISHES
Section: 09 22 16.23—Fasteners

REPORT HOLDER:

DEWALT

EVALUATION SUBJECT:

POWER-DRIVEN FASTENERS, CEILING CLIP ASSEMBLIES AND SILL PLATE ANCHORAGE (DEWALT)

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the power-driven fasteners, ceiling clip assemblies and sill plate anchorage, described in ICC-ES evaluation report ESR-2024, have also been evaluated for the codes noted below.

Applicable code edition:

- 2016 *California Building Code* (CBC)
- 2016 *California Residential Code* (CRC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) and Division of the State Architect (DSA), see Sections 2.1 and 2.2 below.

2.0 CONCLUSIONS

The power-driven fasteners, ceiling clip assemblies and sill plate anchorage, described in Sections 2.0 through 7.0 of the evaluation report ESR-2024, comply with CBC Chapters 19, 19A, 21, 21A, 22, 22A and 23, and CRC Sections R403.1.6 and R301.1.3, provided the design and installation are in accordance with the 2015 *International Building Code*® (IBC) provisions noted in the evaluation report, and the additional design and inspection requirements of the CBC Chapters 16 and 17.

2.1 OSHPD:

The power-driven fasteners, ceiling clip assemblies and sill plate anchorage, described in Sections 2.0 through 7.0 of the evaluation report ESR-2024, comply with the CBC amended Section 1901.3.1 [OSHPD 2] or Section 1901A.3 [OSHPD 1 & 4], provided the design and installation are in accordance with the additional requirements in Sections 2.1.1 and 2.1.2, respectively.

2.1.1 Verification Test Requirements: The installation verification test loads, frequency, and acceptance criteria shall be in accordance with Section 1901.3.4 [OSHPD 2] or 1910A.5 [OSHPD 1 & 4] of the CBC, as applicable.

2.1.2 Conditions of Use:

1. Power actuated fastener in seismic shear application shall be in accordance with Section 1616A.1.20 [OSHPD 1 & 4].

2. Sill plates under nonbearing interior partitions on concrete floor slabs shall be in accordance with Section 2304.3.4 of the CBC, Item 2, Second paragraph [OSHPD 1, 2 & 4].

2.2 DSA:

The power-driven fasteners, ceiling clip assemblies and sill plate anchorage, described in Sections 2.0 through 7.0 of the evaluation report ESR-2024, comply with the CBC amended Section 1901.3.1 [DSA-SS/CC] or Section 1901A.3 [DSA-SS], provided the design and installation are in accordance with the additional requirements in Sections 2.2.1 and 2.2.2, respectively.

2.2.1 Verification Test Requirements: The installation verification test loads, frequency, and acceptance criteria shall be in accordance with Section 1909.2.7 [DSA-SS/CC] and 1910A.5 [DSA-SS] of the CBC, as applicable.

2.2.2 Conditions of Use:

1. Power actuated fastener in seismic shear application shall be in accordance with Section 1616A.1.20 [DSA-SS].

2. Sill plates under nonbearing interior partitions on concrete floor slabs shall be in accordance with Section 2304.3.4 of the CBC, Item 2, Second paragraph [DSA-SS and DSA-SS/CC].

This supplement expires concurrently with the evaluation report, reissued September 2020.

DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories
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

DIVISION: 09 00 00—FINISHES
Section: 09 22 16.23—Fasteners

REPORT HOLDER:

DEWALT

EVALUATION SUBJECT:

POWER-DRIVEN FASTENERS, CEILING CLIP ASSEMBLIES AND SILL PLATE ANCHORAGE (DEWALT)

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the fasteners, described in ICC-ES evaluation report ESR-2024, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2017 *Florida Building Code—Building*
- 2017 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The fasteners, described in Sections 2.0 through 7.0 of the evaluation report ESR-2024, comply with the FBC-B and FBC-R, provided the design and installation are in accordance with the 2015 *International Building Code*® provisions noted in the evaluation report.

Use of the power-driven fasteners has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential.*

For products falling under Florida Rule 9N-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued September 2020.